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Special Issue on

INNOVATIVE ISSUES AND APPROACHES IN SOCIAL SCIENCE, ARTS AND SCIENCE

Special Issue Editors-in-Chief

Dr. N. VETRIVELAN | Prof. V. CHANDRA CHOWDRY
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BODHI

International Journal of Research in Humanities, Arts and Science

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The **BODHI International Journal of Research in Humanities, Arts and Science** (E-ISSN: 2456-5571) is online, peer reviewed, Refereed and Quarterly Journal, which is powered & published by **Center for Resource, Research and Publication Services, (CRRPS)** India. It is committed to bring together academicians, research scholars and students from all over the world who work professionally to upgrade status of academic career and society by their ideas and aims to promote interdisciplinary studies in the fields of humanities, arts and science.

The journal welcomes publications of quality papers on research in humanities, arts, science. agriculture, anthropology, education, geography, advertising, botany, business studies, chemistry, commerce, computer science, communication studies, criminology, cross cultural studies, demography, development studies, geography, library science, methodology, management studies, earth sciences, economics, bioscience, entrepreneurship, fisheries, history, information science & technology, law, life sciences, logistics and performing arts (music, theatre & dance), religious studies, visual arts, women studies, physics, fine art, microbiology, physical education, public administration, philosophy, political sciences, psychology, population studies, social science, sociology, social welfare, linguistics, literature and so on.

Research should be at the core and must be instrumental in generating a major interface with the academic world. It must provide a new theoretical frame work that enable reassessment and refinement of current practices and thinking. This may result in a fundamental discovery and an extension of the knowledge acquired. Research is meant to establish or confirm facts, reaffirm the results of previous works, solve new or existing problems, support theorems; or develop new theorems. It empowers the faculty and students for an in-depth approach in research. It has the potential to enhance the consultancy capabilities of the researcher. In short, conceptually and thematically an active attempt to provide these types of common platforms on educational reformations through research has become the main objective of this Journal.

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CHANCELLOR'S MESSAGE

Shri. A. SRINIVASAN
Esteemed Chancellor
Dhanalakshmi Srinivasan University

I am ecstatic in acknowledging International Multidisciplinary conference on Innovative issues and approaches in Social science, Arts and Science held on 24 August 2024.

I appreciate the Srinivasan College of Arts and Science and organizing committee for showing a keen interest in organizing a successful Conference and contributing new ideas and research findings

This conference in collaboration with BODHI International Journal of Research in Humanities, Arts and Science offers a platform for in-depth discussions. It is also relevant for exploring and searching various aspects of education through the appropriate application of learning.

Education is a key indicator of progress and growth. It should focus on research-driven approaches that contribute to societal advancement and innovation.

The insights shared here will not only enhance our academic pursuits but all inspires innovative approaches to addressing the challenges within our field.

I am confident that this conference will spark meaningful discussions, generate new ideas and strengthen the bonds within our global scholarly society. I wish you all a productive and enlightening experience.

I wish them for their endeavours to spread knowledge. I wish all our students and participants for their continued growth and success in their educational and professional endeavours. I congratulate the participants for their enthusiastic engagement and extend my gratitude for their support to the conference.

SRINIVASAN COLLEGE OF ARTS AND SCIENCE

(Affiliated to Bharathidasan University, Tiruchirappalli)
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PRINCIPAL'S MESSAGE

Dr. N. VETRIVELAN
Principal
Srinivasan College of Arts and Science, Perambalur

It gives me immense pleasure to share my feelings with you on the occasion of the School of English and Foreign Languages - The Gandhi gram Rural Institute, Department of English and Comparative Literature, School of English and Foreign Languages – Madurai Kamaraj University, Srinivasan College of Arts and Science and Bodhi International Journal of Research in Humanities, Arts and Science Jointly Organizing international Multidisciplinary Conference on **"INNOVATIVE ISSUES AND APPROACHES IN SOCIAL SCIENCE, ARTS AND SCIENCE** held on 24th August 2024.

This collection of papers and presentation showcases the cutting-edge research, innovative ideas and expert insights shared during our event. To achieve and promote excellence in publications and applied research, the college has taken the initiative to launch a new journal exclusively to publish students' research papers and articles. It will be an add-on to the enriched catalogue of college publications and academic literature.

I sincerely hope that you all will be the architects of this nation and the world that we all envision it to be. As Nelson Mandela rightly said, Education is the most powerful weapon, which you can use to change the world. I invite and invoke you to do the same.

I would like to congratulate the students, Research scholars,various University colleges whose papers are published in this issue of the journal and simultaneously encourage all the students to contribute their research papers and articles for the successive issues of the Journal.

I extend my congratulate to the authors, reviewers and organizers for their tireless efforts. I hope this publication inspires further research, sparks new connection and contributes to the betterment of our field.

I would like to appreciate each of you for attending our conference and bringing your expertise to our gathering.

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DEAN'S MESSAGE

Prof. V. CHANDRA CHOWDRY

Dean – Academics
Head, Department of English & JMC
Srinivasan College of Arts and Science, Perambalur

It is with immense enthusiasm and anticipation that I greet you at this international conference. International Multidisciplinary Conference on **INNOVATIVE ISSUES AND APPROACHES IN SOCIAL SCIENCE, ARTS AND SCIENCE.** This conference in collaboration with Bodhi International Journal of Research In Humanities, Arts And Science offers a global platform for scholars to present and share their ideas, research findings, and insights.

This conference served as an excellent platform for sharing innovative research ideas among faculty members, students, and research scholars from various colleges and universities.

I am particularly impressed by the innovative ideas and rigorous research presented, which reflect the vibrant intellectual environment.

I would also like to express my gratitude to the Faculty members for their unwavering efforts in making this conference proceedings accessible. Their commitment to fostering academic excellence and creativity is truly inspiring. Additionally, I appreciate the enthusiastic response from students and faculty for their creative contributions and credible articles featured in this publication.

We are honored to have you join us and look forward to a series of insightful discussions and productive engagements.

Congratulations once again to everyone involved in making this conference a remarkable success. Thank you for your participation and contribution to this important event.

EDITORIAL NOTE

We are pleased to present this special issue 8(4) of *BODHI International Journal of Research in Humanities Arts and Science*, which features the proceedings from the highly anticipated international conference on Innovative Issues and Approaches in Social Science, Arts, and Science, held in August 2024. This conference gathered scholars, researchers, and practitioners from diverse disciplines to discuss the latest advancements and emerging trends in these interconnected fields.

The conference provided a unique platform for exploring how the social sciences, arts, and science intersect and influence one another in the contemporary world. As we continue to face global challenges, such as climate change, technological advancements, social justice, and cultural preservation, this intersectionality becomes increasingly critical in shaping innovative solutions.

Throughout the conference, sessions were devoted to the exploration of cutting-edge research, new methodologies, and creative practices that push the boundaries of traditional academic disciplines. In the social sciences, discussions focused on the role of technology in reshaping societies and the ethical implications of these transformations. Scholars in the arts explored how creative expression can illuminate and critique the evolving social, political, and environmental landscapes, while scientists emphasized the role of interdisciplinary research in solving complex global problems.

One of the key highlights of the conference was the recognition of the growing importance of cross-disciplinary collaborations. Many of the presented papers highlighted the need for social scientists to work with artists and scientists to produce research that is both intellectually rigorous and socially relevant. For example, projects that fuse data science with artistic expression have the potential to create new narratives around public health, climate change, and political engagement. Similarly, artistic responses to scientific discoveries can make complex topics more accessible to a broader audience.

In addition to individual presentations, the conference hosted a series of plenaries and workshops designed to foster dialogue and collaboration across disciplines. These sessions generated valuable insights into how traditional academic silos can be broken down, encouraging more holistic approaches to research and policy-making. The collaborative spirit of these discussions reflects the evolving nature of academia, where interdisciplinary exchange is no longer optional but essential.

As the conference proceedings unfold in this issue, readers will find a diverse range of topics and approaches. The first set of articles examine the role of innovation in education and how new pedagogical methods are transforming classrooms across the globe. These pieces also examine how the arts can influence educational curricula, contributing to more inclusive and creative learning environments. Another section focuses on the social sciences, with articles that address the impact of digital technology on global social structures, identity, and inequality. Researchers in the sciences present their latest findings on sustainability, artificial intelligence, and biotechnology, offering fresh perspectives on the role of science in addressing pressing global challenges.

We hope that this special issue sparks further conversations and collaborations between scholars and practitioners from all disciplines, inspiring new ways of thinking about the complex issues facing our world. The diversity and depth of the papers included in this issue showcase the richness of the discussions that took place during the conference and highlight the ongoing importance of fostering interdisciplinary dialogue.

We extend our heartfelt gratitude to the conference organizers, speakers, and participants for their contributions to the success of the event. Their work not only enriches the academic landscape but also contributes to the betterment of society. We are excited to share these proceedings with our readers and look forward to the continued exploration of innovative issues and approaches in social science, arts, and science.

Editors

Aim & Objectives

Academic Excellence in research is sustained by promoting research support for young Scholars. Our Journal on Humanities, Arts and Science of research is motivating all aspects of encounters across disciplines and research fields in a multidisciplinary view, by assembling research groups and consequently projects, supporting publications with this inclination and organizing programmes. Internationalization of research work is the unit seeks to develop its scholarly profile in research through quality of publications. And visibility of research is creating sustainable platforms for research and publication, such as series of books; motivating dissemination of research results for people and society.

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Communication

Papers should be mailed to bodhijournal@gmail.com

CONTENTS

ETHICAL AI IN SOCIAL SCIENCE, ARTS & COMPUTER SCIENCE – CHALLENGES & APPROACH

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Abstract

Artificial Intelligence (AI) is rapidly transforming various fields, including social sciences, arts, and computer science, bringing significant ethical challenges to the forefront. In social sciences, AI's capacity to analyze large datasets and influence decision-making processes raises concerns about bias, fairness, privacy, and the potential reinforcement of societal inequalities. The ethical implications in the arts involve questions of creativity, authorship, and originality, as AI-generated works challenge traditional notions of artistic creation and intellectual property. In computer science, the development and deployment of AI systems necessitate a strong focus on ethical considerations such as transparency, accountability, and the mitigation of algorithmic bias. The convergence of AI with these diverse disciplines underscores the importance of an interdisciplinary approach to addressing these ethical issues. Social scientists, artists, and computer scientists must collaborate to ensure that AI technologies are developed and utilized in ways that respect human values, promote social justice, and foster creativity. This abstract highlight the need for continuous ethical vigilance and cross-disciplinary cooperation as AI continues to evolve and permeate various aspects of human life. The future of AI depends not only on technological advancements but also on our collective ability to navigate its ethical complexities, ensuring that it serves the broader interests of society while respecting individual rights and cultural heritage.

Keywords: *artificial intelligence (ai), ethics in ai, social sciences, arts, bias, fairness, privacy, creativity, authorship, originality, intellectual property, computer science, transparency, accountability, algorithmic bias, interdisciplinary, approach, social justice, collaboration, human values, cultural heritage*

Introduction

Artificial Intelligence (AI) is increasingly influencing a wide range of disciplines, reshaping the ways in which we understand, create, and interact with the world. AI is intricately connected with social sciences, arts, computer science, and various other fields related to education and research, serving as a powerful tool that both influences and is influenced by these domains. In social sciences, AI's ability to process and analyze vast amounts of data offers new insights into human behavior and societal trends, but it also raises critical ethical concerns, particularly around issues of bias, fairness, and privacy. In the arts, AI challenges traditional notions of creativity and authorship, as machines now generate music, visual art, and literature, sparking debates about originality and the role of the human artist. Within computer science, the ethical challenges of AI are

perhaps most pronounced, with developers tasked with ensuring that these powerful technologies are transparent, accountable, and free from harmful biases. The convergence of AI with social sciences, arts, and computer science highlights the urgent need for an interdisciplinary approach to ethics, one that balances technological innovation with the preservation of human values, cultural integrity, and social justice. As AI continues to evolve and integrate into various aspects of life, addressing these ethical concerns will be crucial to harnessing its potential for positive societal impact.

Additionally, AI's impact extends to education and research, where it aids in personalized learning, research data analysis, and the automation of repetitive tasks, thereby transforming pedagogical approaches and research methodologies. The interdisciplinary nature of AI highlights its capacity to integrate and enhance various fields, driving both

technological progress and deeper understanding while simultaneously challenging existing paradigms and ethical frameworks.

Artificial Intelligence (AI) and Ethics

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning, reasoning, problem-solving, and decision-making. AI encompasses a range of technologies, from machine learning and neural networks to natural language processing and robotics. Its growing influence is evident across multiple sectors, including healthcare, finance, transportation, and entertainment, where AI systems enhance efficiency, accuracy, and innovation.

However, the rapid expansion of AI technologies brings significant challenges and ethical considerations. Key challenges include ensuring fairness and transparency, addressing biases in AI algorithms, and protecting user privacy. AI systems often operate as "black boxes," making it difficult to understand how decisions are made, which can undermine trust and accountability. Moreover, the deployment of AI can lead to unintended consequences, such as reinforcing societal inequalities or invading personal privacy.

The approach to addressing these challenges involves developing robust ethical frameworks and guidelines that govern AI development and deployment. This includes creating standards for transparency, implementing bias mitigation strategies, and ensuring that AI systems are designed with fairness and accountability in mind. Collaboration across disciplines—such as computer science, law, and social sciences—is essential to navigate these ethical complexities and to ensure that AI technologies align with broader societal values.

Ethics plays a crucial role in the intersection of AI with other fields. In social sciences, ethical considerations focus on how AI impacts human behavior and societal structures. In the arts, questions arise about the nature of creativity and authorship in AI-generated works. In computer science, ethical AI development requires integrating principles of fairness, transparency, and accountability into technological design. As AI continues to evolve, addressing these ethical concerns is vital for ensuring that its benefits are realized while minimizing potential harms and aligning with human values.

Challenges and Approaches in Ethical AI
Challenges

1. **Bias and Fairness:** AI systems can inadvertently perpetuate existing biases present in the training data or algorithms. This can result in discriminatory outcomes, particularly affecting marginalized groups. Ensuring fairness in AI involves identifying and mitigating these biases to promote equitable treatment for all individuals.

2. **Transparency and Explainability:** Many AI systems, especially those based on complex models like deep learning, operate as "black boxes," meaning their decision-making processes are not easily understood. This lack of transparency makes it challenging to assess and trust AI decisions, and to ensure accountability.

3. **Privacy:** AI systems often rely on large datasets that may include sensitive personal information. Protecting user privacy while still utilizing data for training and improving AI models is a significant challenge. Data breaches and misuse can lead to severe consequences for individuals' privacy and security.

4. **Accountability:** Determining responsibility for AI-driven decisions can be difficult. When AI systems make errors or cause harm, it is crucial to establish clear lines of accountability to ensure that those responsible can be held answerable and appropriate measures can be taken.

5. **Ethical Use and Impact:** The potential for AI to be used unethically—whether for surveillance, manipulation, or harm—poses a

major concern. Ensuring that AI is developed and deployed in ways that align with ethical principles and respect human rights is essential.

Approaches

1. **Ethical Frameworks and Guidelines:** Developing comprehensive ethical frameworks and guidelines helps guide the responsible development and deployment of AI. These frameworks should address issues like fairness, transparency, accountability, and privacy, and provide standards for evaluating AI systems.

2. **Bias Detection and Mitigation:** Implementing techniques for detecting and mitigating bias in AI systems is crucial. This includes using diverse and representative datasets, applying fairness-aware algorithms, and regularly auditing AI systems for biased outcomes.

3. **Explainable AI (XAI):** Research and development in explainable AI aim to make AI systems more transparent and understandable. This involves creating models and techniques that provide clear and interpretable explanations of how decisions are made, enhancing trust and accountability.

4. **Data Privacy Measures:** Employing robust data privacy measures, such as data anonymization and secure data handling practices, helps protect personal information. Implementing privacy-preserving technologies, like federated learning, can also enable AI development while maintaining data confidentiality.

5. **Interdisciplinary Collaboration:** Addressing the ethical challenges of AI requires collaboration across disciplines, including computer science, law, social sciences, and ethics. Interdisciplinary teams can provide diverse perspectives and expertise, leading to more comprehensive solutions to ethical issues.

6. **Regulation and Policy Development:** Establishing regulations and policies that govern AI development and use can help enforce ethical standards and ensure compliance. Policymakers, technologists, and ethicists should work together to create and update regulations that address emerging challenges in AI.

By addressing these challenges with targeted approaches, the development and deployment of AI can be guided in a way that aligns with ethical principles and promotes positive societal impact.

Ethical AI in Social Sciences

Artificial Intelligence (AI) is reshaping the social sciences by providing powerful tools for analyzing and understanding complex social phenomena. However, the integration of AI into social research and policy-making brings significant ethical challenges that must be addressed to ensure that technology benefits society equitably and justly.

One of the primary ethical concerns in the application of AI within social sciences is **bias and fairness**. AI systems, which often rely on large datasets to generate insights and predictions, can inadvertently perpetuate or even exacerbate existing biases present in the data. For example, algorithms used in criminal justice or hiring processes might reinforce racial or gender biases if trained on historical data reflecting such prejudices. Addressing this issue requires rigorous methodologies for detecting and mitigating bias, such as diversifying training datasets, implementing fairness-aware algorithms, and regularly auditing AI systems for discriminatory outcomes. Ensuring fairness in AI applications is crucial for maintaining public trust and achieving equitable social outcomes.

Privacy is another critical ethical issue. AI systems often handle vast amounts of personal data, raising concerns about the protection of individuals' privacy. Social scientists must balance the need for comprehensive data analysis with the necessity of safeguarding sensitive information. Techniques such as data anonymization and encryption can help mitigate privacy risks, but researchers must also be transparent about data usage and obtain informed consent from

participants. Additionally, ethical guidelines and regulations, such as the General Data Protection Regulation (GDPR), play a vital role in governing data practices and protecting individual rights.

Transparency and Accountability are essential for ethical AI in social sciences. AI systems can operate as "black boxes," making it difficult to understand how decisions are made and who is responsible for outcomes. This lack of transparency can hinder efforts to ensure accountability and to address potential harms caused by AI. To counter this, social scientists and AI developers should work towards creating explainable AI systems that provide clear insights into how decisions are derived. Furthermore, establishing clear lines of responsibility for AI-driven decisions and their consequences is vital for maintaining accountability.

The ethical use of AI also involves addressing **power dynamics and societal impact**. AI can influence public opinion, policy decisions, and social behavior, raising questions about the extent to which AI should shape societal norms and values. It is important to consider how AI technologies might affect different social groups and to ensure that their deployment does not exacerbate social inequalities. Engaging with affected communities and stakeholders in the development and implementation of AI systems can help ensure that their perspectives and needs are considered, fostering more equitable and inclusive outcomes.

Interdisciplinary Collaboration is crucial for addressing the ethical challenges of AI in social sciences. Combining expertise from computer science, ethics, sociology, and law can lead to more comprehensive solutions that address the multifaceted nature of these issues. Collaborative efforts can help develop ethical frameworks and guidelines that guide the responsible use of AI, ensuring that technological advancements align with societal values and promote social justice.

In summary, while AI offers valuable tools for advancing social science research and policy, it is essential to address the ethical challenges associated with its use. By focusing on fairness, privacy, transparency, and societal impact, and fostering interdisciplinary collaboration, social scientists can harness the benefits of AI while upholding ethical standards and promoting a just and equitable society.

Ethical AI in Arts

The integration of Artificial Intelligence (AI) into the arts is transforming the creative landscape, offering new tools for artistic expression and innovation. AI technologies, such as machine learning algorithms and generative models, are being employed to create music, visual art, literature, and more. While this technological advancement opens exciting possibilities, it also introduces significant ethical considerations that must be addressed to ensure responsible and fair use.

One of the primary ethical issues in AI-driven art is **Authorship and Originality**. AI can generate artworks, compose music, or write texts that mimic human creativity, raising questions about the nature of creativity and the role of human artists. Who owns the rights to AI-generated works? Should the credit for AI-created art go to the developers of the algorithm, the users who trained it, or the AI itself? These questions challenge traditional notions of artistic authorship and intellectual property. Addressing these concerns requires developing clear guidelines on copyright and authorship in the context of AI, ensuring that human creators' rights are respected while navigating the unique aspects of AI contributions.

Creative Integrity is another significant ethical concern. AI systems often learn from vast amounts of existing art and literature, potentially replicating or remixing existing works in ways that may raise questions about originality and the potential for plagiarism. While AI can generate novel combinations and styles, there is a risk that it may unintentionally reproduce or distort existing intellectual property. Ensuring that AI tools are used in ways that respect and build upon existing creative

works without infringing on intellectual property rights is crucial for maintaining the integrity of the creative process.

Bias and Representation in AI-generated art also pose ethical challenges. AI systems are trained on datasets that reflect existing cultural and societal biases, which can be reflected in the output they produce. For instance, an AI trained predominantly on Western art might generate works that lack diversity or reinforce cultural stereotypes. To address this issue, it is important to use diverse and representative datasets when training AI models and to actively seek input from diverse perspectives during the development and evaluation of AI-generated art.

Accessibility and Democratization are key ethical considerations as well. AI tools can democratize access to artistic creation by enabling individuals with limited traditional artistic skills to produce high-quality art. However, there is also a risk that the benefits of AI in art may be unevenly distributed, with access primarily available to those who can afford expensive technologies or have technical expertise. Ensuring that AI tools are accessible to a broad audience and fostering inclusive artistic practices can help mitigate these disparities.

Finally, **Ethical use of AI in Art** involves considering the broader impact of these technologies on the artistic community and cultural landscape. AI's role in art raises questions about the future of human creativity and the value of traditional artistic practices. Engaging with artists, critics, and the public to understand their perspectives and concerns is essential for developing ethical guidelines and practices that respect the evolving nature of creativity while embracing technological innovation.

In summary, the integration of AI into the arts brings both opportunities and ethical challenges. By addressing issues related to authorship, creative integrity, bias, accessibility, and the broader impact on the artistic community, stakeholders can ensure that AI is used in ways that enhance creativity while

upholding ethical standards and respecting the diverse and evolving nature of artistic expression.

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In summary, the integration of AI into the arts brings both opportunities and ethical challenges. By addressing issues related to authorship, creative integrity, bias, accessibility, and the broader impact on the artistic community, stakeholders can ensure that AI is used in ways that enhance creativity while upholding ethical standards and respecting the diverse and evolving nature of artistic expression.

Ethics in Computer Science

In computer science, ethical AI focuses on ensuring fairness, transparency, and accountability in AI systems. Key issues include mitigating algorithmic bias, protecting user privacy, and ensuring that AI systems are interpretable and accountable for their decisions. Approaches involve developing robust ethical frameworks, implementing fairness-aware algorithms, and promoting transparency through explainable AI techniques. Interdisciplinary collaboration and adherence to ethical guidelines are crucial for addressing these challenges. By prioritizing ethical considerations, computer scientists aim to build AI technologies that respect human values, avoid harm, and contribute positively to society.

Conclusion

In conclusion, integrating AI into social sciences, arts, and computer science presents profound ethical challenges that require careful consideration and interdisciplinary collaboration. In social sciences, ensuring fairness and mitigating bias are crucial to avoid reinforcing societal inequalities while protecting individual privacy. The arts face issues of authorship and originality, where AI's role in creative processes necessitates clear guidelines to balance human and machine contributions. In computer science, ethical AI demands transparency, accountability, and the development of systems that are free from discriminatory biases. Addressing these ethical concerns involves creating robust frameworks, engaging diverse perspectives, and maintaining vigilance as AI technologies evolve. By prioritizing ethical principles, we can harness AI's transformative potential while upholding values of justice, creativity, and respect for human rights. This holistic approach ensures that AI benefits society equitably and positively across all fields.

Conference Papers
2020 Proceedings of the Conference on Fairness, Accountability, and Transparency (FAT)
General Chairs: Author Picture Mireille Hilde brandt, Author Picture Carlos Castillo, Program

Chairs: Author Picture Elisa Celis, Author Picture Salvatore Ruggieri, Author PictureLinnet Taylor, Author Picture Gabriela Zanfir-Fortuna

Publisher: Association for Computing Machinery New York, NY, United States

Conference: Conference on Fairness, Accountability, and Transparency Barcelona Spain January 27 - 30, 2020

ISBN: 978-1-4503-6936-7

Published: 27 January 2020

Sponsors: ACM Features research on fairness, accountability, and transparency in AI systems, addressing ethical challenges.

Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)

Editors: Author Picture Florian Floyd Mueller, Author Picture Penny Kyburz,AuthorPictureJulie R. Williamson,Author Picture Corina Sas, Author PictureMax L. Wilson, Author Picture Phoebe Toups Dugas, Author PictureIrina Shklovski

Publisher: Association for Computing Machinery New York NY United States

Conference: CHI '24: CHI Conference on Human Factors in Computing Systems Honolulu HI USA May 11 - 16, 2024

ISBN: 979-8-4007-0330-0

Published: 11 May 2024

Includes papers on human-computer interaction, often discussing ethical issues in AI and user experience.

IEEE Conference on Artificial Intelligence and Ethics (AI & Ethics)

https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=93

Focuses specifically on ethical challenges and best practices in AI development.

International Conference on Computational Creativity (ICCC)

https://kar.kent.ac.uk/42888/1/AISBQ132.pdf

Representations and Architectures to Support Diagrammatic Reasoning

Addresses the role of AI in creativity and artistic processes, with a focus on ethical considerations.

European Conference on Artificial Intelligence (ECAI)

Books

"Artificial Intelligence: A Guide for Thinking Humans" by Melanie Mitchell

Provides a comprehensive overview of AI, including discussions on ethical implications and societal impacts.

"Ethics of Artificial Intelligence and Robotics" edited by Vincent C. Müller

A collection of essays by leading scholars on the ethical challenges of AI and robotics.

"AI Ethics" by Mark Coeckelbergh

Explores various ethical issues associated with AI and offers insights into responsible AI development.

"The Age of Em: Work, Love, and Life when Robots Rule the Earth" by Robin Hanson

Discusses potential future scenarios involving AI and its ethical implications for society.

"Artificial Intelligence and the Future of Power: Five Battlegrounds" by Rajiv Malhotra

Examines the impact of AI on global power dynamics, including ethical and societal considerations

Material & Methods

Material

1. **Literature Review:** An extensive review of existing literature on ethical AI across social sciences, arts, and computer science. This includes academic journals, conference papers, books, and reports from industry and governmental bodies.

2. **Case Studies:** Analysis of specific instances where AI has been applied in social sciences, arts, and computer science, focusing on the ethical implications and outcomes.

3. **Ethical Guidelines:** Collection of ethical frameworks and guidelines proposed by various

organizations and institutions for AI development and deployment.

4. **Interviews/Surveys:** Conducting interviews or surveys with stakeholders, including researchers, artists, and computer scientists, to gather insights on current practices and challenges.

Methods

1. **Qualitative Analysis:** Analyzing qualitative data from literature, case studies, and interviews to identify common ethical challenges and best practices.

2. **Comparative Analysis:** Comparing ethical approaches across different fields to highlight similarities and differences in handling AI-related issues.

3. **Framework Evaluation:** Assessing the effectiveness of existing ethical frameworks and guidelines in addressing the identified challenges.

4. **Expert Consultation:** Engaging with experts in AI ethics to validate findings and gain deeper insights into ethical practices and emerging trends.

Findings & Results

1. **Bias and Fairness:** Commonly observed in all fields, AI systems often perpetuate existing biases. Social sciences show a focus on mitigating bias in data and algorithms, while the arts and computer science emphasize the need for fairness-aware algorithms and transparency.

2. **Transparency and Explainability:** Lack of transparency is a significant issue in AI, particularly in computer science. Social sciences and arts also face challenges in understanding and explaining AI-generated outcomes, affecting trust and accountability.

3. **Privacy Concerns:** Privacy issues are prominent in both social sciences and computer science, with a need for stronger data protection measures. The arts face fewer privacy concerns but must consider the ethical implications of using personal data in creative processes.

4. **Authorship and Originality:** In the arts, AI's role in creating art raises questions about originality and authorship. Unlike in social sciences and computer science, where the focus is on data and system integrity, the arts grapple with new definitions of creativity and ownership.

5. **Interdisciplinary Approaches:** Successful ethical AI practices often involve collaboration across disciplines. Interdisciplinary approaches have proven effective in addressing complex ethical issues by combining diverse perspectives and expertise.

Interpretation & Discussion

The findings highlight that ethical challenges in AI are multifaceted and affect different fields in distinct ways. Bias and fairness are universal concerns, with the need for tailored solutions depending on the context. Transparency and explainability are critical across all fields, though the technical solutions and stakeholder engagement strategies may differ. Privacy issues are particularly pressing in social sciences and computer science, requiring robust data protection practices.

The arts present unique challenges related to authorship and creativity, reflecting the broader impact of AI on human expression and intellectual property. The need for interdisciplinary collaboration is evident, as combining insights from social sciences, arts, and computer science can lead to more holistic ethical frameworks.

Overall, addressing ethical AI requires a nuanced approach that considers the specific challenges of each field while fostering cross-disciplinary cooperation. By developing and implementing robust ethical guidelines and practices, AI can be leveraged to benefit society while minimizing potential harms and respecting human values.

ANTIMAGIC LABELING OF SOME STANDARD GRAPHS AND ITS ALGORITHM

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Abstract

Graph labeling is a widely used method for assessing and solving various graph-related problems. It entails assigning labels or weights to the vertices and edges of a graph. A bijection from the set of edges to the set of integers 1, 2,..., q such that the vertex sums are pairwise distinct is known as an antimagic labeling of a finite simple undirected graph with q edges. The vertex sum at vertex u is the sum of labels of all edges incident to such vertex. If a graph admits an antimagic labeling, it is said to be antimagic. N. Hartsfield and G. Ringel conjectured in 1990 that all connected graphs are antimagic, with the exception of K_2. The conjecture that all regular graphs, with the exception of K_2, are antimagic is also weakened. Both theories are still up for debate. The antimagic labeling for the friendship graph Fr^3, Fr^4 and the subdivision z z graph of AC_z, H_s, $(H_z \odot K_1)$ is obtained in this study. Together with the antimagic labeling algorithm are provided for Fr^4, H_s, $S(H_z \odot K_1)$, and $S(Ac_z)$.

Keywords: antimagic labeling- (a.m.l), antimagic graph, subdivision graph, ams subject classifications: 05c78.

Introduction

We start with the undirected, simple, finite, connected, and graph G = (V (G), E(G)). We use Clark and Holton's [1969] and harary [4, 3, 2] standard terminol-ogy and notations for all of them. A concise synopsis of terminologies pertinent to the current investigations will be provided.

A graph is made up of lines and nodes, which are referred to as edges and vertices, respectively. Labeled or unlabeled graphs are both possible. Labeled graphs are of relevance to us in this thesis. Labels are mostly utilized for iden- tification in many labeled graphs. The labeling that interests us can have two functions: Depending on the specific labeling, labeling can be used to indicate various extra properties in addition to vertices and edges.

This paper contains only finite, undirected, and loop-free graphs. Simple graphs are called graphs, whereas graphs having potentially many edges are called multi-graphs. Antimagic labeling and antimagic graphs were first intro- duced by N. Hartsfield and G. Ringel [7] in 1990.

Paths, cycles, and complete graphs $K_n(n \geq 3)$ have been demonstrated by N.

Hartsfield and G. Ringel to be antimagic. They made the unproven hypothesis that all connected graphs other than K_2 are antimagic. N. Alon and colleagues [1] demonstrated in 2004 that the last conjecture holds true for dense graphs. They demonstrated that any networks with a minimum degree of $\omega(logn)$ and $n(\geq 4)$ vertices are antimagic.

They also demonstrated that all complete multipartite graphs, with the excep-tion of K_2, are antimagic if G is a graph with $n(\geq 4)$ vertices and the greatest degree $\Delta(G) \geq n - 2$. T.-M. Wang [13, 14] started researching the antimagic la- beling of sparse graphs in 2005 and demonstrated the antimagic nature of toroidal grid graphs. T.-M. Wang et al. (2008) demonstrated that a variety of graph prod- ucts are antimagic and discovered a unique subclass of antimagic graphs [4, 3].

D. Cranston [6] established the antimagic nature of all regular bipartite graphs in 2009. Over the years, it has been demonstrated that many different kinds of graphs are antimagic [10, 11, 12, 13], but the question of whether regular

graphs are also antimagic is still unanswered.

Additionally, they talked about antimagic labeling for complete graphs, cycles, wheels, and pathways. The antimagic nature of the toroidal grids $C_{n1}C_{n2}$ . . . , C_{nk} has been demonstrated by Wang [2005]. It has been demonstrated by Cheng [2008] that every Cartesian product of two or more regular graphs is antimagic.

Antimagic labeling of several path and cycle related graphs and a graph pro- duced by swapping a vertex have been discussed by Vaidya and Vyas [2012, 2013]. Some requirements on the degree of a vertex have been found by Alon et al. [2004] for a graph to be considered antimagic.

Some examples of antimagic labeling applications are provided by Krishnaa [2016].

Preliminaries

Definition 2.1. *For a graph G = (V, E) with q edges and without any isolated vertex, an antimagic edge labeling is a bijection f : E → {1, 2, . . . , q}, such that the induced vertex sum f+ : V → Z+ given by f + (u) = {f (uv) : uv ∈ E} is injective. A graph is called antimagic if it admits an antimagic labeling.*

Definition 2.2. *When a graph is labeled, its vertices, edges, or both can be as- signed integer values under specific conditions. The labeling is referred to as a vertex labeling (or edge labeling) if the collection of vertices (or edges) repre- sents the mapping's domain.*

Definition 2.3. *If a graph with q edges can be labeled with {1, 2, 3, . . . , q} with- out repetition and the sums of the labels of the edges incident to each vertex are different, the graph is said to be antimagic.*

Definition 2.4. *In an ordered triple G = (V (G); E(G); I_G), an unordered pair of elements of V (G) is associated with each member of E(G), an unordered set disjoint from V (G), and I_G is an incidence map. The vertices of G are elements of V (G), whereas the edges of G are members of E(G).*

Definition 2.5. *Let G be a graph with q edges and p vertices. Subdividing each edge of G by a vertex exactly once yields the subdivision graph of G, represented by S(G).*

Constructed by merging z copies of the cycle graph C_4 with a common vertex, the friendship graph Fr^4 is a planar undirected network with $3z + 1$ vertices and $4n$ edges.

The friendship graph Fr^3 is a planar undirected network that is created by linking z copies of the cycle graph C_3 with a common vertex. It has $2z + 1$ vertices and $4n$ edges.

Antimagic Labeling and Algorithm
Theorem 3.1. *For z $\geq$ 3, the graph (Fr^4) is an antimagic graph.*
Proof
The friendship graph Fr^4 is a planar undirected network made up of z copies of the cycle graph C_4 joined by a common vertex. It has $3z + 1$ vertices and $4z$ edges.

$V (Fr^4) = \{v_x : 1 \leq x \leq 2z\} \cup \{u_x : 1 \leq x \leq z\} \cup \{v_0\}$

$E(Fr^4) = \{v_x v_{x+1} : 1 \leq x \leq 2z\} \cup \{u_x u_{x+1} : 1 \leq x \leq z\} \cup \{v_0 v_x : 1 \leq x \leq 2z\}$

An antimagic labeling of friendship graph Fr^4 is obtained by

$\tau : E(Fr^4) \rightarrow \{1, 2, . . . , 4n\}$

$\tau(v_0 v_x) = x$ for $1 \leq x \leq 2z$

$\tau(v_{x+1} u_x) = 2z + 2x - 1$ for $2 \leq x \leq z \tau(v_1 u_1) = 2z + 1$

$\tau(v_{x+1} u_x) = 2z + 2x$ for $1 \leq x \leq z$

It is possible to verify that the above-described labeling function will produce unique vertex labels for each vertex in Fr^4_z
Consequently, τ is an A.M.L.
As a result, the graph Fr^4 is an A.M graph.

Algorithm 1
Antimagic algorithm of Fr^4_z
Input : $Fr^4_z \geq 4$.
$E(Fr^4) \leftarrow \{v_0 v_x, x = 1, 2, . . . , 2z v_x u_x x = 1, 2, . . . , z\}$
for $x = 1$ to $2z v_0 v_x \leftarrow x$

end for

for $x = 2$ to z

$v_{x+1}u_x \leftarrow 2z + 2x - 1$ end for $v_1u_1 \leftarrow 2z + 1$ for $x = 1$ to z

$v_{x+1}u_x \leftarrow 2z + 2x$ end forend procedure

Output: AML of Fr^4_z

Example 3.1. *In Figure 1 explains A.M.L of Fr^4.*

Theorem 3.2. *For $z \geq 3$, the graph (Fr^3) is an antimagic graph.*

Proof
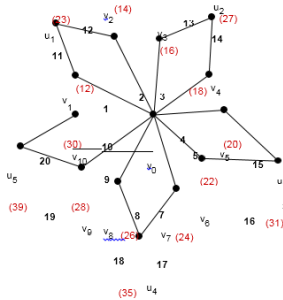
Figure 1 *A.M.L of Fr^4_5*

The friendship graph Fr^3 is a planar undirected network made up of z copies of the cycle graph C_3 joined by a common vertex. It has $2z + 1$ vertices and $3z$ edges.

$V(Fr^3) = \{v_x : 1 \leq x \leq 2z\} \cup \{v_0\}$

$E(Fr^3) = \{v_x v_{x+1} : 1 \leq x \leq 2z\} \cup \{v_0 v_x : 1 \leq x \leq 2z\}$

An antimagic labeling of friendship graph Fr^3 is obtained by

$\tau : E(Fr^3) \rightarrow \{1, 2, \ldots, 3n\}$

$\tau(v_0 v_x) = x$ for $1 \leq x \leq 2z$

$\tau(v_{x+1}u_x) = 2z + x - k$

for $x = 1, 3, 5, 7, \ldots,$ and $k = 0, 1, 2, \ldots$

It is possible to verify that the above-described labeling function will produce unique vertex labels for each vertex in Fr^3

Consequently, τ is an A.M.L.

As a result, the graph Fr^3 is an A.M graph.

Example 3.2. *In Figure 1 explains A.M.L of Fr^3.*

Theorem 3.3. *For $z \geq 4$, the graph $S(H_z \odot K_1)$ is an antimagic graph.*
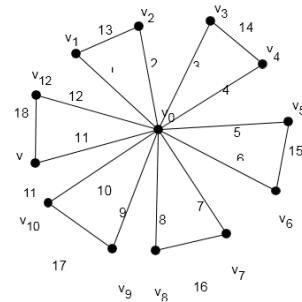
Figure 2 *A.M.L of Fr^3_6*

Proof

For each $v_1, v_2, \ldots, v_z$ and $u_1, u_2, \ldots, u_z$, let $z-1$ be the length. Two subtrahends of each edge, $u_x u_{x+1}$ and $v_x v_{x+1}$, are found: $y_x, 1 \leq x \leq z-1$, and $d_x, 1 \leq x \leq z-1$. When z is odd, a vertex c subdivides the edge $u_{\frac{z+1}{2}} v_{\frac{z+1}{2}}$. When z is even, a vertex c divides the edge $u_{\frac{z+2}{2}} v_{\frac{z}{2}}$.

$E(H_z \odot K_1) = \{u_x d_x \cup d_x u_x \cup v_x y_x \cup y_x v_x \cup c_1, c_2\}$ we now sketch $\tau : E(H_z \odot K_1) \rightarrow \{1, 2, 3, \ldots, 4z - 2\}$.

$\tau(u_x d_x) = 2x - 1$ for $1 \leq x \leq z - 1$

$\tau(d_x u_{x+1}) = 2x$ for $1 \leq x \leq z - 1$

$\tau(v_x y_x) = 2z + 2x - 3$ for $1 \leq x \leq z - 1$

$\tau(y_x v_{x+1}) = 2z + 2x - 2$

case i z **is odd**

$\tau(u_{\frac{z+1}{2}} c_1) = 4z - 1$

$\tau(v_{\frac{z+1}{2}} c_2) = 4z - 2$

case ii z **is even**

$\tau(u_{\frac{z+2}{2}} c_1) = 4z - 1$

It is possible to verify that the above-described labeling function will produce unique vertex labels for each vertex in $H_z \odot K_1$.

Consequently, τ is an A.M.L.

As a result, the graph $H_z \odot K_1$ is an A.M graph.

Algorithm 2

Antimagic algorithm of $H_z \odot K_1$

Input : $H_z \odot K_1$, $z \geq 4$.

$E(H_z \odot K_1) \leftarrow \{u_x d_x, d_x u_x, v_x y_x, y_x v_x, x = 1, 2, \ldots, z - 1\}$

If $z\%2 = 1$

$u\underline{z+1}\,c_1) = 4z\ 1\text{-}2$

$v\underline{z+1}\,c_2) = 4z\ 2\text{-}2$

for $x = 1$ to $z -1 u_x d_x \leftarrow 2x = 1\ d_x u_{x+1} \leftarrow 2x$

$v_x y_x \leftarrow 2z + 2x - 3\ y_x v_{i+1} \leftarrow 2z + 2x - 2$ end for

else

$u\underline{z+2}\,c_1 = 4z\ 1\text{ - }2$

$v\underline{z}\,c_2 = 4z -2$

for $x = 1$ to $z - 1 u_x d_x \leftarrow 2x - 1\ d_x u_{x+1} \leftarrow 2x$

$v_x y_x \leftarrow 2z + 2x - 3$

$y_x v_{x+1} \leftarrow 2z + 2x - 2$

end for end procedure Output: AML of $H_z \odot K_1$

Theorem 3.4. For $z \geq 4$, the graph $S(AC_z)$ is an antimagic graph.

Proof

According to the definition of an armed crown graph, the vertex set of an armedcrown graph is V $(AC_Z) = \{u_x \cup v_x \cup a_x : 1 \leq x \leq z\}$.

Every edge in a subdivision graph is subdivided precisely once, according to its specification. The subdivision graph of

$(AC_z) = \{v_x b_x \cup b_x v_x \cup c_x v_x \cup u_x c_x \cup d_x u_x \cup a_x d_x, x = 1 \leq x \leq z\}$, therefore, has this edge set. The armed crown graph's complete antimagic labeling can be obtained by following this technique.

Case i n is even

we now sketch fτ : $E(S(AC_n)) \rightarrow \{1, 2, 3, \ldots, 6n\}$.

$\tau(a_x d_x) = I$ for $1 \leq x \leq z$

$\tau(d_x u_x) = x + z$ for $1 \leq x \leq z$

$\tau(u_x c_x) = 2z + x$ for $1 \leq x \leq z$

$\tau(c_x v_x) = 3z + x$ for $1 \leq x \leq z$

$\tau(v_x b_x) = 4z + 2x - 1$ for $1 \leq x \leq z$

$\tau(b_x v_{x+1}) = 4z + 2x$ for $1 \leq x \leq z - 1$

$\tau(b_z v_1) = z6$

Case ii n is odd

we now sketch fτ : $E(S(AC_n)) \rightarrow \{1, 2, 3, \ldots, 6n\}$.

$\tau(a_x d_x) = I$ for $1 \leq x \leq z$

$\tau(d_x u_x) = x + z$ for $1 \leq x \leq z$

$\tau(u_x c_x) = 2z + x$ for $1 \leq x \leq z$

$\tau(c_x v_x) = 3z + x$ for $1 \leq x \leq z$

$\tau(v_x b_x) = 4z + 2x - 1$ for $1 \leq x \leq z - 1$

$\tau(b_x v_{x+1}) = 4z + 2x$ for $1 \leq x \leq z - 1$

$\tau(b_z v_1) = 6z - 1$

$\tau(v_z b_z) = 6z$

The characteristic function beyond define labeling will produce distinct labels for each vertex in $S(AC_z)$. The presented graph $S(AC_z)$ is an antimagic graph sinceτ is an A.M.L.

Algorithm 3

Antimagic algorithm of $S(AC_Z)$

Input : $S(AC_z) \geq 4$.

$E(AC_z) \leftarrow \{u_x d_x, d_x u_x, v_x y_x, y_x v_x, x = 1, 2, \ldots, z\}$

if $z\%2 = 0$

for $x = 1$ to z

$a_x d_x \leftarrow x\ d_x u_x \leftarrow x + z$

$u_x c_x \leftarrow 2z + x$

$(c_x v_x) \leftarrow 3z + x\ (v_x b_x) \leftarrow 4z + 2x - 1 (b_x v_{x+1}) \leftarrow 4z + 2x\ y_x v_{i+1} \leftarrow 2z + 2x - 2$

$(b_x v_{x+1}) \leftarrow 4z + 2x\ (b_z v_1) = z6$ end for else for $x = 1$ to $z a_x d_x \leftarrow x$

$d_x u_x \leftarrow x + z\ u_x c_x \leftarrow 2z + x\ (c_x v_x) \leftarrow 3z + x$

end for for $x = 1$ to $z - 1 (v_x b_x) \leftarrow 4z + 2x - 1$

$(b_x v_{x+1}) \leftarrow 4z + 2x$ end for $(b_z v_1) \leftarrow 6z - 1 (v_z b_z) \leftarrow 6z$

end procedure

Output: AML of $S(AC_n)$

Conclusion

In this paper we obtained the antimagic labeling of the following graphs: The antimagic labeling for the friendship graph Fr^3, Fr^4 and the. Together with the $n\ z$ antimagic labeling algorithm are provided for Fr^4, H_s, $S(H_z \odot K_1)$, and $S(Ac_z)$.

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ISOLATION OF POTENTIAL PRODIGIOSIN PRODUCER AND ITS DETAILED CHARACTERIZATION FROM *SERRATIA MARCESCENS*

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Abstract

Pigments produced by organisms as reminiscence of its secondary metabolism are commonly referred as biopigments. These biopigments can be obtained from two major sources (i.e.) plants and microorganisms. The red pigment prodigiosin is a characteristic secondary metabolite, which has linear tripyrrole and characterized by its three rings forming a pyrrolylpyrromethane skeleton with a C-4 methoxy group, and molecular formula $C_{20}H_{25}N_3O$. The biosynthesis of the pigment is a bifurcated process in which mono and bipyrrole precursors are synthesized separately and then assembled to form prodigiosin. . Most pigments absorb light at some defined wavelength, and pigment expression may be easily monitored spectrophotometrically. Serratia is commonly a rod-shaped, Gram negative, facultative bacterium belonging to the Enterobacteriaceae family and ability to produce the red pigment prodigiosin. Pigment production is highly variable among species and is dependent on many factors such as species type and incubation time. Prodigiosin is biosynthesized by Serratia marcescens and other species such as Serratia plymuthica, Serratia rubidaea, Pseudomonas magnisiorubra, Hahella chejuensis, Vibrio gazogenes, Vibrio psycroerythreus. been reported to have antifungal, antibacterial, antiprotozoal / antimalarial activities,, antitumor , algicidal, immunosuppressive, cytotoxic and antidiabetic properties. Present study deals with Isolation of prodigiosin producing strains from mucus of Patella rustica, and Screening of potential prodigiosin producing bacterium.Molecular identification of the potential bacterium based on 16S rRNA sequence method and Standardization of culture conditions for the maximum prodigiosin production .Extraction, purification of prodigiosin and Biochemical characterization of prodigiosin .Analysis of Anticancer activity of the extracted prodigiosin.

Keywords: biopigments, immunosuppressive, patella rustica, 16s rrna sequence, anticancer

Introduction

Biopigments from the microorganisms have been preferred over those from plants because of their stability (Raisainen *et al.,* 2002) and the availability of their cultivation technology (Parekh *et al.,* 2000) throughout the year. A complete pathway for prodiginine biosynthesis has been deduced by analysis of the red cluster in *Streptomyces coelicolor* and the studies demonstrated that undecylprodiginine is derived from one unit of proline, one unit of glycine, one unit of serine and several units of acetate, via a convergent pathway involving condensation of 4-methoxy-2, 2P- bipyrrole-5-carboxaldehyde and 2-undecylpyrrole at a later stage.The macrocyclic prodiginines appear to be derived from undecylprodiginine by oxidative cyclisation (Cerdeno *et al.,* 2001 and Khanafari *et al.,* 2006). Each pyrrole ring is constructed in a different way. Research work using [13]C -labeled precursors and Fourier transform ^{13}C nuclear magnetic resonance has shown the pattern of incorporation for acetate, proline, glycine, serine, alanine and methionine into prodigiosin (Gerber, 1975). Kobayashi and Ichikawa (1991) reported that prodigiosin is associated in extracellular vesicles or present in intracellular granules. Most pigments absorb light at some defined wavelength, and pigment expression may be easily monitored spectrophotometrically (Cerdeno *et al.,* 2001). The actinomycete prodiginines include the linear

tripyrrole undecylprodiginine 1 and several isomeric, cyclic derivatives such as butylmeta-cycloheptylprodiginine 2, ethyl-meta-cyclononylprodiginine 3 and methylcyclodecyl prodiginine 4 (Arab, 1998).*Serratia* specieshas been isolated from soil, water, air, foodstuff, plant surface and animals (Hejazi and Falkiner, 1997). However, pigmentation is only present in a small percentage of isolated cultures only under aerobic condition. Pigment production is highly variable among species and is dependent on many factors such as species type and incubation time. On some media *Rugamonas rubra* produces so much prodigiosin that, as the pH drops, it precipitates out within the cells and colonies change from pillar box red to deep maroon, often with a green metallic sheen under reflected light (Austin and Moss, 1986). Isolation of new strain is still of particular interest because of necessity to obtain microorganisms with suitable characteristics for submerged fermentation (Rasheva *et al.,* 1998).Marks and Bogorad (1959) studied the biosynthesis of prodigiosin by *Serratia marcescens*. Williams (1973) found that the greatest amount of pigment was synthesized when cultures were in the senescent phase of growth and therefore concluded that prodigiosin is a secondary metaboliteWei and Chen (2005) modified Luria-Bertani broth for *Serratia marcescens* SMAR, an SpnR-defective isogenic mutant of *S. marcescens* SS-1 by increasing the concentrations of tryptone and yeast extract while completely removing NaCl from the medium, and thereby obtained increased production of prodigiosin like pigment. They added vegetable oils (2–6% [v/v]) to the fermentation broth which markedly enhanced prodigiosin like pigment production. They also performed mass spectrometry and NMR analysis and confirmed that the prodigiosin like pigment was undecylprodigiosin.

Song *et al*., 2006 extracted prodigiosin from *Serratia* spp. KH-95 directly from the internal adsorbent using acidified methanol and phase separation. Subsequently, it was purified by silica gel chromatography and high performance liquid chromatography (HPLC).Lee et al., 2011 isolated a Gram-negative, red-pigment-producing marine bacterial strain, designated S1-1, was isolated from the tidal flat sediment of the Yellow Sea, Korea. On the basis of phenotypic, phylogenetic, and genetic data, strain S1-1 (KCTC 11448BP) represented a new species of the genus Zooshikella.The antibacterial activity of prodigiosin (PG) was the result of the ability of prodigiosin to pass through the outer membrane and inhibiting target enzymes such as DNA gyrase and topoisomerase IV, which inhibited the cell growth (Berlanga et al., 2000).They used 16s rRNA sequencing to identify *Serratia marcescens.* Wang *et al.* (2004) gave a novel procedure for the direct separation and purification of prodigiosin from the culture broth based on adsorption chromatography. They used a surfactant (0.2% Tween 80) to improve the release of prodigiosin and an adsorbant (X-5 resin) for static adsorption or *in situ* separation. Prodigiosin was inactive against *Pseudomonas aeruginosa*. It had no activity against *Escherichia coli, Proteus vulgaris, Candida albicans, Trichoderma koningi* or *Penicillium notatum*. *Serratia marcescens* IBRL USM 84 produced intracellular antibacterial red pigment Prodigiosin (Darah Ibrahim, 2014). Prodigiosin has been tested against more than 60 cancer cell lines with an average inhibitory concentration of 2.1 μM. Prodigiosin has been shown to have multiple cellular targets. Therefore, the exact mode of action of prodiginines in inducing apoptosis is uncertain. Prodiginines are also attractive options because they are not affected by several multidrug resistance pumps which can confer resistance to other anticancer agents (Llagostera et al., 2005). Prodigiosin has also been shown to affect the accumulation of p53 and induction of NAG - 1, in the human Mcf – 7 breast cancer cell line (Soto-Cerrato et al., 2007).Hence, spray-dried microcapsules containing prodigiosin was produced using kappa-carrageenan and maltodextrin as encapsulation agents after optimizing the effect of spraydrying parameters on the encapsulation yield (EY), moisture content,

particle size, colour intensity of the prodigiosin microcapsules. The particles were successfully applied to yogurt, milk and carbonated drinks (Namazkar and Ahmad, 2013). Prodigiosin extracts have been observed to have toxigenic effects on chick embryos and inhibited the growth of several species of bacteria (Kalesperis et al., 1975).

The present study is to isolate and screen the efficient prodigiosin producer from an estuarine environment. For commercial application, optimization of fermentation condition in order to produce more yield, extraction, chemical characterization and details on application of the product are needed from the isolated strain *Serratia marcescens* and those aspects have been worked out.

Materials and Methods
Sample Collection
Mucus of mollusk specimen of *Patella rustica* were collected with the help of fishermen from the Porto Novo coastal region, Cuddalore District, Tamil Nadu, India. The collected specimens were kept in well aerated containers which were maintained at room temperature while transport to the lab conditions. During collection, precautionary measures were taken into account to avoid the physical damages thereby minimize the mortality and microbial contaminations. The collected samples were transferred immediately to the laboratory. The fresh specimens were acclimatized for lab condition during the initial seven day and on processing the specimens were washed thrice with sterile sea water into their surfaces. The collected mollusks were hold in the sterile sea water at the pH conditions of 6 to induce stress and mucus secretion for 6hrs. The released mucus was collected by centrifugation under 3000 rpm for 30 min. and it was microbially enriched on Zobell marine broth for 48 hrs.

Isolation of Prodigiosin Producing Bacteria
After incubation, one ml of broth from samples were serially diluted up to 10^{-7} using pre steriled sea water and spread plated on Zobell marine agar plates and incubated at $37^{o}C$ for 48hrs. Following incubation, plates were inspected for brick red colored colonies that indicated the production of prodigiosin (Kamble and Hiwarale, 2012). The selected colonies were pure cultured on the same medium to obtain axenic cultures. Axenic cultures were stored and maintained at $4^{o}C$ in slants under the same nutrient conditions.

Screening of Potential Strain
The stored axenic cultures were further propagated in modified nutrient broth (1% NaCl). The bacterial cell absorbance was measured at 620nm and centrifuged at 3000 rpm for 30mins.10ml of acidified methanol was added to cell pellet and centrifuged under the same conditions. A red or pink colour formation in the acidified solution and yellow colour in alkaline solution indicated a positive, presumptive test for prodigiosin (Gerber and Lechevalier, 1976). 5ml of the supernatant was subjected to spectrum scanning in the range of 300 to 700 nm using UV-VIS spectrophotometer. The acidified methanol was used as a blank. The characteristic maximum absorbance for prodigiosin was found at 499nm. Isolated prodigiosin was quantified using the following formula (Mekhael and Yousif, 2009). The OD value was converted to mass concentration via an appropriate calibration using prodigiosin purchased from Sigma Aldrich as the standard.

$$\text{Prodigiosin/cell} = \frac{[OD499 - (1.381 \times OD620)] \times 1000}{OD620}$$

Where,
OD = Optical Density,
OD_{620} = Bacterial Cell Absorbance at 620nm
OD_{499} = Pigment Absorbance at 499nm
1.381 = Constant

Molecular Identification – 16Sr RNA Partial Sequencing
Genomic DNA was extracted from cells of most potential strain prodigiosin producing organism which are grown overnight at 37 °C. PCR amplification and sequencing of the 16S rRNA gene

were performed. The 16S rRNA genes were PCR-amplified from the genomic DNA using the bacterial universal primer set of Eubac 8F (5'- AGA GTT TGA TCC TGG CTC AG- 3') and 1492R (5'- TAC GGY TAC CTT GTT ACG ACT T- 3'). This primer combination amplified a 1500bp 16S rDNA fragment. Amplification reaction was performed in a 0.2 mL optical-grade PCR tube. 50 nano gram of DNA extract was added to a final volume of 50μL of PCR reaction mixture containing 1.5mM $MgCl_2$, 1X Reaction buffer (without $MgCl_2$) (Fermentas), 200μM of each dNTPs (Fermentas), 100pM of each primer and 1.25U Taq DNA polymerase (Fermentas). PCR (Techgene, UK) was performed in an automated thermal cycler with an initial denaturation at 95°C for 5min. followed by 30 cycles of 95°C for 30sec. (denaturation), 52°C for 45sec. (annealing), 72°C for 90 sec. (extension) and 72°C for 10 min. (final extension). PCR product was run on 1% agarose in TAE buffer (40mM Tris, 20mM acetic acid, 1mM EDTA (pH8.0)) to confirm that the right product (1500bp) was formed.

The PCR product was purified using the QIAGEN PCR purification kit for Sequencing and further analysis. The partial 16S rRNA gene sequencing was done using Perkin Elmer Applied bio-systems and ABI Prism software was used to allign the sequence and compared sequences were retrieved by the queries generated by BLAST of GenBank Database. The phylogenetic trees were inferred using the neighbour-joining method.

Optimization of Different Parameters for Maximum Prodigiosin Production

Nutritional conditions of different carbon sources, nitrogen sources and carbon: nitrogen ration were examined for maximizing the production of prodigiosin. Likewise, different cultural conditions like pH, temperature, salinity and inoculum size were also evaluated for maximum production of prodigiosin using the isolated potential strain. Experiments were carried out using adopting search technique (i.e) varying parameters one at a time which were were conducted in 250 ml Erlenmeyer flasks containing nutrient broth medium and every varying parameter was carried out in triplicates and the average values were taken into account. The range of parameter achieved by one step was fixed in subsequent experiments and the estimation of prodigiosin throughout the optimization study was done using the screening formula mentioned above.

Carbon Sources

The influence of different carbon sources on the prodigiosin was investigated using differences in substrates and in response to various monosaccharide, disaccharide and polysaccharides substrates like glucose, galactose, maltose, lactose, sucrose and starch with the concentration of 1% in the medium.

Nitrogen sources

Next to the carbon sources, the effects of different nitrogen sources like peptone, yeast extract, beef extract, ammonium sulphate and malt extract were studied in concentrations of 0.5% and were tested increased production.

Carbon and Nitrogen Ratio

Since the examination of the optimal carbon and nitrogen sources, the strains were cultured in medium with differences in carbon and nitrogen ratio among these promising substrates. The ratio was delivered with 0:10 to 10:0 with the multiplication:reduction of 1 unit.

pH Value

The effect of varying pH on prodigiosin production was evaluated using pH values of 5, 6, 7, 8 and.

Temperature

The optimum incubation temperature for maximum prodigiosin production was examined from 20°c to 45°c with an interval of 5°c.

Salinity

Since it is an estuarine microorganism, the effect of salinity changes was observed by varying the salinity range from 0ppt to 35ppt, with an interval of 5ppt.

Inoculum Size

The inoculum size was varied from 1 to 5 %, with an interval of 1%, to determine the optimum size of the inoculum to be used. 1 ml of inoculum of log phase culture contained 6.5×10^7 CFU/ml.

Large Scale Production and Extraction of Prodigiosin

Standardized cultural conditions and optimized nutritinal sources were used for large scale prodigiosin production. The production was carried out in 2L Erlenmeyer's conical flask containing 800ml of broth under shaking incubation. After incubation period, the growth of the bacteria and prodigiosin production was once again examined. After the large scale production, the cells were harvested by centrifugation at 3000rpm for 30min. The cell pellet was collected and resuspended in acidified methanol (24:1 ratio of methanol and 1mol/l HCl,v/v), vortexed and centrifuged under the same conditions. The supernatant showed pink colour that indicated the presence of prodigiosin and was dried with the help of rotary evaporator.

Chemical Characterization

The extracted crude prodigiosin from the above procedure was characterized for its biochemical compounds present in it. Characterization of a compound is an important aspect considering industrial importance.

Thin Layer Chromatography

TLC was primarily used for the detection of protein present in the extract. Solvent system of methanol, ethyl acetate and chloroform in the ratio of 6:3:1 (v/v) was used as mobile phase (Gulani *et al.,* 2012). 10µl of methanolic extract of prodigiosin was loaded on TLC precoated plate and after the run, it was dried. Then it was sprayed with ninhydrin solution and visualized for the formation of pink bands visible under naked eye, indicating the presence of protein. Finally, the retardation factor (Rf) value of the chromatogram was calculated.

Protein Estimation Assay

The amount of protein present in prodigiosin was estimated by using Lowry's method (1951). Known volume of prodigiosin extract was taken and diluted by adding distilled water to make 1ml of sample. 5ml of Lowry's solution which had 50ml of 2% sodium carbonate in 0.1N sodium hydroxide and 10ml of 0.5% copper sulphate pentahydrate in 1% sodium potassium tartarate was added to sample containing test tube. This was mixed well and incubated for 10 min. Then added with 0.5ml of Folin-ciocalteau reagent and the solution mixture was mixed well. Blue colour was developed after an incubation period of 30min. at room temperature. The resulting solution was read at OD of 660nm using UV visible spectrophotometer. A standard graph was plotted against bovine serum albumin to calculate the amount of protein in the sample.

Anticancer Activity

Cytotoxic potential of extracted prodigiosin was tested on human lung adenocarcinoma epithelial cell line A549 and human cervical carcinoma cell line HeLa which were purchased from the National centre for cell science (NCCS), Pune, India. The growth medium, Minimum Essential Medium (MEM) was removed after incubation using micropipette. The monolayer of cells was washed twice with MEM without Foetal calf serum (FCS) to remove the dead cells and excess FCS. To the washed cell sheet, 1ml of medium (without FCS) containing defined concentration of the leaf extract in respective wells was added. Each dilution of the compound ranges from 1:1 to 1:128 and they were added to the respective wells of 24 well titre plate. The control well was prepared with cells containing 1ml MEM without any added test sample. The titer plate was incubated at 37^0C in 5% CO_2 environment and observed for cytotoxicity using inverted microscope as well as MTT assay.

After incubation, the medium from the wells was carefully removed for MTT (3-(4, 5-dimethyl thiazol-2yl)-2, 5-diphenyl tetrazolium bromide) assay. Each well was washed with MEM (without)

FCS for 2-3 times and 200µl of MTT (5mg/ml) was added. The plate was incubated for 6 hrs in 5% CO_2 incubator for cytotoxicity. After incubation 1ml of DMSO was added in each well, mixed and left for 45sec. Viable cells present in the medium formed crystals which were dissolved by adding solublizing reagent Dimethyl sulphoxide (DMSO) that resulted in formation of purple colour. The absorbance of the suspension was measured spectrophotometrically at 540nm by taking DMSO as a blank (Masters, 2000).

The percentage growth inhibition was calculated using following formula, % cell inhibition= 100-{(At - Ab) / (Ac - Ab)} x100

Where,

At= Absorbance value of test compound

Ab= Absorbance value of blank

Ac=Absorbance value of control

Statistical Analysis

All the experiments were carried out in triplicate times and the values were expressed as mean ± standard deviation (S.D).

Results

Isolation and Screening of Potential Prodigiosin Producing Bacteria

The collected mollusk specimen was stress induced and the mucus was collected by centrifugation method. The collect pellet was microbially enriched using Zobell marine broth. After 48hrs of incubation, the broth was serially diluted and plated on the same agar plates and observed for brick red colored colonies. After 96 hrs of incubation, prodigiosin producing bacterial density was ranged between $4\times10^2 – 2.4 \times10^3$ CFU/g of sediment and it was found to be 5.03% among the total heterotrophic bacteria. Among the colonies, bright red colored strains were concentrated which were isolated, plated on fresh medium for pure culture. Each pure cultured colony was tested for their axenic nature using gram staining procedure and stored in the same agar slants for further studies.

Totally 17 strains were isolated, for convenience, for convenience, the isolated axenic strains were named by the authors first letter (KSR) followed MM (Mucus of mollusk) followed by the strains number specified by Arabic numerals (eg., KSR-MM1 – KSR-MM17). Every individual axenic strain was freshly cultured on the same broth medium (Zobell marine) and screened for potential prodigiosin producing strain. Strain no KSR-MM14 showed maximum production with 0.39 mg/ml than the rest of all the isolated strains . Based on the appreciable result on the screening method, Strain no KSR-MM14 was chosen for further characterization and molecular identification studies.

Molecular Identification of the Potential Strain

The most potential strain KSR-MM14 was isolated for its genomic DNA and 16s rRNA procedure was carried out for molecular identification. This rRNA amplified gene was closely matched more than 99.9% with *Serratia marcescens* CP014017.1 and CP011303.1. Furthermore, maximum likelihood similarity with the other strains of *Serratia marcescens* was shown in the phylogenetic tree plotted using NCBI phylogeny.

Standardization of Cultural Conditions of Maximum Prodigiosin Production

To eliminate nutrient components and cultural conditions having no significant effects on the prodigiosin production, each of the individual different elements replaced in the basal medium preparation was tested for the quantitative production. Further the optimized factors were used for subsequent standardization.

Effect of Different Carbon, Nitrogen and Carbon/Nitrogen Ration on Prodigiosin Production

For standardization of carbon sources, six different sources were tested which belongs to monosaccharide, disaccharide and polysaccharide sources. Among the test, monosaccharide source of glucose showed maximum prodigiosin production of 0.45 mg/ml followed by galactose with 0.38 mg/ml. Polysaccharide sources were observed as

poor choices for the production of prodigiosin. Regarding nitrogen sources, the standardization was done with five different sources and each was tested with 0.5%. Among the substrates beef extract showed maximum production with 0.49 mg/ml prodigiosin followed by peptone as the next optimal choice with 0.41 mg/ml. The least value was recorded with malt extract with 0.35 mg/ml.

As per these predictions, an attempt was made with ratio between carbon and nitrogen sources for the evaluation in prodigiosin production. The observations clearly showed quantitative production variations among the utility of carbon and nitrogen sources. The maximum production was observed in 8:2 ratio with 0.512 mg/ml prodigiosin production and observed same values of 0.49 mg/ml prodigiosin production with 7:3 and 9:1 ratio of carbon and nitrogen sources.

Effect of Different pH, Temperature and Salinity in Prodigiosin Production

Like the nutritional parameters, abiotic cultural conditions also played an important role in the maximizing production of prodigiosin. pH ranged between 4-9 were studied for the optimum pH for maximum prodigiosin production. The peak productionunit was showed at pH of 7.5 with 0.53 mg/ml, close to this pH of 8 revealed production of 0.523 mg/ml prodigiosin. Among the tested different temperatures between 20°C to 45°C for maximum prodigisin production and the peak production was achieved at 30°C with the production value of 0.54 mg/ml.

Further, temperature conditions of 25^0C and 45^0C showed least production of prodigiosin is shown in Table. Since the strain is off from marine origin, the optimization of salinity plays an significant role in growth of bacteria and production of prodigiosin. Various salinity range from 0ppt to 35ppt were employed to study their effect on prodigiosin production. Among the different parameters, maximum production was achieved at 25 ppt with 0.55 mg/ml prodigiosin followed by 30 and 35 ppt with 0.54 and 0.52 mg/ml prodigiosin.

Standardization of Inoculum Size for the Maximum Prodigiosin Production

Various size of inoculum was checked from 1-5% for optimum inoculum size. In which the larger inoculum size limited the maximum production of pridigiosin and smaller inoculum size lengthen the growth cycle as well as the incubation time for maximum production of prodigiosin but the production of prodigiosin was also indiscriminately effected according to inoculums size and the maximum unit was evinced in 2% inoculum with the value of 0.56 mg/ml prodigiosin followed by 3% inoculum with the prodigiosin concentration of 0.51 mg/ml.

Large Scale Production and Extraction of Prodigiosin

From the above standardized nutritional and cultural conditions, large scale production was carried out. From the cultivated broth culture, the cells were taken from the broth for prodigiosin extraction using centrifugation. The cell pellet was extracted with acidified methanol and the debris was removed using the same conditions of centrifugation. The final supernatant having acidified methanol was brick red in color which indicated the presence of the red pigment prodigiosin and the solvent was rotary evaporated and dried for further use.

Chemical Characterization of Prodigiosin

The extracted and purified prodigiosin was estimated for its biochemical composition. The sample extract was expected for the presence of protein prodigiosin and it was calculated using ninhydrin as the visualizing agent usually mint for proteins. The Rf value of the protein was observed to be 0.66 with pink colored spot. Further, the extracted prodigiosin was found to contain no amount of lipid and carbohydrate which was simple understood from the TLC method. Further, this biochemical determination was confirmed by biochemical estimation of total percentage of protein,. The amount of protein in the extract was 99.89%, the amount of carbohydrate and free fatty

acid was found to be negligible which showed the purity of the compound. The above results showed that the sample has maximum percentage of protein with negligible percentage of carbohydrate and fatty acid. The presence of maximum protein in the sample extract might be because of prodigiosin and the extract was predetermined, found to contain prodigiosin using spectrophotometer reading and the standard prodigiosin as brought from the Sigma fine chemical company.

Anticancer Activity
Hep G2 Cell Lines
The cytotoxic effect of the extracted prodigiosin on Hep G2 cell lines was examined. Cells were treated at different concentrations of prodigiosin ranging from 3.9 to 500µg/ml, respectively. The data of IC_{50} (Half maximal inhibitory concentration) are shown in Table. The leaf extract exhibited significant inhibition of cell proliferation of HepG2 cell lines in proportion to its concentration ranging from 3.9 to 500µg/ml. In the highest concentration (500µg/ml) the cell inhibition was in the mean value of 89.7%. IC_{50} value of HEPG2 cell lines was 15.6 µg/ml of extract concentration and showed lowest cell inhibition of 40.10% in the lowest concentration taken (3.9µg/ml).

HELA Cell Lines
HELA cells were treated at different concentrations ranging from 3.9 to 500µg/ml, respectively. The IC_{50} value (Half maximal inhibitory concentration) was shown in Table. The extract exhibited significant inhibition of cell proliferation which was directly proportion to the test concentration ranging between 3.9 to 500 µg/ml. The highest cytotoxicity of 91.2% was observed at the highest tested concentration of 500µg/ml taken and the mean value of IC_{50} value was observed at the concentration 15.6µg/ml .The lowest cell inhibition rate was predicted in the lowest concentration taken (3.9µg/ml).
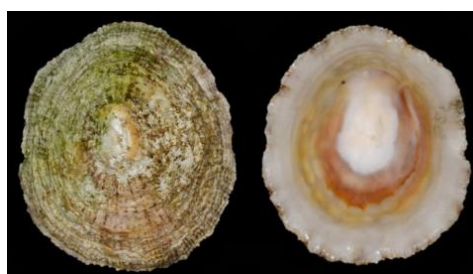
Patella rustica
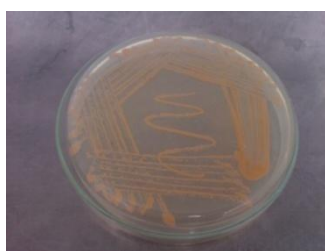
Prodigiosin Producing Bacterial Strain
(*Serratia Marcescens*)
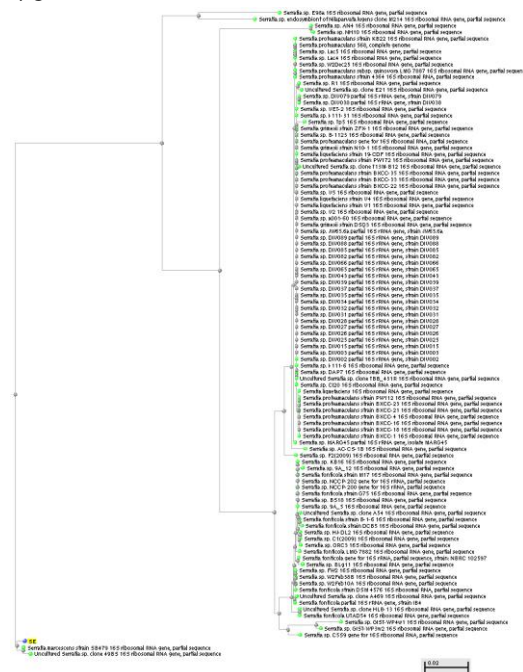
Phylogenetic Tree of the Potential Bacterium
Serratia Marcescens **(Yellow Color Highlighted)**
Plotted using NCBI Phylogeny
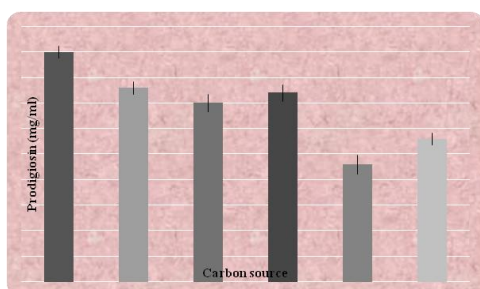
Influence of Different Carbon Sources on Prodigiosin Production

Optimization of Different Temperature on Prodigiosin Production
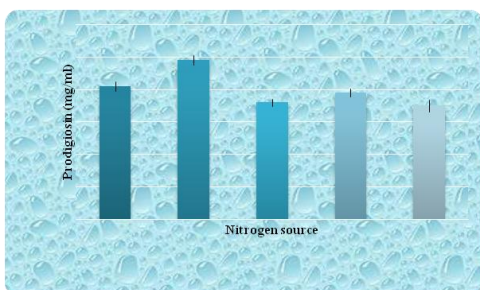
Effect of Different Nitrogen Sources on Prodigiosin Production

Optimization of Various Salinity Conditions on Prodigiosin Production
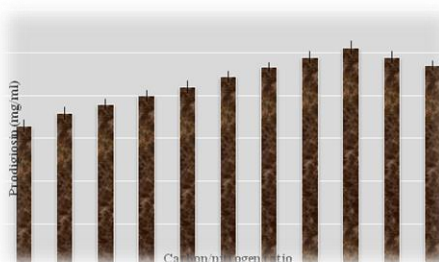
Influence of Different Carbon/Nitrogen Ratio on Prodigiosin Production

Optimization of Inoculum Size on Prodigiosin Production
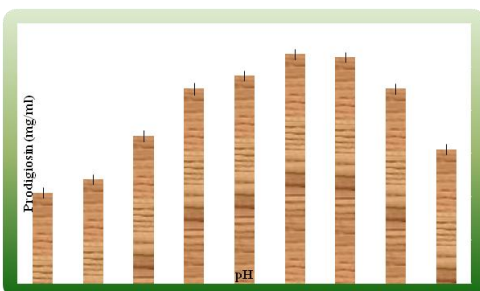
Optimization of Different pH Conditions on Prodigiosin Production

Extraction of Red Pigment, Prodigiosin

TLC Plate Showing the Presence of Protein Spot using Ninhydrin as the Visualizing Agent
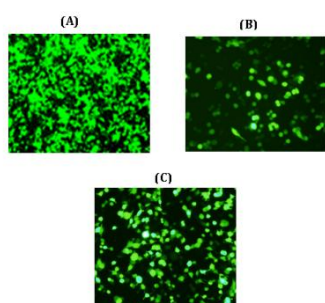
Microscopic Examination of Cytotoxic Effect of Extracted Prodigiosin on Liver Cancer (HepG2) Cell Line, (a) Control (without), (b) 500µg/ml and (c) 15.6µg/ml Concentration of Extracted Prodigiosin
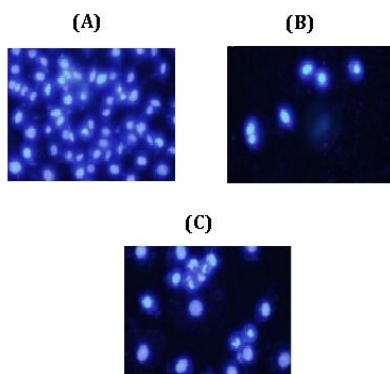
Effect of Extracted Prodigiosin on HeLa Cells A549, (a) Control (Without Prodigiosin) (b) 500µg/ml Concentration and (c) 15.6µg/ml Concentration of Extracted Prodigiosin

Screening of most potential prodigiosin producing bacteria

S. No	Assigned Strain No	Prodigiosin Quantity
1	KSR-MM1	0.21 mg/ml
2	KSR-MM2	0.233 mg/ml
3	KSR-MM3	0.241 mg/ml
4	KSR-MM4	0.167 mg/ml
5	**KSR-MM5**	**0.09 mg/ml**
6	KSR-MM6	0.129 mg/ml
7	KSR-MM7	0.31 mg/ml
8	KSR-MM8	0.34 mg/ml
9	KSR-MM9	0.214 mg/ml
10	KSR-MM10	0.231 mg/ml
11	KSR-MM11	0.237 mg/ml
12	KSR-MM12	0.312 mg/ml
13	KSR-MM13	0.30 mg/ml
14	**KSR-MM14**	**0.39 mg/ml**
15	KSR-MM15	0.31 mg/ml
16	KSR-MM16	0.11 mg/ml
17	KSR-MM17	0.153 mg/ml

Green Color Indicates Best Value and Red Color Indicates Least Value in Table

The Values of Prodigiosin Production in Response to Various Carbon Sources

Carbon Source	Mean	S.D
Glucose	**0.45**	**0.012**
Galactose	0.38	0.012
Maltose	0.35	0.017
Lactose	0.37	0.016
Sucrose	**0.23**	**0.018**
Starch	0.28	0.011

Green color indicates best value and red color indicates least value in table

The Values of Prodigiosin production in Response to Different Nitrogen Sources

Nitrogen source	Mean	S.D
Peptone	0.41	0.014
Beef extract	**0.49**	**0.015**

Yeast extract	0.36	0.011
Ammonium sulphate	0.39	0.012
Malt extract	**0.35**	**0.019**

Green color indicates best value and red color indicates least value in table

The Values of Prodigiosinproduction in response to Different Ration of Carbon/Nitrogen SUBSTRATE

Carbon/Nitrogen Ration	Mean	S.D
0:10	**0.33**	**0.014**
1:09	0.36	0.015
2:08	0.38	0.012
3:07	0.4	0.013
4:06	0.42	0.015
5:05	0.445	0.013
6:04	0.467	0.012
7:03	0.49	0.014
8:02	**0.512**	**0.016**
9:01	0.49	0.014
10:00	0.47	0.011

Green Color Indicates Best Value and Red Color Indicates Least Value in Table
The Values of Prodigiosinproduction in Respect to pH Conditions

pH	Mean	S.D
5	**0.21**	**0.012**
5.5	0.24	0.011
6	0.34	0.013
6.5	0.45	0.014
7	0.48	0.012
7.5	**0.53**	**0.012**
8	0.523	0.011
8.5	0.45	0.012
9	0.31	0.012

Green Color Indicates Best Value and Red Color Indicates Least Value in Table
The Prodigiosinproduction in Respect to Different Temperature

Temperature (°C)	Mean	S.D
25	0.34	0.012
30	0.48	0.013
35	**0.54**	**0.012**
40	0.41	0.014
45	**0.21**	**0.012**

Green color indicates best value and red color indicates least value in the Values of Prodigiosinproduction in Respect to Different Salinity

Salinity (ppt)	Mean	S.D
0	**0.12**	**0.011**
0	**0.12**	**0.011**
5	0.21	0.012
10	0.28	0.011
15	0.38	0.012
20	0.45	0.016
25	**0.55**	**0.015**
30	0.54	0.014

Green color indicates best value and red color indicates least value in table
The Values of Prodigiosinproduction in Respect to Inoculum Size

Inoculum Size	Mean	S.D
1%	0.43	0.013
2%	**0.56**	**0.012**
3%	0.51	0.011
4%	0.46	0.013
5%	**0.39**	**0.014**

Green color indicates best value and red color indicates least value in table
Cytotoxic activity of extracted prodigiosin on HepG2 (liver cancer) cell line and HeLa (Human cervical carcinoma) at different concentrations

S. No.	Test Sample Concentration (μg/ml)	0.01% Ethanol Dilutions	Cell Inhibition/ Cytotoxicity (%)	
			HepG2	HeLa
1	**500**	**1:1**	**89.7**	**91.2**
5	31.3	1:16	52.23	53.83
6	15.6	1:32	50.43	50.19
7	7.8	1:64	46.01	48.09

2	250	1:2	71.32	71.41
3	125	1:4	60.14	62.19
4	62.5	1:8	54.53	57.56

8	3.9	1:128	40.10	47.06
9	Cell control	Neat	0.06	0.06

Green color indicates best value and red color indicates least value in table

Discussion

The present study highlighted the isolation, characterization and the potential applications of prodigiosin produced from associated marine bacteria of mollusk of *Patella rustica* isolated from Porto Novo, Cuddalore district, Tamilnadu, India. This potential strainwas as *Serratia marcescens* which was confirmed based on 16S rRNA sequencing. The obtained sequence showedmaximum 99.9% similarity with *Serratia marcescens*. Likewise Giri *et al.,* 2004 isolated a prodigiosin producing wild type bacterial strain from Anna University and they also have concluded that it was *Serratia mercescens* from its biochemical characterization.

In this investigation, glucose and beef extract were showed maximum production of prodigiosin, further among ratio between this showed peak production at 8:2 ratio. Surprisingly it showed higher production from the utilized commercial medium that is Zobell marine broth (Hi-media) that was used in screening test. Similarly Giri et al., supplied the powdered peanut broth which had supported better growth of *Serratia marcescens* and higher yield of prodigiosin when compared with the existing nutrient broth and peptone glycerol broth. A block in prodigiosin production was seen above 30°C in nutrient broth, but the fatty acid seed medium used by them supported prodigiosin production upto 42°C though the yields were lower than what was obtained at 28°C. Likewise, there are articles reporting the production of prodigiosin using cheaper materials. Helvia *et al.,* 2010 used cassava wastewater.

Regarding temperature, the potential strain produced maximum prodigiosin between 25°C. Among the standardized parameters for the maximum production of prodigiosin, temperature of 35°C was highly encouraged by Wang *et al.,* 2012 who concluded that *Serratia mercescens* grow more rapidly at 35°C as well as started to produce prodigiosin at 35°C. Giri *et al.*, 2004 also observed an enhanced prodigiosin production at 28°C in different media they have studied using *Serratia mercescens.* Optimum pH of 7.5 obtained in the present study had been strongly recommended by many researchers also. Sundaramoorthy *et al.,* 2009 and Gulani *et al.,* 2012 worked with *Serratia mercescens* and found pH 7.5 as the most ideal pH for maximum prodigiosin production. Though there are few investigation available on other bio-pigments and till now no detailed study available in Indian waters on the production of prodigiosin. The present study is the first report on the isolation of potential prodigiosin producers from marine strains and associated strains of mullusk. It showed a consistent production of prodigiosin with 25 ppt salinity.

No research till now effectively demonstrated the production with the optimization on inoculum size. 2% of inoculums having 6.5×10^7 CFU/ml was observed with maximum production of prodigiosin. From the present study, it had been proved that inoculum size also played a vital role in the prodigiosin production and showed higher variation among different parameters in its production.

Using the culture conditions and the cheaper source ragi, prodigiosin was bulk produced and extracted using acidified methanol. According to Gerber, 1975 prodigiosin is sometimes bounded to proteins thus the extraction may require acid treatment before isolation of the pigment. So, acidic methanol was used as the solvent for the extraction of prodigiosin. It was used by Giri *et al.,* 2004. The extracted prodigiosin was biochemically analysed and it was found to have 99.98% of protein with negligible amount of carbohydrate and fatty acid. Thin layer chromatography showed a peptide red spot at Rf value of 0.66, which was strongly supported by the work of Gilani *et al.,* 2012 who have reported the same in *Serratia mercescens*.

In the present investigation, the antiprolifierative effect of the prodigiosin on Hep G_2 and HeLa cell lines was studied. The prodigiosin exhibited significant inhibition of cell proliferation of both cell lines in proportion to the prodigiosin concentration ranging from 0 to 1000 µg/ml. In the study at the highest concentration (1000 µg/ml) the cell viability was in the range of 89.7 and 91.2% LD_{50} value of Hep G_2 and HeLacell lines. Lee *et al.,* (2011) reported that the cytotoxic activity of prodigiosin and cycloprodigiosin from *Zooshikella rubidus* against human melanoma cells, observed GI_{50} values against two cancer cell lines, A375P and SK-MEL-28. Necrosis and apoptosis are two different ways of cell death. Necrotic cell death is an unregulated process resulting from severe damaged to the cell and is characterized by ATP depletion, cell swelling, lysis and the release of intracellular contents resulting in tissue inflammation (Travis *et al.*, 2000).

However, apoptosis is another form of cell death involving the activation of an endogenous cell suicide program by either intrinsic or extrinsic stimuli. Cells are developed many of the hallmark features of apoptosis, including condensation of chromatin, nuclear fragmentation, appearance of apoptotic bodies and an increase in the sub-G1 population (Yuan *et al.*, 2003). However the mechanism of cell death was not concentrated in the present study. Extent of cell death at various concentration of prodigiosin only assessed which showed fruitful result against both the cell lines.

Summary and Conclusion

The present study is on production, characterization and anticancer activity of prodigiosin from mollusk of *Patella rustica* associated marine bacteria isolated from Porto Novo, Tamilnadu, India. Strain no KSR MM 14 showed maximum prodigiosin production and the potential strain was identified as *Serratia marcescens* using 16S rRNA sequencingand blast homology search. Growth parameters were optimized to obtain maximum prodigiosin production which were found to be at glucose as carbon source (0.45 mg/ml) and beef extract as nitrogen source (0.49 mg/ml) with carbon and nitrogen ratio of 8:2 (0.512 mg/ml), temperature of 30°C (0.53 mg/ml), pH 7 (0.54 mg/ml), 25ppt salinity (0.55 mg/ml), and 2% of Inoculum size having 6.5×10^7 CFU (0.56 mg/ml). *Serratia marcescens* was grown in shake flasks for large scale production using the above described media and prodigiosin was extracted using acidified methanol and rotary evaporated. The biochemical composition of prodigiosin revealed that 99.98% protein and TLC indicated the presence of protein red spot at Rf value of 0.66. To check the bioactive potential of prodigiosin antiproliferative effect were studied using Hep G2 and HeLa cell lines which have showed concentrated dependent promising anticancer activity. Further, the present study proved that commercial production with this strain is possible.

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REVIEW ON INTERNET OF THINGS (IOT) BASED INTELLIGENT FARMING SYSTEM USING CLOUD [SIIFSC]

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Abstract

The Internet of Things, or IoT, is becoming more and more popular in agriculture as well as other industries with the introduction of new technology. The development of human civilization is mostly due to agriculture, and as the population grows, it becomes more important to raise production while lowering costs and requiring less labor. In order to meet those needs, the Internet of Things idea is used. There is a lot of manual labor involved in the current agricultural practice. Farmers found it challenging to keep an eye on field conditions at all times and from any location. As a result, sensors help gather agricultural factors like temperature, humidity, rain, and moisture, etc., and IoT technology notifies farmers instantly of these parameters. To increase agricultural productivity, the suggested system integrates sensors, Raspberry Pi, and the Internet of Things. You can access a live information feed online at thingspeak.com. With the aid of mobile devices, farmers can monitor and manage all farming operations in this system, from pre-farming to post-farming, and they may receive advice around-the-clock. The current technology gains an edge with animal detection, which identifies the presence of animals and sounds an alert. The daily escalation of animal disturbance in residential areas has a negative impact on both natural and human life. It is possible to stop both human and animal life with this technology.
Keywords: smart farming, iot, raspberry pi, pir sensor, agriculture.

Introduction

The foundation and strength of the Indian economy is agriculture. The majority of people in India are employed in agriculture, yet they face numerous challenges as a result of industrialization, deforestation, and other factors. In order to meet India's constantly expanding need for food, farm production must be increased. This is mostly caused by a lack of information and advice, problems with oversight, and challenges carrying out crucial tasks necessary for agriculture. Given the current state of agriculture, which is beset with numerous problems, possessing IoT-based smart farming is imperative. IoT includes many of the upcoming intelligent concepts, such as smart cities, smart homes, smart transportation, and smart farming.

A high-tech, capital-intensive method of producing sustainable, clean food for the general public is called "smart farming." In agriculture, it refers to the utilization of contemporary Information and Communication Technologies (ICT). When combined with embedded IoT, intelligent farming could be referred to as a linked farm that supports several devices from various producers of agricultural products. Important environmental time-sensitive parameters, such as temperature, precipitation, water level, and soil moisture content, are gathered from the farm using various sensors and promptly communicated to the farmer. The cloud computing infrastructure stores and processes the vast amounts of data produced by the wireless sensor network. The suggested solution automates agricultural tasks and helps farmers take the essential actions without requiring manual assistance. Using Internet of Things technology, it updates the farmer on the state of the environment using a Raspberry Pi. Increased connectivity is made possible by the excessive communication that Internet of Things Cloud Service enables amongst low-cost sensors [11].

Literature Review

The goal of Asres Temam Abagissa et al.'s [1] Smart Agricultural Device Controlling System, which is based on IoT, is to automate farming and increase agricultural output. Sensor data is sent over the cellular network, where it is processed by the system to determine what has to be done in terms of corrective and preventive actions. A wireless communication system based on the cloud is proposed by Shweta B. Saraf et al. [2] to monitor and control a number of sensors and actuators in order to determine the water requirements of plants. Water consumption was decreased by implementing an automatic irrigation system depending on soil moisture. Moisture sensors were utilized by Abhishek Kumar et al. [3] to monitor the moisture content of the different plants. The sensors then sent a signal to the Arduino board, which turned on the pump and employed a rotating platform or sprinkler to water the corresponding plant. Rahul Dagar et al. [4] suggested a simple architecture for Internet of Things sensors to gather data and transmit it to the server via Wi-Fi so that the server may make decisions based on the information. An Internet of Things (IoT)-based wild animal intrusion detection system was presented by Prajna P et al. [5] to monitor the area and take pictures of any intruders using a camera and sensor. Image processing is used to process classified images so that appropriate actions can be taken.

Using Arduino and cloud computing, Rajalakshmi R et al. [6] developed an Internet of Things (IoT) based agriculture stick for real-time monitoring of temperature, humidity, soil moisture, electrical conductivity, and rain status. An Arduino-based water irrigation system with inputs from both sensors was proposed by Shruthi Bansod et al. [7]. The amount of water to be given to the farm will be determined by the system based on the data obtained from the spoil sensor. Farmers' physical labor is reduced, and by doing away with manual switching mechanisms, it helps to make better use of the resources.

The Animal Detection System in Farm Areas was created by Vikhram B et al. [8]; it uses PIR and ultrasonic sensors to detect animal movement and transmit a signal to the controller. By making noise and sending a signal to GSM, it distracts the animal. The forest department and farmers receive the result from the system instantly.

Existing Work

IoT-based smart farming is designed with several agriculturally necessary measures in mind. Actually, a great deal of study is conducted to improve how well the agricultural sector operates. Green house watering and roofing are controlled with Arduino by using the statistical data gathered from the sensors (such as temperature, humidity, wetness, and light intensity sensor) [9,10]. To make decisions, the gathered information is compared to the weather forecast. Using Internet of Things technology, the system is equipped with sensors to track data and send it to the farmer via a web server.

In the context of wireless sensor nodes, the system previously described is comparable. The use of communication technologies and the nodes' data storage are the only differences. As the number of nodes increases, the server requires more storage space, which drives up the cost. In order to improve system performance and data storage, this study suggests an intelligent agricultural system that uses sensor networks, cloud computing, and Internet of Things communication technologies. In this setup communication delay and accuracy lagging were there.

Proposed Work: SIIFSC

By keeping an eye on the field and taking appropriate action without requiring human participation, the suggested system contributes to the improvement of both the quantity and quality of the farm. IoT and cloud computing together have the potential to be more effective. This system gathers environmental data, including moisture content, temperature, rainfall, and so forth, from a variety of sensors placed across an agricultural field. Through

an IoT gateway (Thingspeak), the sensed data is stored in the cloud and seen in real time.

By comparing the sensed readings and predefined threshold values that are supplied into the cloud based on crop selection, the cloud server makes decisions. Here, Raspberry Pi is utilized in place of Arduino for improved performance & accuracy. Additionally, the controller receives an input signal from PIR and ultrasonic sensors that identify the presence of animals on the farm. The board is activated instantly, and the animal will be redirected off the farm by a sound produced by the system. This mechanism safeguards the farm and poses no threat to humans or animals. The technology will advise farmers on when to plant their crops based on climate conditions.
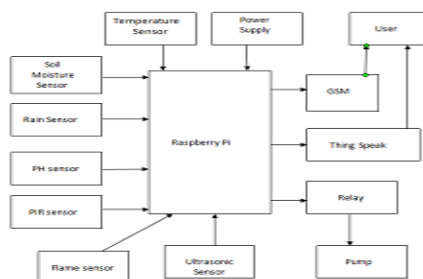

Fig 1: Block Diagram of Proposed Work IIFSC

Following are the Sensors used for this Application Area

Raspberry Pi: The Raspberry Pi is a crucial component for networking and computing in the Internet of Things. With automation, it provides remote location controlling. There are several Raspberry Pi versions available. The Raspberry Pi Version 3, an ARM Cortex, and one gigabyte of RAM are the parts that make up the system. In addition, it has a Micro SD card slot, four USB ports, a full HDMI port, a 3.5mm audio jack, forty GPIO pins, a Display interface (DSI), and a video camera interface (CSI).

Fig 2: Raspberry Pi

DHT 11 Sensor: The digital signal output of the DHT11 temperature and humidity sensor complex is calibrated. Temperature and humidity sensor technologies, along with digital signal gathering techniques, can provide high reliability and long-term stability. It contains both an NTC temperature sensor and a resistive-type humidity sensor. By integrating with an 8-bit microprocessor, it provides outstanding quality, quick response times, immunity to interference, and affordability.
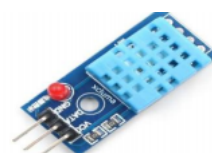
Fig 3: DHT 11 Sensor

pH Sensor: pH is monitored for a variety of purposes, including process control in manufacturing, food production, safety appliances, medical, and environmental fields. Litmus paper, a pH-sensitive glass electrode, sensors with ion-selective layers on FETs, and other devices are used to monitor pH. The soil's acidity and alkalinity are measured with a pH sensor. Plants thrive in pH ranges between 5.5 and 7.0. If it rises above the threshold, the farmer is notified right away.

Fig 4: pH Sensor

Soil Moisture Sensor: This sensor can be used to test the soil's moisture content. The yield will be higher when there is a shortage of water in the soil; otherwise, it will be lower. It is this sensor that

allows plants to be watered automatically. The sensor generates both analog and digital outputs and operates on the open-short principle.

Fig 5: Soil Moisture Sensor

When the soil is dry, current cannot flow through it and it functions as an electrical circuit. However, current can flow through damp soil, the circuit is said to be short, and the output is zero. It turns the pump ON or OFF based on the output.

Ultrasonic Sensor: Non-contact measurement between 2 and 400 cm is possible with the ultrasonic module; the range can be as much as 3 mm. Its transmitter, receiver, and feedback circuit are all ultrasonic. When a high-voltage elec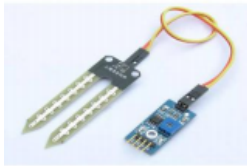trical pulse is given to an ultrasonic transducer, it produces a burst of sound waves and vibrations across a specific frequency band. Sound waves bounce back from obstacles in front of the ultrasonic sensor, creating an electrical signal. It is computed how long it takes to send out sound waves and receive an echo.

Fig 6: Ultrasonic Sensor

Afterwards, the receiver detects the receiving echo and produces a waveform with a time period proportional to the distance. The microcontroller that is linked receives the signal and executes the required operations.

PIR Sensor: PIR sensors enable motion detection within their detection range. It is easy to use, compact, and has minimal power and cost.

These sensors are frequently found in devices and appliances used in offices and residences. A PIR sensor can identify movement within a 10-meter radius of the sensor. Since the power is usually up to 5V and the actual detection range is between 5m and 12m, it is a median figure.

Fig 7: PIR Sensor

Flame Sensor: One type of detector used to identify and react to flames or fires is the flame sensor. Because of its technique for detecting the flame, this sensor responds more quickly and accurately than a heat/smoke detector. This sensor picks up flames at wavelengths between 760 and 1100 nm from the light source.

Fig 8: Flame Sensor

Rain Sensor: One type of switching device that is used to detect rainfall is a rain sensor. In addition to detecting the strength of the rainfall, it serves as a switch when a drop of rain passes through the rainy board. The module has an LED power indication, a rain board, a control board that is separated for greater simplicity, and potentiometer-adjustable sensitivity.

Fig 9: Rain Sensor

Relay: An electrically operated switch could be a relay. An electromagnet is often used in relays to mechanically actuate a switch. When a separate low-power signal is required to control a circuit, relays are employed. Here, the relay is being controlled with that purpose in mind.

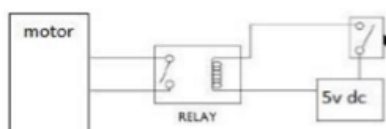**Fig 10: Relay**

Interfacing with Motor

Fig 11: Relay with Motor

To pump water to the field, a relay is interfaced with the motor depicted in Figure 10. By connecting it to a Raspberry Pi, it can be electronically operated to artificially give water to the field as needed. Signals can be sent to turn it on or off as needed. Pumping is the process of artificially supplying water. The types of water pumps that are employed are numerous. A submersible water pump that is connected to a power source via a relay is used in this operation.

Python IDLE: An Integrated Development Environment (IDE) for Python is called the Integrated Development and Learning Environment (IDLE). Similar to Python Shell, IDLE can be used to develop, edit, and run Python scripts in addition to executing a single statement. For writing Python programs, IDLE offers a feature-rich text editor with syntax highlighting, auto completion, and intelligent indentation. Additionally, it provides a debugger with tools for breakpoints and stepping.

Thing Speak: The IoT Cloud platform Thing Speak allows sensor data to be sent to the cloud. With MATLAB or other software, this can analyze and show data and create its own applications. This contains a REST API for internet services that enables the development of Internet of Things applications as well as the collection and storing of sensor data in the cloud.

Working Setup

The system could consist of both software and hardware. The Raspberry Pi board is attached to the sensors, and it feeds data into the controller. Figure 12 displays the sample working model. After that, the sensed data are kept on cloud storage for later decision-making. Farmers can more easily view the information from the ThingSpeak web application or mobile device by storing the data.

Fig 12: Working representation block diagram

All of the employed sensors' readings are available on this platform. In addition, it gives the user guidance on what to plant depending on climate and temperature in relation to the crop recommendations fed into the cloud platform. The PIR and ultrasonic sensors identify the presence of every animal that enters the farm area and notify the controller of its arrival. In addition, it produces a sudden rush of sound waves similar to electric pulses that drive the animal off the property

Conclusion & Future Work

This work suggests an automated farming system that uses smart IoT and cloud computing to increase agricultural productivity. Through IoT, the detected data will be transmitted, and the system will be able to display it so that preventive and remedial action may be taken. This system is designed to give Indian farmers the best possible IoT architecture for

agricultural, resulting in increased productivity and quality of output, reduced usage of electricity and water, and more economically efficient crops that yield higher profits. In the future, web servers and machine learning algorithms can work together to make intelligent decisions for effective farming. Future work will primarily concentrate on adding more sensors to this system in order to collect more data, particularly in relation to pest control, and on using artificial intelligence to upgrade this agricultural Internet of things technology to a fully automated system.

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ENHANCING ADVANCED CYBER THREAT DETECTION AND MIGRATION USING MACHINE LEARNING

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Abstract

Given the speedy evolution of threats in phrases of each complexity and scope, cybersecurity has emergesas an problem of the maximum significance withinside the virtual age. When it comes to combating the Ever-increasing surroundings of cyberattacks, conventional strategies of chance detection and prevention are frequently ineffective. The motive of that is to analyse the usage of machine getting to know strategies to enhance cybersecurity measures, with a selected emphasis on threat detection, prevention, and response. To begin, an exam of the ideas of machine getting to know and the significance of this area to cybersecurity is presented. When it comes to Recognising and mitigating cyber threats, some of unique device learning Methodologies, inclusive of as deep learning, signature-primarily based totally detection, and anomaly detection, are evaluated in terms of how effective they are

***Keywords**: cybersecurity, malware classification, intrusion detection, botnet detection, machine learning, deep learning etc.*

Introduction

In an era that is characterised by the pervasive presence of digital technology, the field of Cybersecurity serves as an critical defence in opposition to the continuously moving terrain of cyber threats. Despite the fact that the growth of networked technologies, cloud computing, and the Internet of Things (IoT) has brought about new levels of convenience and efficiency, it has also Made people and businesses liable to a huge style of threats. Traditional strategies to cybersecurity, no matter their importance, often war to hold up with the degree of class and the quantity of attacks which are happening withinside the cutting-edge era.

In reaction to this unrelenting challenge, the incorporation of strategies that use machine learning has emerged as a powerful ally in the fight to protect digital assets. The unstoppable Ascent of device learning, which has been propelled via way of means of tendencies in laptop power, the availability of data, and inventions in algorithmic design, has liberated capabilities that are transformative across a wide range of fields.

Machine learning approaches provide a dynamic manner to augmenting fashionable safety measures, that's a giant development withinside the field of cybersecurity research. Through the utilisation of algorithms that are able to acquire understanding from data, specialists withinside the discipline of cybersecurity are capable of gather a fixed of gear which are of awesome price so one can proactively shield networks, systems, and sensitive information.
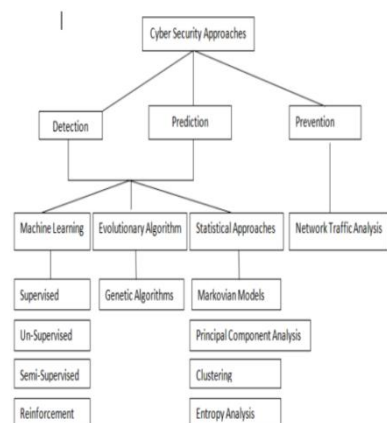
Review of Literature

(Ijmtst, 2023) Studied "Machine Learning Approaches for Prediction and Prevention of Cyber Attacks for Cyber Security" and discovered that the current rapid digitization will raise the cost of data violations. Cyber hazards brought on by hackers and other online criminals usually lead To a loss of records protection, which ultimately consequences in sizable monetary losses and a negative image for the business. The quantity of cyberattacks on expanding businesses has steadily increased over the last few years.

It is impractical to apply human evaluation of cyber threat Discovery and assist for cyber risk detection in view that it's miles costly, time-consuming, and error prone.(Neelu Khare, 2020) Studied "Cybersecurity Threat Detection the use of Machine Learning and Deep Learning Techniques and discovered that the Internet of Things (IoT) and Industry 4.0 Have led to a great boom withinside the quantity of internet-related devices. This gives a tremendous undertaking for cybersecurity risk detection structures to successfully detect all malicious programmes and events in the network. All forms of assaults, including fileless Malware, intrusion, botnet, and malware, are a part of the converting hazard landscape. To identify Malicious occurrences, a mastering detection device ought to take a look at the program's behavioural Pattern. In this context, we've got placed forth fashions that leverage system gaining knowledge of and deep learning approaches to identify the harmful programmes and events within the system. (Lee et al., 2019) Studies Cyber Threat Detection Based on Artificial Neural Networks Using Event Profiles and found that one of the major problems with cybersecurity is the availability of an automated method for detecting cyberthreats. In this paper, we describe an artificial neural network-based cyberthreat detection method. The suggested solution improves cyberthreat identity through changing a huge range of accrued protection activities into precise event Profiles and making use of a deep learning-primarily based totally detection

algorithm. (Chukhnov& Ivanov, 2021) Studied Algorithms for Detecting and Preventing Attacks on Machine Learning Models in Cyber-Security Problems Researchers discovered that machine gaining knowledge of algorithms are vulnerable to lots of assaults supposed to trick the structures into making intentional mistakes.

An evaluate of attack technology on schooling datasets and models with the intention of causing damaging (poisoning) effects is given in the article. Trials were carried out to use the present day attacks on exceptional models. There has been evolved a comparative evaluation of the cyber-resistance to unfavorable facts acts of several models, most commonly employed in operating systems. It is looked at whether the several models that are most frequently applied to damaging information influences are stable. In the event that up to 50% of the training data are contaminated, the models' stability is demonstrated. (Apruzzese et al., 2023) Studied The Role of Machine Learning in Cybersecurity and determined that The blessings of synthetic intelligence (AI) at the moment are extensively acknowledged due to the growing complexity of contemporary information systems and the ever-increasing flow of massive data that results from them. In particular, machine learning (ML) techniques Are already getting used to cope with a number of real-international problems, specifically with the introduction of deep learning. Machine translation, ride and excursion suggestions, object Detection and tracking, or even some of makes use of in healthcare are exciting times of the useful applications of machine learning.

Furthermore, because machine learning has established such promise withinside the context of self reliant riding and telecommunication Systems, it's miles as it should be seemed as a era enabler. Studied Cyber Security Using Machine Learning Techniques" He found that the look at of gadget learning (ML), a department of synthetic intelligence (AI), helps create systems that can recognise patterns, draw conclusions logically, and learn from past data with little assistance from

humans. Cybersecurity approaches offer cutting-edge security solutions for threat detection and reaction. The previously used security solutions are inadequate due to the fact thieves can now get round traditional safety procedures. (Rana & Patil, 2023) Studied "Cyber Security Threats Detection and Protection Using Machine Learning Techniques In IOT and located that With the emergence of the Internet Of Things (IoT), part computing, laptop safety, and cyberattacks, generation has advanced to the point of the fourth industrial revolution.

Cybersecurity threats arise from the rapid growth of Internet of Things (IoT) gadgets and the net in numerous forms, which generate more data. One of the most important worries in IoT is the detection and defence against cybersecurity attacks. Many humans recall system learning (ML) strategies to be among The maximum promising methods to counteract cyber protection dangers and provide protection. In many programs associated with cyber security, system learning (ML) strategies are essential. (Vadivelan et al., 2022) Studied "Study On Detection Of Cyber Attacks Using Machine Learning" and discovered that there is an urgent need for creative and efficient protection structures because of the developing complexity and class of cyberattacks. Because machine gaining knowledge of makes it viable to identify, categorise, and mitigate cyberattacks, it has turn out to be an effective weapon in the fight against these threats. An assessment of using gadget learning techniques in cybersecurity is given in this abstract. Large quantities of data, consisting of system Logs, community traffic, and person behaviour, may be analysed via way of means of system mastering algorithms to find patterns and abnormalities that could be signs of cyberattacks

The Machine Learning-Cybersecurity Nexus
It is crucial to have a strong expertise of the essential standards that guide machine learning algorithms in order to have a complete comprehension of the combination of machine learning and cybersecurity. With the motive of shining mild at the diverse programs of Supervised

studying, unsupervised studying, and semi-supervised studying withinside the area of Cybersecurity, this segment provides a top level view of those 3 varieties of learning. The efficacy Of device gaining knowledge of fashions is contingent upon the life of rigorous schooling and evaluation Processes.

In order to put a sturdy basis for the following conversations, we investigate subjects like as characteristic engineering, cross-validation, assessment measures, and strategies to counteract overfitting. The following phase presents a proof of the diverse functions that machine learning performs in the field of cybersecurity. These functions include threat identification, prevention, and reaction. The importance of recognising traditional and abnormal Behaviours, automating incident response, and integrating hazard intelligence feeds is brought to light by this.

Machine Learning Fundamentals
Machine getting to know is the muse of contemporary-day cybersecurity improvements as it enables the evaluation of huge datasets, the popularity of patterns, and the formation of predictions that are essential for the detection, prevention, and response to threats. Within the scope of this Part, we can look into the essential thoughts that underpin device gaining knowledge of and the significance of these ideas in the field of cybersecurity

Understanding Machine Learning Algorithms
The term "system learning" refers to a extensive form of algorithms, every of that is designed to meet particular requirements within the field of cybersecurity. This subsection offers a precis of the essential ideas, which can be as follows:

- **Supervised Learning**: In the process of supervised learning, models are trained using Datasets which have been labelled, with the enter information being related to the output labels that correspond to it. In order to finish

duties which include class and regression, this approach is absolutely necessary

- **Unsupervised Learning**: Discovering hidden styles or companies is the purpose of unsupervised learning, which entails education fashions on records that has now no longer been labelled. In the sphere of cybersecurity, clustering and dimensionality discount are applications that are frequently used

Training and Evaluation of Machine Learning Models

The achievement of gadget mastering fashions is contingent at the implementation of rigorous training and evaluation processes**:**

Feature Selection and Engineering

The choice of features, additionally called input variables, has a significant impact on the performance of the model. The process of choosing and engineering functions includes figuring out which statistics houses are the most effective for a certain endeavour.

Cross-Validation

In order to assure the generalizability of the results, cross-validation strategies divide the dataset into schooling and checking out subsets. This makes it possible to conduct more thorough model evaluations**.**

Evaluation Metrics

Metrics like as accuracy, recall, F1-score, and ROC-AUC are extremely important in the field of cybersecurity since they aid in assessing the efficacy of A version in figuring out dangers at the same time as concurrently decreasing the variety of fake positives.

Overfitting and Regularization

An important thing of robust gadget learning fashions is the improvement of techniques to save you overfitting, which takes place while machines memorise training data rather than generalising**.**

Ensemble Methods

Some examples of ensemble techniques consist of random forests and gradient boosting. These strategies integrate severe fashions which will boom the accuracy and stability of predictions**.**

Conclusion

Organizations and those alike face a non-stop battle because of the continuously shifting terrain of cyber threats. Despite the fact that traditional methods of cybersecurity are necessary, they may be turning into an increasing number of inadequate withinside the face of threats which might be hastily being developed. The purpose of this study was to investigate the valuable contribution that machine learning may make to the enhancement of cybersecurity efforts, with a particular emphasis on threat detection, prevention, and response. Throughout the path of this voyage, we have investigated the various applications of machine learning. These applications include anomaly Detection and signature-primarily based totally detection, in addition to behavioural analysis, predictive analytics, and natural language processing. A first-rate stage of precision, speed, and flexibility has Been confirmed through those programs of their potential to discover and fight threats.

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SECURE SHARING OF MEDICAL INFORMATION USING CLOUD COMPUTING

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Abstract

The patient's medical history and prescription information are stored in electronic health records. The attackers are drawn to the health records because they contain valuable information. An incorrect medication or operation is the result of losing an electronic health record. In order to enable efficient diagnosis and treatment, EHRs typically contain extremely sensitive and vital patient data that is routinely exchanged among physicians, radiologists, healthcare providers, pharmacists, and researchers. By using key exchange protocols, multiple parties can create a shared encryption key that they can use to sign or encrypt data that they intend to exchange. Expanding key exchange methods with certificates to a bigger system could be challenging since they need a reliable third party to confirm the accuracy of the messages they receive. They require ample storage.

Introduction

Using computing resources that are provided as a service over a network is known as cloud computing technology. In order to store and carry out the intended business processes, users of the cloud computing paradigm must grant access to their data.

Because there is a significant quantity of sensitive and important data stored on clouds, cloud service providers are required to offer trust and security.

Concerns exist about fine-grained, adaptable, and scalable access control in cloud computing. Resource management is better handled by cloud computing since the user is relieved of the burden of locating resources for storage. When a user is done, they can either release the additional data they have requested from the cloud provider or continue to store it.

System Analysis
Existing System

The current system is manual, mostly paper-based, and devoid of standards. Large hospitals are unable to undertake the time-consuming and laborious task of recording all information on paper. Concerns about privacy leaks may also arise from personal information. Users that are dishonest have the potential to expose sensitive information. Big data that is multimedia is hard to preserve.

Disadvantages Exiting Systems

- Danger of improper data management.
- Reduced Safety.
- Improper coordination between users and various applications.
- Fewer Users: More Compliant.
- No guarantee of accuracy.
- Out of the reach of remote users.
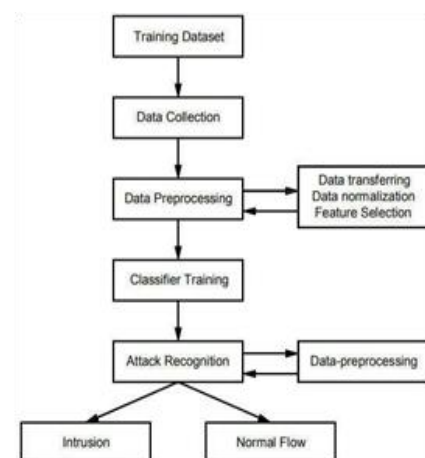
Proposed System

Establishing a key is the first stage in establishing secure communication between two parties. A technique called Key Establishment (KE) enables two interacting parties to share a secret key. The suggested system can maintain the confidentiality of information sent based on physiological characteristics and offer ECC-based verified access. Use secure session protocols and a comparatively efficient key exchange to ensure 100% secure communication.

This characteristic makes guarantee that, in the face of a passive adversary, the compromise of one or more entities' long-term private keys does not result in the compromise of previously agreed- upon session keys established by honest entities. The user should send a request message to the data provider if they still need access to the data after the session has ended.

Advantages of Proposed System

- Finding the characteristics and variables that influence how well key agreement and key generation systems function is the aim of the proposed effort.
- Minimize the loss of data.
- Using ECDH and the Control Unit, resolve issues with the current authentication technique and boost performance.
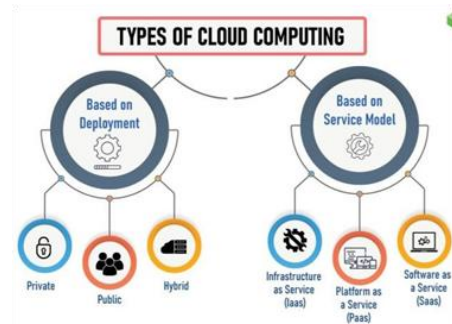- Elevated security.

System Specification
Hardware Requirements

- Processer : Dual core processor
- 2.6.0 GHZ
- Ram   : 4GB
- Hard disk : 160GB
- Compact disk : 650mb
- Keyboard : Standards keyboard
- : 15 Inch color monitor

Software Requirements

- Operating system : window OS.

- Front end : ASP NET.
- Ide : visual studio 2010.
- Back end : SQL server.
- Application : web application.

Data Flow Diagram

A two-dimensional diagram shows how information is moved and processed within a system. Each data source is identified along with how it works with other data sources to provide a common result in the graphical representation.

When creating a data flow diagram, one must first identify external inputs and outputs, then ascertain the relationships between the inputs and outputs, and finally provide visuals that illustrate the relationships and outcomes of the connections. Teams working on design and business development might discover or enhance specific areas of data processing by using this kind of diagram to depict the process.

System Testing

Type of Testing

Testing is a set of various examinations with the main goal of thoroughly taxing the computer-based system. Even though every test has a distinct objective, all of them should confirm that every system component has been correctly integrated and is carrying out its assigned duty. Testing is the process of determining whether the created system satisfies the real requirements and system objectives.

The goal of testing is to identify mistakes. A test that has a high chance of uncovering an inaccuracy that has gone unnoticed is good. A test that finds the hidden fault is considered successful. It is the goal with which test cases are created. A test case is a collection of data that will be input into the system.

System Testing

Once validated, a system must be extensively tested to make sure that all of its parts are fulfilling their designated roles and that it continues to function properly even in the event that incorrect data is entered or functions are requested. Creating a list of test criteria either for the entire system or for certain hardware, software, and communications components is the first step in the testing process. A structured system testing program may be built for a sensitive and significant system, like an electronic voting system, to guarantee that every part of the system is adequately examined.

Validation Testing

It is necessary to generate both valid and invalid data, and then design the program to process and identify faults in this data. When a user of a module want to access a page, they must utilize the login page and provide their password. The user receives a message such as "you must enter user id and password" if they enter the wrong password or use rid. Here, the user-provided inputs are verified. That is textbox validation, password validation, and date format validation. Modifications that are required in light of the testing's findings

System Implementation
Name of the Modules

- Authentication Framework.
- User Enrolment.
- Key distribution.
- EHR sharing.
- Key and session verification.

Module Descriptions
Authentication Framework

The admin needs to set up a structure for safe HER sharing. A Key Exchange (AKE) mechanism that enables mutual authentication between doctors and the admin via a control unit underpins the security of the connection between doctors and the intermediate server. Next, design a control unit for the process of verification. Establish security constraints and key generation features.

User Enrolment

The process of enrolling with an application to initiate communication is known as user enrolment. Doctor and admin are the definitions of users here. They both register for this application and receive authentication keys to complete the login procedure. They must provide information such as their name, father's name, gender, age, phone number, email address, login, and password throughout the registration procedure. The control unit is receiving the registered details for verification.

Conclusion

Implement ECDH-based key-exchange protocols in the proposed effort to determine the optimal algorithms for lightweight cryptography in emergency and critical infrastructure scenarios. The goal of the proposed work is to determine the characteristics and variables that influence how well key generation and agreement methods operate. Utilize the Control Unit and ECDH to enhance performance and solve the issues with the current authentication technique. Future research has been noted, including the requirement for a more thorough evaluation of the use of physiological

variables as a source of entropy for cryptographic keys. It is proposed to execute the adaption of this secure data exchange procedure to various applications in the future, utilizing a real- time sensor-based approach.

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ADAPTIVE PACKET ROUTING DATA SEND FROM SOURCE TO DESTINATION THROUGH AN COMMUNICATION NETWORKS BASED ON REINFORCEMENT LEARNING

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Abstract

A flexible way to direct packets to the communications community is the use of a desktop that receives information as stated in our study of intelligence. We show that the Q-routing method previously shown on small toy networks can be upgraded to larger real-size networks. The overall effectiveness of that route on networks made up of three top-of-the-line networks has been examined: random communication, special attachment (PA) and precise structure recognized as topology (HOT), designed to mimic. Topology of internet router degree to send data from source to destination. Our simulation shows that in terms of finding alternatives under overload, HOT topology is in a position to offer significant benefits over the PA community that is seen in the form of harps where there are barriers to discussion. We demonstrate that the Q-routing approach, which was previously proven on small toy networks, can be extended to realistically sized big networks. Researchers have examined the effectiveness of this routing strategy on three artificial networks with varying topologies: random connections, preferred attachment (PA), and highly optimized topology (HOT), an architecture created to imitate the router level topology of the Internet. Our simulations demonstrate that the HOT topology can provide a significant benefit over a PA network, which is characterized by hubs where communication bottlenecks arise, in terms of finding other channels under high loads.

Keywords: adaptive routing · preferential attachment · highly optimized topology · reinforcement learning

Introduction

Route navigation is a common problem for development through network-based visitor systems, from road transport infrastructure to digital information packages. In preliminary exchange networks, router degree algorithms are typically designed to stand, and router tables are stored at each location consistently by combining shorter routes between source pairs and vacation area [1]. Dijkstra shortcut algorithm and vector routing algorithm are common versions of algorithms to improve calculation of route tables. With the demand for networks in ever-increasing tourist loads, as well as the increasing use of curved public spaces such as wi-fi communication facilities (and the modern concept of the 'Internet of Things' [2]), there are those looking for a more flexible (or flexible) route. traffic adjustment and social

networking can determine the route table. Such self-doubt leads to serious developmental problems. Early work in this region contains the use of the Hopfield community as a basis for establishing the complexity of Travel Salesman [3-5]. Strengthening learning, the department of machine learning [6], has been a very effective way to integrate and solve problems of hard work. An example of this is the cash arrival arrangement designed as an expert problem [7]. Recently, the method has also been used to capture images of employees on common neural networks to introduce the relationship between contour link and curve tracking [8]. In the case of roaming the chat networks, Boyan and Littman introduced Q-routing, an application for enhanced learning, in its original design as Watkin's Q-learning [9]. This work has established that the flexible route desk

should also be read for general public performance as compared to the average time of expansion of packages that can be expanded under heavy loads. However, the show by Boyan et al. it used to be in a very small community of 36 nodes a grid topology. Subsequent work in training explored networks of 250 nodes and studied the cost of directional and output power [10 - 16]. Although the work of Boyan et al. [17] is over two years old, the next work on this subject using countless authors did not mention major networks or topology with special links. Since then, chat networks should increase their size, and upgrade their connection structures to target a larger number of users. Thus a powerful test of the full functionality of Q-routing on real-size networks and connecting houses as viewed online.

It is organized. This is the work done in existing research. In this paper, we consider the number of community topology with a variety of locations set at 500 and the number of social networks set at 5000. In a network of this size, we designed it based entirely on the IBM pink ebook. [18]. We create different social topologies with random connections between nodes and sequential links with the help of special attachments [19]. We also consider the concept of a novel public building, which is considered an advanced topology as a result

Li et al. [20] designed to show more of the level of the Internet level router than the popular attachment network. As such, all site visitors from the network component should transmit through connected routers. By doing this, we show in this paper that the Q-routing approach reaches large issues of route flexibility. Our differences also reflect the impact of unconventional topology on how Q-routing can help improve overall performance when networks are under increasing traffic volume. The paper is filed as follows. The second section provides notes and ideas on how to Q-routing, and how to practice to find the best ways to transfer packets on the network.

Q-Routing: The Basics

Route agreements are designed to find the most effective means of transferring public packages that aim to reduce durability, simplification, and stability. In addition, route agreements can communicate between nodes in the community with the help of packet routing that must specify a neighboring destination. Since then, chat networks have often converted to user clauses, as well as their connection structures. Therefore, a package route with dry route tables will probably not fit in these networks. Additionally, the package route should alternate route tables based entirely on route routes in the community that affect community performance. For example, route tables can be converted primarily on a long-term basis to locate vacation destinations in less time. Q-routing is used in the context of public numbers, on the other hand it no longer applies to large networks such as the online community of packet transfers to avoid congestion on popular routes. In addition, internet networks have been growing rapidly, and they also need to find a high-quality routing algorithm to ensure an exciting and durable delivery. Therefore, this is a desirable risk to follow the Q algorithm in the online community fashion that should be stronger as visitors to the public domain increase, and choose the best ways to avoid traffic congestion which is a satisfactory guarantee of network delivery. As such, Q-routing accelerates from Q-learning which is a single Reinforcement Learning (RL) method of the proposed route, and is designed primarily based on the RL framework to achieve its goal. Additionally, package lists should be updated regularly until traffic congestion occurs on online networks. Therefore, everywhere in the community should find a good neighborhood with the package sent to their destination, and should avoid overcrowding. Allow N = { 1, 2, 500} a set of nodes or regions on an Internet network that can select a route using long-distance view between source and vacation area in public (location), and then. provided as a route table in the Q-values clauses to apply the route policy. Action set (a) is a set of

neighboring notes that can precede the destination. According to the work of Boyan et al. [17], the optimal delivery time for packet P between the supply area x and the holiday destination d using the neighboring area y can be represented as Qx (d, y) which should take less. transit time between node y and n d d packet transfer. Additionally, the x-location should receive the rated route information between the neighboring area y and the destination d to make the route route forwarding package P with the help of node y. As the following figure represents the minimum time limit for node y.

$$t = \min_{z \in y} Q_y(d, z) \quad \text{-- 1}$$

where z is a neighbor of node y. Consider, if packet P can not work quickly and should be applied to the node x line before giving the packet stop time P represented as q. Additionally, the transfer time between node x and node y is represented by using s when the estimated transmission time between node x and node y is confirmed as Eq. 2.

$$\Delta Q_x(d, y) = \eta(q + s + t - Q_x(d, y)) \quad \text{-- 2}$$

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place η reading level, and the phrases (q + s + t) and Q_x (d, y) symbolize new limited time and estimated ancient time respectively. Because the Q-line should change your channel desk primarily based on measurement delivery time for neighboring nodes. Finally, we will find the Q_x (d, y) tables for it. Each node is used to select a neighboring node to avoid overcrowding network.

Internet Network Model

In this paper, the three topics of social media headlines are different to find out how communication affects social functioning as a whole as line extensions. In addition, OMNET ++ 4.3.1 community simulation software is used to build these networks, and it works on University brilliant pc (Iridis 4)

Network Topologies

In this section, three patterns of social structure fashion experts namely random network, random community with special adhesion and heuristically optimal topology are considered.

Random Network Random community as evidenced in Fig. 1 is a basic network model that provides a fixed list of nodes and links the entire link between a pair of nodules with a chance p. The random network communication system creates a large object that attracts the attention of the network to study the transformational homes of its class [23,24].

Random Network with Popular Attachments In many real networks such as affiliates and quotation networks they constantly improve the size of the community by inserting nodes and edges in accordance with the distribution of power law [25 - 27]. In these networks, new nodes choose to join the current node with a wide range of connections as new nodes are introduced to the public depending on the opportunity associated with a variety of modern nodes. This process is known as special attachment as proven in Fig. 2, and the fake code of these public buildings is provided in [19]. Heuristically Optimal Topology Heuristically ultimate topology (HOT) as evidenced in Fig. 3 is designed entirely based on the integration of technical and economic issues in order to follow the social theme and social sector planning [20]. For all site visitors from the edge community should be forwarded to the community through connected routers leading to greater congestion in the network environment. In addition, the extension of the transfer will be increased.
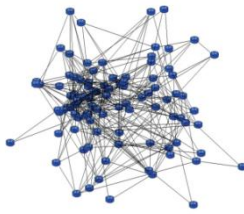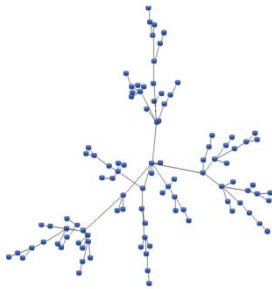
Fig. 1. Random network

Fig. 2. Random network with preferential attachment

if the public crosses a certain distance from their destination. So, HOT topology too is designed to reduce the distance between the public domain and the half in order to limit transmission time. Li et al. [20] recommended that HOT topology is a structure of three social classes: the spine, the gate and the lateral nerves. In addition, the HOT topology needs to reflect the distribution of the law of gravity to reflect the relationship between the AS level and the level of the route.
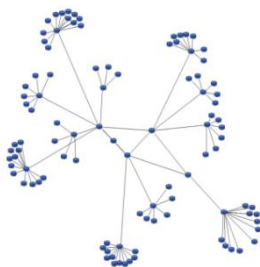

Fig. 3. Heuristically optimal topology

attachment, and then reconnect the social network to create three layers of structure. Due to the core of the community it should cover the congestion closely, so it should have low connections that can speed up its speed to improve network performance, and moreover it saves value on repairs. Gate routers are connected to the core of the community by selecting different high-level nodes, and then connected to the public area in accordance with the diploma of all gates.

Performance Networking Performance

This section provides an exploratory study that introduces exploration set up, and provides test and analysis results.

Test Settings

This test is intended to demonstrate the Q algorithm of the package transmission algorithm during the normal extension and distribution length of the line, and how it tolerates visitor congestion under varying degrees of load on three community tops. In this paper, we set the packet size mainly based on Ethernet jumbo frames that extend body sizes from standard IEEE 802.3 for decommissioning.

The effect of TCP on the body [28]. Packet size starts from 1526 bytes and should be less than 11,455 bytes due to the fact of Ethernet error checking restrictions. However, the frame size of the package contributes to the transfer of length to the Ethernet hyperlink [28]. As such, we consider the variety of packages produced publicly as a result of the overcrowding of site visitors, and are referred to as load levels. The load range is also accelerated based entirely on the frame size of the package. For example, upload Levels 1 and 6 include abnormal body sizes of 1526 by 9156 bytes, respectively. Thus, load degree 6 produces six times the 1526 bytes at a time. In addition, every node produces periodically available packets that are sent to all nodes in the network. Each container specifies its terminus, and is shipped according to the route table. In addition, a simple M / M / 1 mannequin line is embedded in all nodes to store a few packets with an unlimited FIFO line. In this paper, we have long found that we can tell how much time a packet should spend on line until it is transferred to a network link. The overall performance of Q-routing applications is contrary to the shortest route algorithm.

Test Results and Interviews

The fourth figure is to test the average transit time between Q-routing and shortcut algorithm while a variety of packages are expanded to make site visitors more congested. Certainly it can be assumed that Q-routing can limit the amount of time to load degree 6 in the top three communities, and is not much different from long queuing in phase 1 loading due to the fact that there is no overcrowding. In addition, the Q-line can find similar routes as shorter routes after the intersection period which is why the normal stretch time at the lower load rate is no different. In addition, it can limit the length of 60.33 and 58.30% to load degree 6 when PA and HOT differ from a random network, respectively. In addition, the PA community includes the best lengths because some nodes in the network are connected to a wider network, compared to other nodes there is only one way to transfer packets as a result of visitor congestion.
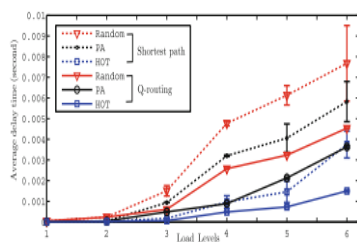

Fig. 4. Comparing average delay time between shortest path and Q-routing

In addition, assessing the average expansion time at load degree 6 as evidenced in Fig. 5. which contrasts with the high level of load between short direction and Q-routing. Algorithms in three community topology, can be considered Q-routing The algorithm can reduce the average time spent by 59.46, 37.93, and 40.78% on Random, PA, and HOT networks respectively because the Q-routing algorithm is integrated into all nodes that reflect the status of modern visitors. using its Q-page route decision-making options, and selecting the most effective ways to reduce site traffic congestion. Figure 5 was found to be linear length between loading phases 1 and 6 where the Q algorithm is

used to transfer the packet to three network topologies, and it is assumed that the distribution of line size at each link in the random community captures very small wide variations . The line size for each load degree is due to the fact that the informal community is constructed in an interconnected position with an equal probability of 0.04, and results in a greater degree of node degree connection. However, the PA community is different from the random community with a new node preferring to join current nodes with a large diploma in communication, thus leading to this community progressing to only one side, and this is the reason why this community holds a very simple list. line size per load level compared to network loosening. In addition, the HOT network is built on the re-connection of the node diploma of the PA network, so it can reduce visitor congestion and contain a reduced line length compared to the PA network, yet holds a larger line size than the random network due to the site. guests will be crammed into the core of the routers connected to the low connection of the node diploma.connection.
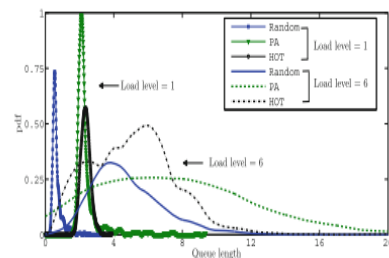
Fig. 5. Distribution of queue lengths between load levels 1 and 6 on three networks

In short, a short router algorithm is no longer suitable for transmitting packets if there is a large range of packets that would like to be sent to the network because it uses a fixed router desk to transfer packets, and moreover leads to hard work. get a visitor congestion by realizing that it always uses the same package transfer route. In addition, Q-routing can find similar routes as shorter routes if they learn until the time to meet. Therefore, the Q-routing algorithm should transfer packets especially

if the number of packets is constantly increasing because your tracking desk may be at the current level to select the appropriate node location to avoid congested routing routes. its tourist destination.

Conclusion and Future Work

In this paper, the dynamic route has been tested for communication networks primarily based on the portable computer-assisted learning management system. The concept, which is recognized as Q-routing was often added a second time back. However, that function and all the work you mention was in the network of small toys. In this work, we have proven that a Q-routing strategy can reach the level of 500 network nodes and 5000 hyperlinks between them. The current standard for router topology is HOT (Highly Optimized Topology [20]) topology. When we compare the networks of random special attachments with the HOT of public topology with respect to the dynamic route, we show how the random community gets the best improvement in reducing the normal length by large quantity because it is easy to find alternating routes. The HOT topology, being a real-time online mannequin capable of surpassing PA formation significantly, suggests that a flexible route is a potential alternative to real networks operating under heavy loads. In our current work, we are involved in exploring the flexible routing strategies of mobile advertising networks that incorporate routes into the Internet of Things' content. We are also involved in additional algorithms that are environmentally friendly to classify RL, such as the SARSA algorithm [29] and its overall performance enhancement strategies with service constraints (e.g., limited bath sizes in nodes).

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SECURITY & PRIVACY ISSUES OF
CLOUD & GRID COMPUTING NETWORKS

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Abstract

A recent development in Internet computing, cloud computing offers fresh insights into internetworking technology. In the world of information technology, cloud computing has grown in importance. Confidential data security is a major topic of worry since unauthorized people' access to it could lead to very serious issues. Proper approaches for data segregation are essential for maintaining data security and confidentiality in cloud computing. on addition to providing tools and a modeling environment, this paper compares and contrasts cloud computing with grid computing and offers advice on how to safely store data and files on the cloud.

Introduction

Cloud computing offers high-level security, data privacy, and safe access from anywhere at any time[9]. Cloud computing refers to the provision of computing as a service, as opposed to a product, whereby computers and other devices are given access to shared resources, software, and data. Cloud computing offers software, processing, data access, and storage services that don't require end users to be aware of the setup and physical location of the system providing the services. Cloud computing providers store corporate software and data on servers located remotely, and they deliver programs via the internet that may be accessed using a web browser. Foster, Zhao, Raise, and Lu [1] define cloud computing as.

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Cloud computing offers software, processing, data access, and storage services that don't require end users to be aware of the setup and physical location of the system providing the services. Cloud computing providers store corporate software and data on servers located remotely, and they deliver programs via the internet that may be accessed using a web browser. Foster, Zhao, Raise, and Lu [1] define cloud computing as: cloud computing offers high-level security, data privacy, and safe access from anywhere at any time. The provision of computing as a service is known as cloud computing.

Computing requires reliability, security, efficiency, and ubiquity. Today, cloud and grid computing [21] is widely used in business, government, education, and entertainment, utilizing the 50 million servers that are installed at thousands of datacenters worldwide. The spike in interest in cloud and grid computing can be attributed to three key factors:1. A sharp decline in hardware costs combined with a rise in processing and storage capacity2. The exponential increase in data size in Internet publication and scientific instrumentation/ simulation.3. Services computing widespread acceptance. Computing requires reliability, security, efficiency, and ubiquity. Today, cloud and grid computing [21] is widely used in business, government, education, and entertainment, utilizing

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1. A sharp decline in the price of hardware and a rise in processing and storage capacity
2. The exponential increase in data size in Internet publication and scientific instrumentation/ simulation.
3. Services computing widespread acceptance.

Principles of Cloud Computing

A cloud is an online network of computers and servers that is open to the general public. All of the computing resources are gathered by cloud computing, which uses software to automatically manage them. In order to improve the accuracy of the information gathered and offer customers and businesses more intelligent services, data analysis integrates historical and current data. Users do not need to know how to purchase servers, software, solutions, and other items. Through the internet, users can purchase computer resources based on their own need.

In addition to merely gathering computer resources, cloud computing offers a management system and has the capacity to serve millions of users at once. Virtualization is currently permeating every aspect of data centers . It has enhanced service capability and turned into a helpful tool. We only need to install a virtual machine that runs on the server when the server cluster's excess storage and processing capacity eliminates the need to buy more servers.
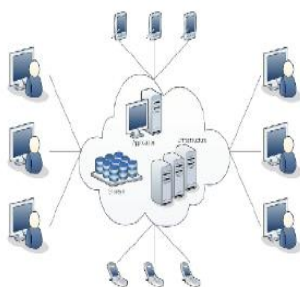
Network Diagram in Cloud Computing

The system management receives the user's request after which it locates the necessary resources and makes a call to the relevant provisioning services on the system. These services launch the relevant web application, carve out the required cloud resources, and either produce or open the needed document. The system's monitoring and metering features measure cloud usage after the web application is launched, allowing resources to be allocated and credited to the appropriate user or users. The system management receives the user's request after which it locates the necessary resources and makes a call to the relevant provisioning services on the system. These services launch the relevant web application, carve out the required cloud resources, and either produce or open the needed document. Following the deployment of the web application, the system's metering and monitoring features follow the use of the cloud to ensure that resources are distributed and assigned to the appropriate user or users).

Physical Security

Physical security covers the hardware side of the data center. It deals with online redundant issues like power supplies. Application security measures include

- Redundant power supplies
- Redundant Internet connections
- Redundant hardware

Application Security

Application security covers the software side of the data center. It deals with online security issues like hackers and viruses [8]. Application security measures include:

- Anti-virus detection software
- Data encryption software
- Administrative controls
- Security audit

Cloud Computing Benefits Include

Cloud computing offers high-level security and data privacy, as well as safe access from anywhere at any

time. It also has the potential to significantly increase productivity and efficiency in the tax and accounting industries.

- Dedicated resources,
- Improved resource use,
- Anytime/anywhere data access,
- Platform independence,
- Security,
- Hassle-free maintenance,

Cloud Computing Services

The public can presently access a large variety of Cloud services. Generally speaking, these services fall into three categories.

- Software-as-a-Service (SaaS)
- Platform-as-a-Service (PaaS)
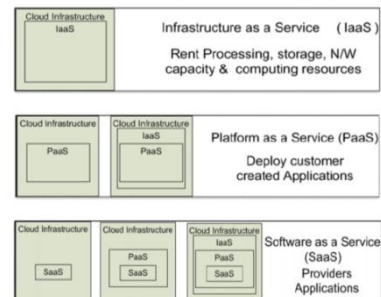- Infrastructure-as-a-Service (IaaS)

Software-as-a-Service (SaaS)

SaaS, or software as a service Programs as applications that are given to the user via a web browser or any other web-rich client are generally referred to as services [4]. Millions of users can access programs through browsers thanks to this type of cloud computing. According to users, this can result in some server and software cost savings. From the provider's perspective, there is only one software to maintain, which can result in cost savings. As of right now, the most well-known provider of this kind of service is Salesforce. com.The end user can access the service from any location since the service provider hosts both the application and the data. Examples are Cloud Numbers,

Platform-As-A-Service (Paas)

Platform as a Service (PaaS), another name for cloud platform services, provides a computing platform and/or solution stack as a service. It makes application deployment easier without adding to the expense and complexity of purchasing and maintaining the underlying software and hardware layers.

February 2014 issue of International Journal on Computational Sciences & Applications (IJCSA), Vol. 4, No. 1.86Google Apps, Sales Force, VMforce, and Joyent Accelerator are a few examples.

(Service models of cloud)

Infrastructure-as-a-Service (IaaS)

Maximum control is possible when building a computing infrastructure from the operating system up with Infrastructure-as-a-Service [3]. The Application Programming Interface (API) for virtual servers offered by Amazon Web Services allows users to access, stop, start, and customize their virtual servers and storage. Examples include IBM Cloudburst, Eucalyptus Community Cloud, and Amazon EC2.While some service providers charge for their cloud computing services, others give them for free.

Grid Computers

By connecting dissimilar systems, grid computing creates a single, cohesive architecture. By linking the many components, grid computing creates a virtual entire. Giving people access to IT resources when they need them is the aim of grid computing. Advantages of GC: Grid computing helps businesses achieve two objectives:

- Remote access to information technology resources
- Total processing capacity

Distinctions between Clouds and Grids

Cloud computing is better suited to environments where a large number of users are requesting small amounts of data (or many but small allocation

requests), whereas grid computing is better suited for organizations with large amounts of data being requested by a small number of users (or few but large allocation requests)

Wolfgang Entsch, the driving force behind Sun's grid initiatives and a current member of the Open Grid Forum board of directors and advisor to the EU DEISA project, clarified that grids are ideally suited for complicated scientific activity in virtual organizations. Conversely, he argued, clouds are ideally suited for straightforward tasks like numerous quick jobs.

Guides and Simulation Settings for Gridcomputing and Cloud

Several products and tools that support the creation of cloud and grid computing applications include:

- Zenoss is an all-in-one solution for IT infrastructure monitoring. Networks, servers, virtual devices, storage, and cloud deployments are all managed by it.

- To assess the needs of large-scale cloud applications, developers might consider using CloudSim and CloudAnalyst. It provides developers with information on how to split up programs between value-added services and cloud infrastructures.
  3. Because of Cloudera's flexibility in handling cluster-based, data-intensive queries, cloud computing deployments are using the open-source Hadoop software framework more and more.

- 4.With the capabilities of Google Web Toolkit (GWT) paired with a next-generation fast application development tool called Spring Roo, developers may create sophisticated browser apps for use in business production settings.

- The Paradyn Performance experiment management is supported by this Grid computing solution through methods for quantitatively comparing several experiments and performance diagnosis based on dynamic instrumentation.

- Nimrod-Guses uses the Globus middleware services to dispatch jobs across computing grids and find resources dynamically. It enables researchers and engineers to plan parametric experiments, stage data transparently, and do programming at distant locations.

- Condor-G is a representation of the Globus and Condor projects, allowing the use of enormous resource collections spanning several domains as though they were all part of the user's own domain.A cutting-edge technology for quickly developing applications is called Spring Roo.

Tips to Store Data and Files Safely in Cloud

The days of storing all of your files—including music, pictures, and documents—on your computer's hard drive are fast drawing to an end. The constant need for extra storage capacity to house all of your digital assets is being addressed by cloud storage.

An examination of the market size and annual growth rates for public cloud services is provided below:
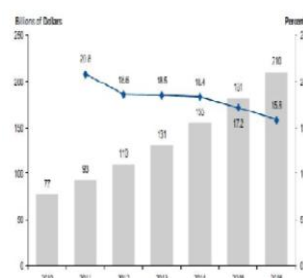
Final Report & Future Area

We have provided a thorough comparison between cloud computing and grid computing in this study. The newest development in computing and storage is cloud computing. In any case, cloud computing is becoming more and more sophisticated, and as long as it is possible to access it through web services at a fair cost without requiring a significant investment in capital infrastructure, it will undoubtedly spread and generate a lot of demand in the future.

Grid computing is the foundation of cloud computing, which gives users access to shared servers that distribute data, software, and resources as needed.

It's becoming less common to store all of your files—including papers, images, and music—on the hard drive of your computer. The constant need for extra storage capacity to house all of your digital assets is being addressed by cloud storage.

More storage space to house all of your digital assets is a constant problem that cloud storage is helping to solve.The market size and annual growth rates for public cloud services are analyzed as follows:

The widespread availability of high-speed broadband Internet will make cloud computing even more crucial. Since cloud computing has become popular, buying huge capacity hard drives is no longer essential because data can now be saved on the cloud. There are various challenges with cloud computing to be solved, such as issues with broadband spectrum availability, interoperability of different systems, security, privacy, and service quality.

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RESEARCH ON WEB DATA ACCEPTANCE MINING BASED WEB ADVOCACY SYSTEMS – A REVIEW

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Abstract

Data mining for Web intelligence leads to formulate the Web a richer, friendlier, and more intelligent resource for users sharing and exploring. Web acceptance mining has become the accountable of all-embracing research, as its abeyant for Web-based alone services, anticipation of user abreast approaching intentions, adaptive Web sites, and chump profiling are recognized. In recent times, an array of advocacy systems to adumbrate user approaching movements through Web acceptance mining accept been proposed. Nevertheless, the superior of recommendations in the accepted systems to adumbrate user approaching requests in an accurate website is beneath satisfaction. Diverse efforts accept been fabricated to abode the botheration of advice afflict on the Internet. Web advocacy systems based on web acceptance mining try to abundance users behavior patterns from web admission logs, and acclaim pages to the online user by analogous the user's browsing behavior with the mined actual behavior patterns.
Keywords: web acceptance mining, web advocacy, web log, web personalization.

Introduction

Web mining is the appliance of data mining techniques to dig out knowledge from web data such as web content, web structure, and web usage data. The aggregate of advice accessible on the internet is accretion rapidly with the atomic advance of the World Wide Web and the appearance of e-Commerce. Although users are provided with added advice and account options, it has become added difficult for them to acquisition the "right" or "interesting" information, the botheration frequently accepted as advice overload.

Recommender systems are alternative, user-centric, able approaches to accouterment the botheration of advice afflict by adapting the agreeable and anatomy of websites to the needs of the users by demography advantage of the ability acquired from the assay of the users' admission behaviors. They can be about authentic as systems that adviser users against absorbing advantageous altar in a ample amplitude of possible options [2], [25]. In contempt years there has been an accretion absorption in applying web acceptance mining

techniques to body web recommender systems [5], [13], [24].

Web acceptance recommender systems yield web server admission logs as input, and accomplish use of abstracts mining techniques such as affiliation aphorism and absorption to abstract implicit, and potentially advantageous abyssal patterns, which are again acclimated to accommodate recommendations. Web server admission logs almanac user browsing history, which contains affluence of hidden advice apropos users and their navigation. They could, therefore, be an acceptable another to the absolute user appraisement or acknowledgment in anticipation user models. Unlike acceptable techniques, which mainly acclaim a set (referred to as the advocacy set) of items accounted to be of absorption to the user abject their decisions on user ratings on different items or added absolute feedbacks provided by the user [20], [21].

The web acceptance mining systems ascertain user preferences from their absolute feedbacks, namely the web pages they accept visited.

Absorption and collaborative clarification approaches are accessible to absorb both bifold and non-binary weights of pages, although bifold weights are usually acclimated for accretion ability [12]. Affiliation Aphorism (AR) mining can advance to college advocacy attention, and are simple to calibration to ample datasets, but how to absorb page weight into the AR models has not been explored in antecedent studies[18].

In this paper dissimilar web acceptance mining methods for Web Advocacy Systems are reviewed. The rest of the paper is put in order in the following manner. The section 2 provides the literature survey, section 3 presents the details about Web Mining Nomenclature and section 4 concludes this paper.
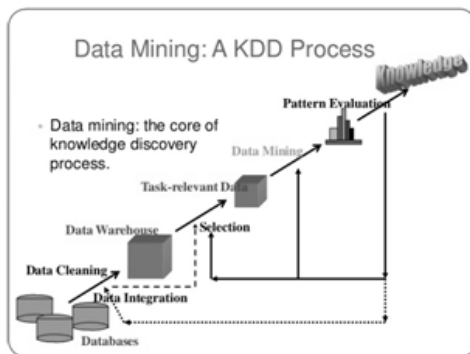
Literature Review

In this literature survey, various Web acceptance mining techniques methods for Web Advocacy Systems have been analyzed. The accent of Web acceptance mining has led to an amount of assay affidavit in the area. However, a lot of these affidavit were hindered by some affectionate of limitations. Different combinations of mining techniques were already appropriate for web admission recommendation. B.Nigam and S.Jain have proposed a new way of alignment the Markov model named as Dynamic Nested Markov archetypal for clay the user web navigation sessions. Activating Nested Markov archetypal uses the nesting concept; the higher-order Markov archetypal is nested inside the lower-order Markov model. Through this nesting, the second-order Markov

archetypal is accommodated central the first-order Markov model. In Activating Nested Markov model, all the advantages of lower-order archetypal and higher-order model are accomplished in one model. In this archetypal focus is on time complexity and advantage of the anticipation state. Result shows that the top advantage has accomplished and time complication has-been reduced [17].

Dhyani et al. have offered an innovative archetypal based on Markov action for web admission anticipation has check of top complication due to application of all admission sequences throughout the anticipation process [8]. V.V.R.MaheswaraRao and V.ValliKumari have suggested board acquaint a new admission to adumbrate users browsing behavior at two levels to accommodated the attributes of the navigation. One is class date and the added is web page stage. In date one is to adumbrate category. The accidental categories can be excluded. The ambit of adding is massively reduced. Next, application pruned Markov models application college adjustment in the akin two to adumbrate the users browsing page is added finer and top operational performance. The after-effects of agreement prove the low accompaniment complication and predictive ability is able-bodied in both stages [19].

A.Anitha et al. have recommended that admission for next page admission prediction. Its use an accumulated admission of amalgam Markov archetypal and a proposed archetypal which acquisition out awful constant admission patterns by brace astute abutting acquaintance based clustering. The resultant patterns are awful relevant, and the admeasurements abstracts set that is activated for consecutive mining action is awful reduced. The proposed adjustment resulted in acceptable anticipation accurateness with beneath accompaniment amplitude complexity. The check of this plan is, about affiliated admission sequences are not advised for mining process. Hence, it is appropriate to extend this plan by because noncontiguous admission sequences also [3].

M.Jalali et al. have designed a advocacy arrangement alleged WebPUM, an online anticipation using Web acceptance mining arrangement and adduce a atypical admission for classifying user aeronautics patterns to predict users' approaching intentions. The admission is based on the new blueprint administration algorithm to model user aeronautics patterns for the aeronautics patterns mining phase. Furthermore, longest accepted subsequence algorithm is acclimated for classifying accepted user activities to adumbrate user next movement. The proposed system has been activated on CTI and MSNBC datasets. The after-effects appearance an advance in the quality of recommendations. Furthermore, abstracts on scalability prove that the ad measurement of data set and the amount of the users in dataset do not decidedly accord to the allotment of accuracy [14].

S.chimphlee et al. have presented web admission anticipation archetypal by amalgam roughest absorption with Markov model. It has above check that abridgement of anticipation accurateness due to approximation while basic clusters. The achievability of an article for acceptance to a array can abate the array tightness, which in about-face affects anticipation accuracy. The consecutive mining appropriate in that plan is all k-th adjustment Markov model [6]. F.Khalil et al. have recommended a new framework for admiration the next web page admission "Modelling and admiration web page accesses application Markov Processes". F.Khalil has acclimated the Markov archetypal for web predict-ion. If the Markov archetypal is not able to adumbrate the next page again the affiliation aphorism are acclimated to adumbrate the next web page [15].

Antonio Maratea et al. have stated that personalized Web page advocacy is carefully belted by the attributes of web logs, the built-in complication of the botheration and the college adeptness needs. When handled by absolute Web acceptance mining methods, because of the actuality of an ample amount of allusive clusters and profiles for visitors of a usually awful rated Website, the model-based or distance-based techniques are acceptable to actualize actual able and simple assumptions or, on the added hand, to about-face out to be awful circuitous and slow. The columnist advised a heuristic majority intelligence technique, which calmly adjusts to alteration abyssal patterns; with the low amount absolutely individuate them advanced of navigation. The proposed address imitates animal behavior in an anonymous ambiance in accident of several individuals alive in alongside and it has the adeptness to adumbrate with bigger accurateness and in absolute time the next page accumulation visited by a user. This Address has been arrested on absolute abstracts from users who browse a accepted Website of accepted content. Average accurateness on assay sets is bigger on a 17 chic botheration and, a lot of importantly, it continues to be abiding as the Web aeronautics goes on [16].

A.Anitha and N.Krishnan have spotlighted the recommendations to learners as able-bodied as web masters to advance all-embracing capability of web based teaching and learning. This plan deals with assay of web log abstracts and development of advocacy framework application web usage mining techniques like high approximation based asperous set clustering application k abutting neighbors, activating abutment pruned all k-th adjustment Markov archetypal and all k-th adjustment association rule mining by activating common (k+1) account set generation using Apriori. The ambition of this chip admission is to make accurate recommendations for acquirements administration systems with bargain accompaniment amplitude complexity [4].

As per the perspective of www structure, the recommender systems are acceptable broadly acclimated by users and advice retrieval systems to accomplish after-effects of both perfecting and recommendation. In the literature, a lot of advisers focus on Web acceptance mining that analyzes Web logs with a action of advertent ability in databases. Indeed, Web sites are breeding a big bulk of Web logs abstracts that accommodate advantageous

advice about the user behavior. The appellation "Web Acceptance Mining" was alien by Cooley et al. in 1997 if an aboriginal attack of anatomy of Web Mining was done; in accurate they ascertain Web mining as the "discovery and assay of advantageous advice from the World Wide Web". It is aswell authentic as "the appliance of abstracts mining techniques to ample Web abstracts repositories". By citation the analogue that Cooley et al. gave in [7], Web acceptance mining is the "automatic assay of user admission patterns from Web servers" [10].

Analyzing web log files to abstract advantageous patterns is alleged web acceptance mining. Web acceptance mining approaches cover clustering, affiliation aphorism mining, consecutive arrangement mining etc., to facilitate web page admission by users, web advocacy archetypal is needed. The web acceptance mining approaches can be activated to adumbrate next page access. Web mining is the application of data mining Techniques to extract knowledge from Web data, in which at least one of structure or usage (Web log) data is used in the mining process. There are three broad categories of Web mining [1**1**]:

Web Mining Nomenclature

The web mining is defined as to determine and retrieve constructive and interesting patterns from a huge dataset. In web mining, this dataset is the enormous web data [23]. Web data includes dissimilar varieties of information including, web structure data, web log data, and user profiles data [1]. Web mining is the application of data mining techniques to dig out knowledge from web data, where at least one of structure or usage data is used in the mining process. Web usage mining has diverse application areas such as web pre-fetching, link prediction, site reorganization and web personalization [22], [9].
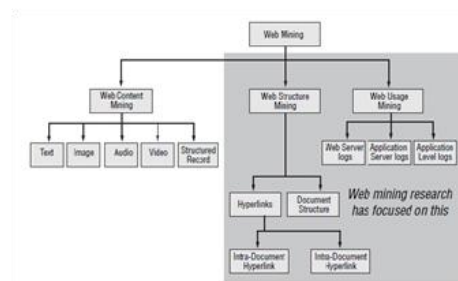

Figure 2 Web Mining Nomenclature

A. Web Content Mining

Web content mining is the process to discover useful information from text, image, audio or video data in the web. Web content mining sometimes is called web text mining, because the text content is the most widely researched area. The technologies that are normally used in web content mining are NLP (Natural language processing) and IR (Information retrieval).

B. Web Structure Mining

Web structure mining operates on the Web's hyperlink structure. Web structure mining is the process of using graph theory to analyze the node and connection structure of a web site. This graph structure can provide information about ranking or authoritativeness and enhance search results of a page through filtering. According to the type of web structural data, web structure mining can be divided into two kinds.

The first kind of web structure mining is extracting patterns from hyperlinks in the web. A hyperlink is a structural component that connects the web page to a different location. The other kind of the web structure mining is mining the document structure. It is using the tree-like structure to analyze and describe the HTML (Hyper Text Markup Language) or XML (eXtensible Markup Language) tags within the web page.

C. Web Usage Mining

Web acceptance mining as well accepted as web log mining, aims to ascertain absorbing and common user admission patterns from web browsing abstracts that are stored in web server logs, proxy

server logs or browser logs. Web acceptance mining is the appliance that uses abstracts mining to assay and ascertain absorbing patterns of user's acceptance abstracts on the web. The acceptance abstracts annals the user's behavior if the user browses or makes affairs on the web site. It is an action that involves the automated assay of patterns from one or added Web servers. The Web acceptance abstracts includes the abstracts from Web server admission logs, proxy server logs, browser logs, user profiles, allotment data, user sessions or transactions, cookies, user queries, bookmark data, abrasion clicks and scrolls, and any added abstracts as the after-effects of interactions.

Conclusion and Future Work

World Wide Web is growing rapidly, and to facilitate web browsing which advice user in his surfing session, and to appoint users of a website at an aboriginal date of surfing, a arrangement for web admission advocacy is essential. So it is all-important to abstraction the user web aeronautics behavior to advance the superior of web services, offered to the web user. Analysis of user web aeronautics behavior is accomplished through clay web aeronautics history. Many approaches were alien to do this assignment a lot of them are based on "Markov model" which is the widest one was acclimated to archetypal the user web aeronautics sessions. Lower-order Markov archetypal provides top coverage, but with low accuracy. Higher-order Markov archetypal accord low advantage but top accurateness with added time complexity.

Since the verification of accepted web admission models such as top complexity, beneath accuracy, and adverse predictions and so on, it's all-important to enhance web pages advocacy access to amusement this weakness by authoritative improvements which aftereffect top recommendations accuracy, low complication and to annihilate accepted approaches disadvantages.

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SYNTHESIS OF TRANSITION METAL COMPLEXES WITH BIO-MEDICAL APPLICATIONS

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Abstaract

Mannich bases play a crucial role in the field of pharmaceutical chemistry. Their biological functions include a broad spectrum, including the inhibition of carbonic anhydrase (CA) and acetylcholine esterase (AChE). The chelating ability, easy availability, and pharmacological capabilities, including analgesic, antipyretic, anticancer, bactericidal, and fungicidal effects, have increased the significance of Mannich base ligands. Considering these parameters, we have created the transition metal complexes of a novel Mannich base ligand and examined their physicochemical characteristics. The current study primarily focuses on the metal complexes formed by the Mannich base ligand, with the following specific goals.

Keywords: mannich bases, metal complexes, ligand, ligand

Introduction

Schiff bases are formed when any primary amine reacts with an aldehyde or a ketone under specific conditions. Structurally, a Schiff base (also known as imine or azomethine) is a nitrogen analogue of an aldehyde or ketone in which the carbonyl group (CO) has been replaced by an imine or azomethine group. Schiff base ligands are easily synthesized and form complexes with almost all metal ions. Over the past few years, there have been many reports on their applications in biology including antibacterial, antifungal, anticancer, antioxidant, anti-inflammatory, antimalarial, antiviral activity and also as catalyst in several reactions such as polymerization reaction, reduction of thionyl chloride, oxidation of organic compounds, reduction reaction of ketones, aldol reaction, Henry reaction, epoxidation of alkenes, hydrosilylation of ketones,synthesis of bis(indolyl) methanes and DielseAlderreaction, hence the need for a review article highlighting the uses of Schiff base ligands and their complexes[1].

A major portion of inorganic chemistry may be related to its main branch that is coordination chemistry, which is the investigation of the properties, structures and reactions of complexes formed by ligands coordinated to a transition metal centre. Transition metal complexes play a central role in the construction of molecular materials, which display unusual conducting and magnetic properties and find applicability in material chemistry, supramolecular and biochemistry. Nickel (II) complexes of macrocyclic ligands are well known to be biologically important and interesting because of their anticarcinogenic, antibacterial and antifungal properties. Also, they have been screened for their medicinal properties because they possess some degree of cytotoxic activity.

The electron transfer events of metal ions have enormous importance in metalloenzyme systems, especially respiratory enzymes. The redox properties include oxidation and reductions of the central metal ion with ligands have been previously studies and reported. The redox potential of the Ni(I)/Ni (II) and Ni (II)/Ni (III) couples have been shown to be markedly affected by the nature of the solvent, background electrolyte and the structure of the chelating ligand with the complexes. In this article we reported the coordination behaviour and characterization of macrocyclic ligands with their nickel (II) metal ion. We have taken in to account the factors which affect the structure of complexes

and their geometries and determining the structures based around the theory of magnetic moments and other spectral studies[2-10].

Materials and Methods

We used the active hydrogen atom and put it through the Mannich process using salicylaldehyde and a secondary amine. Below is a list of the methods and materials that were employed.

Chemicals Used

For aminating purposes, we used 1,3-cyclohexanedione as the active hydrogen component, Vanillin as the selective reactant, and Hydrazinehydrate as secondary amine reactants. In all reactions, ethanol is typically utilized as a solvent. Chloroform and Dimethylsulfoxide were also employed for solubility experiments. All of these chemicals were Analar grade (A.R) goods from Sigma-Aldrich, and they were utilized as just that.

Synthesis of Metal Complex

The transition metal, namely cobalt was used to produce complex with Mannich-base ligand (L1) and 8-hydroxyquinoline (L2) as secondary ligand. The following procedure was used to carry out the complexation reaction.

Synthesis of Metal Complexes (1)

Under continuous stirring, Mannich-base ligand (L1) of hot ethanolic solution of (1 equivalent, 0.01 mol) and the secondary ligand 8-hydroxy quinoline (L2) (1equivalent, 0.01 mol) was progressively combined with $CoCl_2.6H_2O$ in hot ethanolic solution (1 equivalent, 0.01 mol) under stirring over a pre-heated oil bath. After stirring for 30 mins, the mixture was evaporated to dryness for a few hours. In this instance, the brown-coloured solid complex was separated. It was filtered before being rinsed with 50% alcohol and dried.

Results and Discussion

To characterize the complex created, they were exposed to a variety of physical and spectroscopic techniques. Solubility experiments, melting point assessments, and spectrum techniques such as UV-Visible and FT-IR spectra were also conducted. The following are the findings of the various physical and spectral techniques for the ligand and its associated metal complex, as well as its antibacterial activity.

Cobalt Complex (1) with Ligand (L1)
Physical Data

Table 1 shows the physical belongings of the complex (1) generated from ligand (L1).

Table 1. Physical Data of the Complex (1) and Ligand (L1)

Compound	Colour	Melting point (^{o}C)
Ligand (L1)	Yellow	154
Cobalt complex (1)	Brown	223

Solubility

The solubility of the ligand (L1) and its associated complex (1) in various solvents was investigated, and the findings are shown in Table 2. The ligand (L1) as well as the metal complex (1) soluble more readily in aprotic solvents than in protic solvents, according to solubility experiments.

Table 2. Solubility test results complex (1) and ligand (L1)

Compound	Water	Ethanol	Chloroform	DMSO
Ligand (L1)	Insoluble	Insoluble	Sparingly soluble	Soluble
Cobalt complex (1)	Insoluble	Insoluble	Insoluble	Soluble

Conductivity and Magnetic Susceptibility Measurements

Numerous solvents, including water, ethanol, chloroform, and DMSO, were used to test the solubility of the newly synthesized metal complex. The Equiptronics digital conductivity meter (Model EQ-660) was used to determine molar conductance in DMSO, with the cell constant calibrated using 0.1M KCl solution. The electrical conductivity of a

10^{-3} M solution of respective complex in DMSO were determined, revealing the complexe's neutral (non-electrolytic) character. The molar conductance of the mixed ligand complex (1) was 16 Ω^{-1}mol^{-1}cm^2. Thechloride ions were shown to be coupled to metal ions via conductivity tests, suggesting that they function as ligands rather than ions. Components for the produced complexes were selected depending on the metal – ligand ratios (1:1:1) and the type of the electrolytes as determined by conductance experiments, which aids in determining the structure of the complexes. The conductance and magnetic properties of metal complex (1) was shown in Table 3.

Table 3. Conductance and Magnetic Properties of Cobalt Complex (1) with Ligand (L1)

S. No	Compounds	Conductance (Ω^{-1}mol^{-1}cm^2)	Magnetic Susceptibility (μeff. B.M)
1.	Cobalt complex (1)	16	2.52

IR Spectra

The existence of a strong band at 3386 and 2954 cm-1, which is attributed to vOH and the –N-H amine group, is a significant finding in the ligand spectrum (Fig. 1). The bands attributable to –N-H and O-H moved towards higher frequency in cobalt complex (Fig. 2), suggesting that amine nitrogen and hydroxyl oxygen were engaged in coordination through metal ions. In cobalt complex (1), the M-O bond is represented by the new peak appeared at 774 cm^{-1}. The new peak appeared at 3080 cm-1 indicates N→Co formation from the secondary ligand 8-hydroxyquinoline. The M-Cl bond is represented by the new peak at 490 cm^{-1}. The IR spectral data of the complex (1) and the ligand (L1) were displayed in Table 4.

Table 4. IR Spectral data of the complex (1) and the ligand (L1)

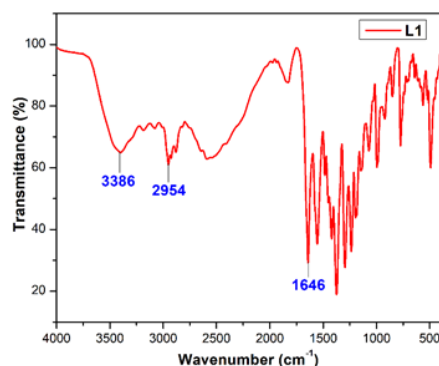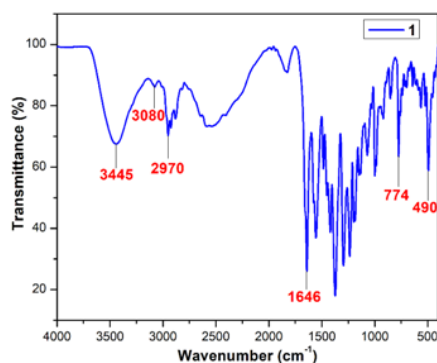| Compound	IR stretching frequency (cm-1)				
	-OH	-N-H	N→M	M-O	M-Cl
Ligand (L1)	3386	2954	-	-	-
Cobalt complex (1)	3445	2970	3080	774	490

Fig.1. Ligand (L1) FT-IR spectra

Fig. 2. Cobalt complex (1) FT-IR spectra

UV-Visible Spectra

The ligand and complex UV-visible spectra were obtained in the region of 100-1100 nm. The UV spectra of ligand (**L1**) primarily revealed two strong maximum bands at 220 nm and 270 nm, which correspond to the $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions, respectfully (Fig. 3). The UV spectra of complex (**1**) primarily revealed two strong maximum bands at 218 nm and 276 nm, which correspond to the $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions, respectfully. The LMCT

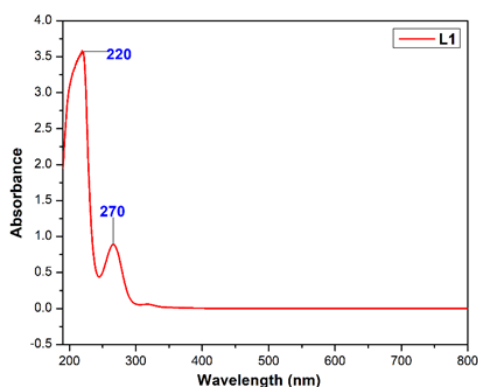transition is represented by the wide band in the 324 nm range. Fig. 4 shows the UV spectrum of cobalt complex (**1**).
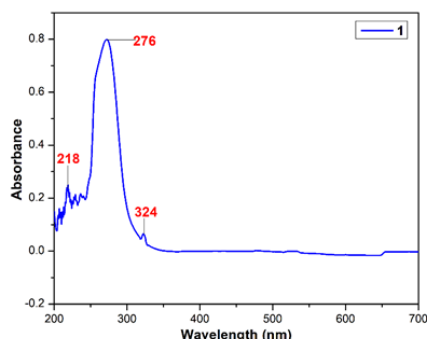

Fig. 3.Ligand L1 UV-spectra

Fig. 4. Cobalt complex (1) UV-Spectra

Biological Screening
Antibacterial Activity

The antibacterial activity of the ligand (L1) and cobalt complex (1) were tested. The ligand (L1) had low activity compared to the corresponding complexes(1). The investigation was done in a controlled environment. The complex 1 was only highly active, with an MIC value of 2 μg/mL in *S. aureus*. Obviously, the complex 1 was significant activity against *K. pneumoniae*, with MIC value of 2μg/mL, than the control Ciprofloxacin, which had MIC value of 8 μg/mL. The cobalt complex 1 was less active against *P. aeruginosa*, with MIC value of 12 μg/mL, than the control Ciprofloxacin, which had MIC value of 6 μg/mL. In comparison to complexes (1) and ligand (L1), complex 1 has exceptional activity in *S. aureus, K. pneumoniae*, and *E. coli*. Table 5 summarizes the findings.

Table 5. Antibacterial Activity of Ligand (L1) and Cobalt Complex (1)

Compounds	Minimum inhibitory concentration (MIC) in μg/mL			
	S. aureus	*P. aeruginosa*	*E. coli*	*K. pneumaniae*
L1	18	16	16	10
1	2	12	4	2
Ciprofloxacin	4	6	6	8

Conclusion

- The present study deals with the preparation of Co(II) complex (**1**) by using mannich base ligand (**L1**) and 8-hydroxyquinoline (**L2**) as secondary ligand.
- The synthesized complex was characterized through various analytical and spectroscopic techniques like physical properties, solubility, conductance, magnetic, UV-Vis and FT-IR spectroscopy.
- The synthesized cobalt complex was further assessed for antibacterial activity against various pathogenic bacteria.
- In comparison to complex (**1**) and ligand (**L1**), complex **1** has exceptional activity in *S. aureus, K. pneumoniae*, and *E. coli*.
- Therefore, cobalt complex (**1**) might be a potential source for developing ecologically significant bioactive compounds, including biodegradable bactericide, and biopharmaceuticals.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON GUEST EXPERIENCES IN HOTELS

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Abstract

The hospitality industry is witnessing a significant transformation driven by Artificial Intelligence (AI). This research article explores the impact of AI on guest experiences in hotels. We examine how AI applications are personalizing guest journeys, enhancing efficiency, and predicting guest needs. The article analyzes data on AI adoption in hotels and its effect on guest satisfaction. Furthermore, we discuss potential challenges and ethical considerations surrounding AI use in the hospitality sector.

Keywords: *hospitality industry, artificial intelligence (ai), guest experience, personalization, efficiency, predicting guest needs aiadoption, guest, satisfaction, challenges, ethical, considerations*

Introduction

Today's travelers crave personalized experiences and seamless service. Hotels are increasingly adopting AI to cater to these evolving guest expectations. AI encompasses various technologies, including chatbots, virtual assistants, recommendation systems, and smart room controls. By leveraging guest data and machine learning algorithms, AI personalizes guest experiences, streamlines operations, and anticipates guest needs, ultimately leading to higher satisfaction and guest loyaltyAI encompasses a range of intelligent technologies like chatbots, virtual assistants, recommendation systems, and smart room controls. By leveraging guest data and machine learning algorithms, AI personalizes guest journeys, streamlines operations, and predicts guest needs. This translates to a more enjoyable and convenient experience for guests, ultimately leading to higher satisfaction and loyalty.

## The Rise of the Discerning Traveler

Modern travelers are tech-savvy and have access to a wealth of information online. They expect hotels to cater to their individual preferences and provide a frictionless experience from booking to checkout. Additionally, the rise of online review platforms has empowered guests to share their experiences, making it crucial for hotels to maintain a positive reputation.

The Role of AI in Hospitality

Faced with these evolving guest expectations, hotels are turning to AI to stay ahead of the curve. Here's how AI is impacting the guest experience in several key areas:

Personalization: AI can analyze vast amounts of guest data, including booking history, travel preferences, and past reviews. Based on this data, AI can personalize recommendations for restaurants, activities, room upgrades, and amenities. This caters to individual guest tastes and creates a more relevant and enjoyable stay.
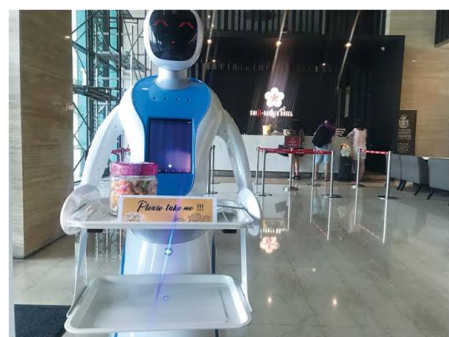
Enhanced Communication and Service: Chatbots and virtual assistants powered by AI offer

24/7 guest support. They can answer questions, handle basic requests like reservations and directions, and even facilitate a faster check-in/out process. This improves guest convenience and reduces wait times, allowing human staff to focus on more complex needs.

Artificial Intelligence in Hospitality Industry

Proactive Service and Improved Efficiency: AI can analyze guest behavior and preferences to predict needs before they arise. For instance, AI can adjust room temperature to a guest's liking before their arrival, suggest amenities based on past usage, or even anticipate requests for extra towels or toiletries. This proactive approach enhances guest comfort and reduces the need for reactive service requests, further improving efficiency.

Beyond Convenience: The Emotional Connection:
While AI offers numerous practical benefits, it's important to remember that human interaction remains a crucial aspect of hospitality. Guests still value a warm welcome, a friendly conversation with staff, and a sense of genuine care during their stay.

The future lies in a harmonious blend of AI and human touch. Hotels should leverage AI to enhance efficiency and personalization without sacrificing the human connection that guests value. AI can be a powerful tool for anticipating needs, streamlining processes, and freeing up staff to provide exceptional, personalized service.

In the next section, we will delve deeper into the data available on the impact of AI on guest experiences, explore some potential challenges, and discuss ethical considerations surrounding AI use in the hospitality sector.

Impact of AI on Guest Experiences

- **Personalization:** AI analyzes guest data (booking history, preferences, reviews) to personalize recommendations for restaurants, activities, room upgrades, and amenities. This caters to individual guest tastes and creates a more relevant and enjoyable experience (https://10xds.com/location/usa/).

- **Enhanced Communication and Service:** Chatbots and virtual assistants provide 24/7 guest support, answering questions, handling basic requests (reservations, directions), and facilitating faster check-in/out processes. This improves guest convenience and reduces wait times (https://callcenterstudio.com/).

- **Proactive Service and Improved Efficiency:** AI can analyze guest behavior and preferences to predict needs. For instance, AI can adjust room temperature before arrival or suggest amenities based on past usage. This proactive approach enhances guest comfort and reduces the need for reactive service requests.

Data Analysis
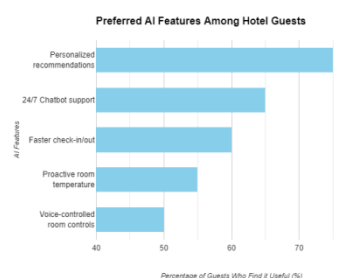
Guest Satisfaction and AI Adoption: Studies indicate a positive correlation between AI adoption and guest satisfaction. Research by Oracle suggests that AI can improve guest service fulfillment time by 33%, leading to higher customer satisfaction rates https://go.oracle.com/LP=77094.

Guest Reviews and AI Sentiment Analysis: AI can analyze guest reviews to identify areas for improvement and proactively address potential issues. Sentiment analysis tools can detect positive and negative feedback, allowing hotels to personalize responses and address concerns promptly.
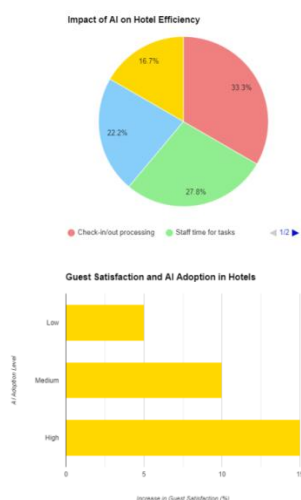
Challenges and Ethical Considerations

- **Data Privacy Concerns:** The use of AI necessitates collecting and analyzing guest data. Hotels must ensure robust data security measures and transparent communication regarding data usage to maintain guest trust.
- **Bias in AI Algorithms:** AI algorithms can perpetuate biases present in the data they are trained on. Hotels must be aware of potential biases and implement safeguards to ensure fair and inclusive guest experiences.
- **Human Interaction and the "AI Touch":** While AI offers numerous benefits, human interaction remains a crucial aspect of hospitality. Hotels should aim for a balance, leveraging AI to enhance efficiency and personalization but ensuring guests still receive a warm and welcoming human touch.

Conclusion

AI is reshaping the hospitality landscape, offering hotels a powerful tool to personalize guest experiences and elevate guest satisfaction. By implementing AI responsibly and ethically, hotels can create a future where technology seamlessly augments the human touch, leading to a more enjoyable and memorable stay for guests.

Key Takeaways

- **Personalized Experiences:** AI allows hotels to cater to individual guest preferences, leading to a more enjoyable and relevant stay. From recommending restaurants to adjusting room temperature, AI personalizes the guest journey.
- **Enhanced Efficiency and Convenience:** Chat bots, virtual assistants, and smart room controls powered by AI streamline processes and improve guest convenience. Faster check-in, 24/7 support, and proactive service requests all contribute to a smoother experience.
- **Increased Guest Satisfaction and Loyalty:** Studies show a correlation between AI adoption and higher guest satisfaction. By anticipating needs and providing exceptional service, hotels can build stronger guest relationships and loyalty.

Looking Ahead: Challenges and Opportunities

The future of AI in hospitality holds immense potential. However, challenges remain:

- **Data Privacy and Security:** Hotels must ensure robust data security measures and transparent communication regarding data usage to maintain guest trust.
- **Ethical Considerations and Algorithmic Bias:** AI algorithms can perpetuate biases present in training data. Hotels must be aware of potential biases and implement safeguards to ensure fair and inclusive guest experiences.
- **The Human Touch:** While AI offers numerous benefits, the human connection remains vital. Hotels should aim for a balance, leveraging AI to enhance experiences while ensuring guests receive a warm and welcoming human touch.

The Way Forward

As AI continues to evolve, hotels that embrace this technology and use it responsibly will be best positioned to thrive. By creating a seamless blend of AI and human interaction, hotels can personalize guest experiences, anticipate needs, and ultimately, create a future of hospitality that is both innovative and guest-centric.

The impact of AI on guest experiences is undeniable. AI is not a replacement for human interaction, but rather a powerful tool that can elevate hospitality to a whole new level.

Further Research

- The long-term impact of AI on hotel staff roles and training needs.
- The effectiveness of AI-powered accessibility features for guests with disabilities.
- Guest preferences and perceptions regarding AI interaction in hotels.

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Oracle Hospitality Industry Predictions for 2023: (https://blogs.oracle.com/hospitality/post/hospitality-industry-predictions-for-2023) This report from Oracle discusses key trends in the hospitality industry, including the growing role of AI in guest experiences.

How Artificial Intelligence Enhances the Hote Guest Experience: (https://www.oracle.com/a/ocom/docs/industries/hospitality/nor1-guide-to-ai-for-hospitality-executives.pdf) This article by Oracle delves into specific AI applications and their benefits for guest service fulfillment and overall guest experience.

The Impact of AI on guest satisfaction in Hotel Management: An Empirical Study of Luxury Hotels: (https://www.researchgate.net/publication/372048811_THE_IMPACT_OF_ARTIFICIAL_INTELLIGENCE_AI_ON_GUEST_SATISFACTION_IN_HOTEL_MANAGEMENT_AN_EMPIRICAL_STUDY_OF_LUXURY_HOTELS) This research paper explores the correlation between AI adoption and guest satisfaction in luxury hotels.

Academic Articles and Studies

Artificial Intelligence: A New Frontier for Elevating the Guest Experience in Hospitality? (https://www.trustyou.com/press/trustyou-unveils-responseai-revolutionizing-review-management-for-hospitality) This article explores the use of AI for guest communication, personalization, and sentiment analysis from online reviews.

Impact of Artificial Intelligence in Travel, Tourism, and Hospitality (https://www.sabre.com/locations/india/resources/news/revolutionizing-travel-and-hospitality-the-unprecedented-impact-of-artificial-intelligence/) This article provides a broader view of the impact of AI across the travel and hospitality sectors.

Additional Resources

Hotel News Resource: (https://www.hotelnewsource.com/) This website offers news and insights on the hotel industry, including articles on technology trends like AI.

Hospitality Technology Magazine: (https://hospitalitytech.com/) This magazine covers the latest advancements in technology for the hospitality industry, including AI applications.

Data Sources

Statista - Hotel Industry Statistics: (https://www.statista.com/study/11886/hotels-statista-dossier/) This website provides data and trends on various aspects of the hotel industry, including technology adoption.

Hotel Online Review Platforms: Platforms like TripAdvisor and Google Reviews offer guest sentiment data that can be analyzed to understand guest preferences and the impact of AI features.

IN VITRO PROPAGATION OF GMELINA ARBOREA ROXB,-A MULTIPURPOSE TREE THROUGH SHOOT TIP MULTIPLICATION

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Abstract

Gemilina arborea Roxb. (Verbenaceae) is an economically and also medicinally important forest tree. The wood of this tree is very valuable for making furniture, general carpentry, packages and constructions in place of teak wood. This plant has also lot of medicinal values in Ayurvedic formulations for treating various diseases. The present investigation was carried with an objective to develop a mass multiplication procedure through invitro culture using shoot tip explants of mature tree. The surface sterilized explants were cultured on MS medium (Murashige and Skoog 1962), supplemented with different concentrations of Benzyl amino purine (BAP) (1.0 – 5.0 mg/l) and kinetin (KN) (0.5 – 5.0 mg/l) for bud sprouting. Bud break and development of shoots from axillary node explants were a function of cytokinin activity. Of the two hormones tested BAP (4.0 mg/l) was more effective than Kinetin in inducing bud break as well as multiple shoot formation. The elongated shoots developed roots in vitro upon transfer to MS medium supplemented with NAA (2mg/l) for 15 days. In vitro produced plantlets were hardened and successfully established in natural soil.
Keywords: gmelina arborea, verbenaceae, auxins, cytokinins, explants.

Introduction

Gmelina arborea Roxb., commonly known as white teak belongs to the family *verbenaceae.* It is a multipurpose tree used as timber, fuel, fooder and medicine. The wood is one of the best timbers of the tropics, widely used for particle board, ply wood core stock, pit props, matches, saw timbers for light construction, furniture, general carpentry and packing. The leaves are used as fodder for animals and silk worms, the bitter sweet fruit were also once consumed by humans. The plant parts are used for the treatment of various ailments like tuberculosos, gonorrhea, cough, headache, abnormal tumors, ulcers and many chemically active substances like butyric acid, traces of tartaric acid, resinous and saccharine matter have been isolated from various parts (Chopra *et al*.,1956; Sathyanarayana and Rao, 1986). Because of its very rapid growth, ease of establishment, expectation of early returns and promising wood characteristics, including high durability and good yield and quality of pulp, the attention of foresters, world over is drawn towards this important multipurpose tree. (Arya and Haqe 1982, Thirunavukkarasu and Debata, 1998).

Tree multiplications by conventional method of propagation are slow, seasonal and are unable to meet the present demand, because of the poor germination of seeds. Hence there is a need to develop and a rapid and reproducible protocol for multiplication of this multipurpose tree. There are very few reports available on the micropropagation of this species (Roy 1995, Kumar et al., 1997). The present investigation was carried with an objective to develop a mass multiplication procedure through *invitro* culture using shoot tip and axillary node explants of mature tree.

Materials and Methods

The explants (shoot tip, axillary node) were obtained from actively growing 5 year old elite *Gmelina arborea* tree, from the experimental garden. The excised explants (0.5 -1.0 cm long) were kept under running tap water for 20 – 30 min, washed thoroughly with 2 – 3 drops of Tween 20 detergent

solution for 15 – 30 minutes. Traces of tween 20 solution were removed by washing 6 – 7 times with distilled water subsequently the explants were shaken in 70 % (v/v) Mercuric chloride for 5 minutes. The explants were finally rinsed 5 – 6 times (each 5 minutes duration) in sterile distilled water under aseptic condition. The explants were prepared after trimming the excess tissue. The surface sterilized explants were cultured on MS medium (Murashige and Skoog 1962), supplemented with different concentrations of Benzyl amino purine (BAP) (1.0 – 5.0 mg/l) and kinetin (KN)(0.5 – 5.0 mg/l) for bud sprouting. The media were solidified with 0.8% (W/v) bacteriological grade agar after adjusting the pH 5.7. Media were dispensed into clean culture tubes (150 x 25 mm, Borosil, India) which were capped with non – absorbent cotton plugs and autoclaved at 121° C under 1.1 Kg cm $^{-2}$ pressure for 20 min. All cultures were incubated under cool, white florescent light (35u Em^{-2} S^{1}) with 55 – 65% relative humidity, after 40 to 50 days, the percentage of cultures established was determined. The efficiency of cytokinin for multiple shoot development was accessed. After 2 to 4 subcultures the multiple shoots were cut to 5 – 6 cm long, transferred to half strength MS basal medium supplemented with 0.1 – 3.0 mg/l NAA, IBA and IAA for rooting.

Result and Discussion

Bud break and development of shoots from shot tip explant were a function of cytokinin activity. Of the two hormones tested BAP was more effective than KN in inducing bud break as well as multiple shoot formation. There was a linear correlation between the increase in concentration of BAP and percentage of shoot development up to the optimal level (4.0mg/l). The number of shoot per explant also increased with increments in BAP (4.0mg/l) induced bud breaks in 80% of the shoot tip explants than axillary node. The explants cultured on this medium showed their first response by an initial enlargement of the existing shoot bud following bud break within 8 – 10 days. New shoots developed adjacent to the primary shoot

tip with 20 – 25 days. These shoots attained height averaging 3cm in 60 days bearing 6 to 9 leaves. However, Thirunavukarasu and Debata 1998 reported that the number of shoot lets produced per explants was highest (27 $\pm$ 0.1) when the culture medium was devoid of cytokinin and auxin. The result of the present study supports earlier findings as the shoot multiplication was induced in the presence of exogenous cytokinins.

Thirunavukarasu and Debata 1998 reported that the explants from the crown region of *Gmelina* trees are not ideal candidates for multiple shoot formation. The main reason for this is the browning of explants soon after inoculation, which is due to the exudation of phenolic compounds from the explants. In contrast explants from the epicormic shoot do not show any browning symptoms and axillary buds proliferated to form multiple shoots. The results of the present study also confirm this as multiple shoot induction was best when axillary node was used as on explants. Similar conclusion have been made earlier in some other trees like *Eucalyptus terticornis*, *Tectona grandis* (Das and mitra, 1990: Devi *et al*., 1994)

Excised shoots failed to root half strength MS medium without any growth regulator supplementation. Addition of Auxin to the culture medium induced rooting. Of the three auxins tested. NAA (2.0mg/l) was found to be most effective in inducing roots. About 89% of the excised shoots developed roots within 12 – 15 days of culture on half-strength MS fortified with NAA at an optimal concentration of 2.0mg/l. In 30 days roots developed from each shoot with root length averaging 4.5 cm. On the medium supplemented with IBA (2.0mg/l). Up to 80% rooting could be induced on the medium fortified with 1.0mg/l IBA. IAA at 0.1 – 2.0 mg/l induced light brown callus formation at the proximal end of the excised shoots and two to three roots were occasionally developed after 30 days.

Using the method described above, rapid mass propagation of *Gmelina arborea* plants was achieved by *in vitro* culture of shoot tip and axillary node explants of mature tree. This method should provide a useful tool for production of this multipurpose tree.

Micropropagation from shoot tip explants of Gmelina arborea on MS medium. (a) & (b) Shoot bud initiation from shoot tip explants after 20 days of culture. (c) Multiple shoot bud development after 20 days of culture. (d) Shoot elongation after 15 days of culture (6 to 9 leaves). (e) Root initiation.

Table: 1 Shoot Initiation and Multiple Shoot Induction from Shoot Tip and Axillary Node Explants of *Gmelina Arborea*

Hormones (mg/l)	% of response		Mean No. of Shoots	
	Shoot tip	Axillary node	Shoot tip	Axillary node
BAP				
0	-	-	-	-
1.0	30^d	30^c	0.8^k	0.4^j
2.0	50^c	45^c	0.9^j	0.8^j
3.0	60^{bc}	50^c	1.2^i	1.0^i
4.0	80^a	75^a	1.6^{gh}	1.5^{hi}
5.0	70^b	60^{bc}	1.3^i	1.0^i

Each mean is based on 15 replicates each of which is repeated three times. Data recorded after four weeks of culture. Each treatment followed by the same letter was not significantly different from each other (DL 0.05) according to the Dunken Multiple Range Test.

Table: 2 Root Induction in *Gmelina Arborea* on MS basal Media Containing Various Auxins

Hormones (mg/l)	% of response		Mean No. of roots	
	Shoot tip	Axillary node	Shoot tip	Axillary node
NAA				
0.1	40^c	30^d	0.2^d	0.1^d
0.5	60^b	56^c	0.3^d	0.2^d
1.0	80^a	78^a	1.2^c	1.0^c
2.0	89^a	85^a	3.2^a	2.8^a
3.0	80^a	79^a	2.5^b	2.2^b
IBA				
0.1	40	35	0.2^c	0.1
0.5	50	42^d	0.4^d	0.3
1.0	80^a	60^b	1.2^c	1.0
2.0	70^b	55^c	0.8^c	0.7^{cd}
3.0	60^b	50^c	0.6^{cd}	0.5^d
IAA				
0.1	-	-	-	-
0.5	-	-	-	-
1.0	20^d	15^b	0.2^d	0.1^d
2.0	30^d	25^e	0.6^{cd}	0.4^d
3.0	20^d	20^e	0.3^d	0.2^d

Each means is based on 15 replicates each of which is repeated three times. Data recorded after four weeks of culture initiation. Each treatment followed by the same letter were not significantly different from each other (DL 0.05) according to the Dunken Multiple Range Test.

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A STUDY ON PARTIAL DIFFERENTIAL EQUATIONS USING MONGE'S METHOD

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Abstract

In this paper, we discussthe Partial Differential Equation of order two with variable coefficients. Here it explainsa large class of Partial Differential Equation using Monge's method and Monge's method for solving some essential types of second order Partial Differential Equations. The most general linear Partial Differential Equations of second order in two independent variables x and y with variable coefficient isRr + Ss + Tt = V.
Keywords: *Monge's Method, Intermediate Integral, Complete Integral.*

Introduction

A Partial Differential Equation is said to be of order two, if it involves least one of the differential coefficients. The general form of a second order Partial differential equation is two independent variables are given

$$p = \frac{\partial z}{\partial x}\ , q = \frac{\partial z}{\partial y}, r = \frac{\partial^2 z}{\partial x^2}, s = \frac{\partial^2 z}{\partial x \partial y}, t = \frac{\partial^2 z}{\partial y^2}$$

The most general linear Partial Differential Equation of second order in two independent variables x and y with variable coefficient is given
$$Rr\ +\ Ss\ +\ Tt\ =\ V \text{PRE-REQUISITES}$$

Definition 2.1

An **intermediate integral** of a partial differential equation system E is another PDE system of lower order, whose solutions of E, the derivation of this relies only one well known properties of first order PDEand some elementary linear algebra.

Definition 2.2

An **arbitrary function** simply means that it is a function that you are free to define, a function is any algorithm or relation that relates a bunch of input equalities to a bunch of output quantities such that each input corresponds to one and only one output.

Definition 2.3
Complete integral

A solution of a partial differential equation ofthe second order that contains as many arbitrary constants asindependent variables.

Monge's Method of Integrating
$$Rr\ +\ Ss\ +\ Tt\ =\ V$$

Definition 3.1

The Partial Differential Equation $F(x, y, z, p, q, r, s, t) = 0$ of the second order can be integrated. The most important method of solutiondue to Monge's applies to a comprehensive class of such equations but by no means to all. Monge's method depends on establishing one or two intermediate integrals (first integrals) of theform $u = f(v)$.

Where u and v are functions of $x, y, z, p, q\ and\ f$ is some arbitrary function

Monge's Method of Integrating
$$Rr\ +\ Ss\ +\ Tt\ =\ V$$
Where r,s,t have their usual meanings and $R, S, T, V$are functions of $x, y, z, p\, and\, q$. The given Equation
$$Rr\ +\ Ss\ +\ Tt\ =\ V \qquad (1)$$
We have $dp = \frac{\partial p}{\partial x} dx + \frac{\partial p}{\partial y} dy = rdx + sdy$
and $dq = \frac{\partial q}{\partial x} dx + \frac{\partial q}{\partial y} dy = sdx + tdy$
∴ r $= \frac{dp - sdy}{dx}$ and t $= \frac{dq - sdx}{dy}$
Substituting these values of r $and t in$ (1), we get

$R\left(\frac{dp-sdy}{dx}\right)+Ss+T\left(\frac{dq-sdx}{dy}\right)=Vdy(Or)$

$Rdy\,(dp-sdy)+Ssdxdy+Tdx\,(dq-sdx)=Vdxdy(Or)$

$(Rdpdy+Tdqdx-Vdxdy)-s\,(Rdy^2-Sdxdy+Tdx^2)=0$

If any relation between x,y,z,p,q makes each of the bracketed expressions vanish, this relation will satisfy the differential equation (1),

From $Rdy^2-Sdxdy+Tdx^2=0$}

$Rdpdy+Tdqdx-Vdxdy=0$}and

$dz=pdx+qdy$

It may be possible to obtainone or two relations between x,y,z,p,q called intermediate integrals,and there form to deduce the general solution of (1).

The equations (2) are called Monge's subsidiary Equation.

The method of solutions areexplained in the following procedure: Resolve the Equation

$Rdy^2-Sdxdy+Tdx^2=0$

Into the two equations

$dy-m_1dx=0\,,dy-m_2dx=0$

Now, from the first of the equations (4) and the Equation

$Rdpdy+Tdqdx-Vdxdy=0$

Combining, ifnecessary, with $dz=pdx+qdy$,find two integrals $u_1=a\,,v_1=b.$ then $u_1=f_1\,(v_1)$ is an intermediate integral, $f_1$being an arbitrary function. In the sameway, taking the second of the equations (4), find another pair of integrals, $u_2=a,v_2=b.$ then $u_2=f_2(v_2)$Where f_2 is an arbitrary function is another intermediate integral.

To obtain the final integral,either of these intermediate integrals may be integrated, and this must be done when $m_1=m_2 if m_1\,and\,m_2$ are unequal, then solve the two intermediate integrals for $pandq$ and substitute the values of$pandq$ thus found in $dz=pdx+qdy.$ Integrating it obtain the complete integral of (1)

Illustrative Example

Solve $r=a^2$ t (6) Solution:

We have $dp=\frac{\partial p}{\partial x}dx+\frac{\partial p}{\partial y}dy=rdx+sdy$

and $dq=\frac{\partial q}{\partial x}dx+\frac{\partial q}{\partial y}dy=sdx+tdy$

$dp=rdx+sdy$

$dp-sdy=rdx$ and

$dq=sdx+tdy$ and $dq-sdx=tdy$

where $r=\left(\frac{dp-sdy}{dx}\right)$ and t $=\left(\frac{dq-sdx}{dy}\right)$

putting these values of r and t in (6),we get

$\frac{dp-sdy}{dx}=a^2(\frac{dq-sdx}{dy})$

$(dpdy-a^2dqdx)-s\,(dy^2-a^2dx^2)=0$

Monge's subsidiary equation is

$dpdy-a^2dqdx=0$ and

$dy^2-a^2dx^2=0$

Equation (8) resolves into the two equations

$dy-adx=0$

$dy+adx=0$

From (7) & (9) we get

$dpdy-a^2dqdx=0\therefore[dy=adx]$

$dp\,(adx)-a^2dqdx=0$

$adx\,(dp-adq)=0$

dp – adq = 0

(or)

from (9) & (11) we get

$y-ax=a_1,andp-aq=b_1$

$p-aq=f_1(\,y-ax)\,\therefore[u_1=f_1\,(v_1)]$ (12) is an intermediate integral,f_1 being an arbitrary function.

Similarly, from (7) and (10), we find another intermediate integral

$dpdy-a^2dqdx=0$

$dp\,(-adx)-a^2dqdx=0$

$-adx(-aq-adq)=0\therefore[dy=-adx]$

$adx\,(dp+adq)=0$

$dp+adq=0$

from (10) and (11) we get

$y+ax=a_1andp+aq=b_1$

$p+aq=f_2(y+ax)$

(14)

Where f_2 is an arbitrary function solving (13) and (14) for $and q$, we get

$p - aq = f_1(y - ax)$ and $p + aq = f_2(y + ax)$

$$2p = f_1(y - ax) + f_2(y + ax)$$

$$p = \frac{1}{2}f_1(y - ax) + f_2(y + ax)$$

$$p - aq = f_1(y - ax)$$

$$p + aq = f_2(y + ax)$$

$$2aq = f_1(y - ax) - f_2(y + ax)$$

$$q = \frac{1}{2a}f_1(y + ax) + f_2(y - ax)z$$

Substituting these values of $and\ q\ in\ \boldsymbol{dz = pdx + qdy}$, we get,

$$dz = \frac{1}{2}[f_1(y - ax) + f_2(y + ax)]dx$$
$$+ \frac{1}{2a}[f_2(y + ax) - f_1(y - ax)]dy$$
$$= \frac{1}{2}f_1(y - ax)dx + \frac{1}{2}f_2(y + ax)dx$$
$$+ \frac{1}{2a}f_2(y + ax)dy$$
$$- \frac{1}{2a}f_1(y - ax)dy$$
$$= \frac{1}{2a}f_2(y + ax)(dy + adx) - \frac{1}{2a}f_1(y - ax)(dy - adx)$$

$$\boldsymbol{z = \frac{1}{2a}\emptyset_2(y + ax) - \frac{1}{2a}\emptyset_1(y - ax)}$$

Which is the complete integral of the Equation (6).

Conclusion

This paper describes a Partial Differential Equation using Monge's method. Also discusses some basic definitions and examples with the solution ofMonge's Method of integrating $Rr + Ss + Tt = V$.

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ARTIFICIAL INTELLIGENCE IN CRIME DETECTION USING BLUE BRAIN TECHNOLOGY

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Abstract

On this paper, we have counseled an idea to locate the crime of humans with the aid of the usage of blue brain generation. The human brain is the maximum treasured introduction of the god within the global but the" Blue brain" or digital brain means a system can act as a human mind, it may think, take choices and respond, and a system can feature as a human mind. The specific identity of humans is their personal creative understanding. After death, it'll get destroyed. But we can recreate their understanding the use of blue mind era. Virtually we referred to as it a virtual brain. The Blue brain is a try to reverse engineer the human brain and recreate it at the mobile degree interior a laptop simulation. After the demise of the body, the digital mind will act as a man. So, even after the loss of life of the character, we cannot lose the information, intelligence, character, feelings, and memories of the human.

Keywords: the human brain, virtual brain, nanobots, blue gene supercomputer, the neocortex.

Introduction

Human is does now not stay for hundreds of Years however the data in his mind may be stored and used for numerous hundreds of years. [1] Intelligence refers back to the capacity to recognize, think, act, interpret and predict the destiny to gain and handle relationships, ideas, and so forth. It facilitates in selection-making, trouble-solving, gaining knowledge of, and reasoning. The intelligence thus plays a totally crucial role in survival and development beyond the present. The technology that facilitates in this activity is blue mind. The main purpose is to upload the human brain right into a machine. It is able to be used for the development of human society. [2]On 1 July 2005, the mind thoughts Institute (BMI, at the Ecole Polytechnique Fidrale deLausanne, Switzerland.) and IBM (worldwide enterprise Machines) released the blue mind challenge. The primary purpose of this venture. As of August 2012, the biggest simulations are of microcircuits containing round a hundred cortical columns such simulations involve about 1 million neurons and 1 billion synapses. That is about the identical scale as that of a honey bee mind. Its miles were hoping that a rat mind neocortical simulation (~21 million neurons) could be done by using the

quit of 2014. A full human mind simulation (86 billion neurons) has to be viable by using 2023 supplied sufficient investment is received. The studies entail simulating the human mind and studying the organic accuracy, and intelligence of the [2] Human brain. In this paper, we reviewed the blue mind, why we want a blue mind and the functioning of the human brain gadget. Programs of this generation, about the blue gene supercomputer, crime detection with nano Bots, evaluation between human intelligence and synthetic intelligence, and merits and demerits of the usage of this artificial Intelligence.

Blue Brain

Blue brain is the call of the arena's first virtual brain. The digital machine is one which could characteristic as, a totally suitable software of an synthetic Intelligence human brain. [4] inside 30 years, we will be able to experiment ourselves into computer systems. We are able to say it's far a virtual mind i.e., an artificial brain, which is not sincerely a herbal brain, however can act as a mind. It could assume just like the mind, take decisions primarily based on past enjoy, and respond as a natural mind. [1] it is feasible through the use of a supercomputer, with a

huge quantity of storage capability, processing energy, and an interface among the human mind and the synthetic one.

Focus is part of the herbal global. We consider that attention relies upon on arithmetic and good judgment, legal guidelines of physics and chemistry and biology; it's not magical. The concept of mind uploading is based on this mechanical view of the mind. It denies the ritualistic view of human existence and attention. Eminent laptop geniuses and neuroscientists have foretold that specifically programmed machines might be able to thought and even reach some stage of recognition. Such gadget intelligence capacity may provide a computational substrate necessary for importing.

Why We need a Blue Brain?

Intelligence is an inborn excellent that cannot be created. A few human beings have this nice in an effort to suppose as much as such an quantity that others cannot reach it. Human society is constantly in want of such intelligence and an smart brain to have with.[3] however the intelligence is lost together with the frame after demise. The digital brain is a method to it. The brain and intelligence will be alive even after death. We frequently face problems in remembering matters inclusive of humans's names, birthdays, the spellings of words, proper grammar, important dates, historical facts, etcetera. In a busy life, anyone desires to be comfy. Can't we use any system to help with this kind of? Digital brain may be a better solution for it.

We want a blue mind because of the following:

- To upload contents of the natural mind into it.
- To preserve the intelligence, knowledge, and talent of any man or woman all the time.
- To recall things without any attempt.
- To shop the records securely it's far retrieved on every occasion it wishes.
- The brain and intelligence can be alive even after demise.
- Virtual machines can produce a higher strategy to human problems.

Functioning of the Human Brain System

Basically, the functioning of the Human Brain depends onthe following:

A. The cerebrum
B. The cerebellum
C. The brainstem

A. Cerebrum

The cerebrum or cortex is the most important part of the human brain, related to higher mind capabilities which include thought and movement. The cerebral cortex is split into 4 sections, known as "lobes": the frontal lobe, parietal lobe, occipital lobe, and temporal lobe. Right here is a visual representation of the cortex:

B. Cerebellum

The cerebellum, or "little brain", is much like the cerebrum in that it has hemispheres and a particularly folded floor or cortex. This shape is related to the regulation and coordination of motion, posture, and balance. The cerebellum is believed to be plenty older than the cerebrum, evolutionarily. What do I imply via this? In Other words, animals that scientists count on to have advanced prior to humans, as an instance, reptiles, do have evolved cerebellum. But reptiles do no longer have a neocortex.

C. Brainstem

Underneath the limbic machine is the brain stem. This shape is liable for simple vital existence features such as respiration, heartbeat, and blood strain.

Scientists say that that is the "simplest" a part of human brains due to the fact animals' entire brains, consisting of reptiles (who seem early on the evolutionary scale) resemble our mind stem.
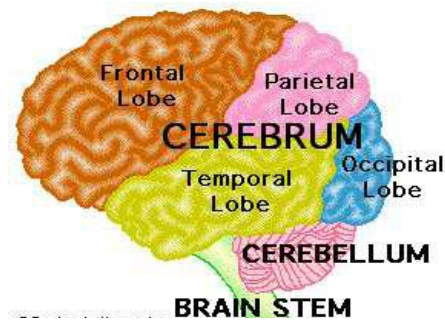
Vapplications

- Gathering and Testing 100 Years of Data.
- Cracking the Neural Code
- Understanding Neocortical Information Processing
- A Novel Tool for Drug Discovery for BrainDisorders
- A Global Facility
- A Foundation for Whole Brain Simulations
- A Foundation for Molecular Modeling of Brain Function

Computer + Neuron Function = Blue Brain

The blue brain records the data of humans thru their neuron function inside the pc. The blue brain will be the international's first virtual mind. Within 30 years, we are able to be capable of test ourselves into computer systems. The digital mind can think like a brain, take selections based on past revel in and reply as a herbal brain. So, the person can assume with none attempt. It's far feasible via using supercomputers, with a large quantity of garage ability, processing electricity, and an interface between the human mind and the artificial one. Through this interface, the statistics stored within the herbal brain can be uploaded to the laptop. So, the mind and the know-how, and intelligence of all people can be stored and used forever, even after the dying of someone.

How it is Possible?

Now the query involves thoughts is it surely feasible to create such forms of brains? The answer to this query is yes.

1. This is viable because of fast-growing era.
2. The importing is viable through using small robots known as Nanobots.
3. These robots are small sufficient to tour in the course of our circulatory gadget. Visiting into the spine and mind, they will be able to Reveal the hobby and structure of our crucial frightened system.
A. They may be able to provide an interface with the computer even as we still reside in our biological shape.
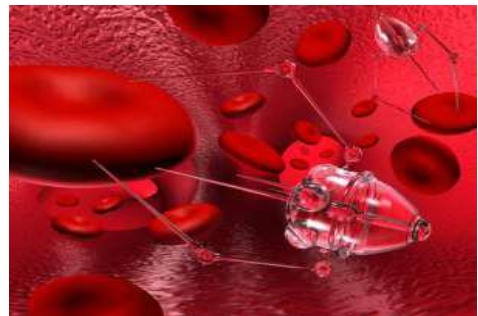
Crime Detection using Supercomputer

The blue mind can file the past experience, recollections, and expertise of the character. Through the use of this recording, we will recover the data of the individual at any time. The use of this benefit, we'd be capable of detect the crime of the man or woman. This approach of detection has many blessings over the lie detector. Within the lie detector, electric powered Voltage is exceeded on to the human frame to discover the crime. The lie-detecting approach presents quite a few aspect results including mental depression, and headaches. However, inside the blue brain method, handiest we simply insert the nanobots into the person who has performed the crime which interfaces with the laptop to file the past info of the man or woman. The nanobots travel the circulatory system of the crime people throughout the circulatory system and it'll purpose a few facts collected from the crime humans.

From that, we are able to capable of stumble on the crime of the individual. By applying this blue mind era. This software is a major breakthrough for the crime branch to make the detection of crime.

Networks of Neurons

First, a community skeleton is built from all the distinctive kinds of synthesized neurons. Then the cells are connected collectively according to the rules which have been determined experimentally. Finally, the neurons are functionalized and the simulation is delivered to life. The patterns of emergent conduct are regarded with visualization software program. A simple unit of the cerebral cortex is the cortical column. Every column may be mapped to one function, e.g., in rats, one column is devoted to every whisker. A rat cortical column has about 10,000 neurons and is about the size of a pinhead.

Merits and Demerits of the Blue Brain
Merits

- Prothetic devices to restore vision, hearing, or limb control might be the next step.
- It is useful in the medical world for the person having short-term memory loss, or Parkinson's disease and it can also provide a hearingfor deaf people.
- Remembering things without any effort.
- Making a decision without the presence of a person.
- Using the intelligence of a person after death.
- Understanding the activities of animals.
- Allowing the deaf to hear via direct nerve stimulation.

Demerits

- It is similar to the human cloning problem.
- If it is implemented, people become completely dependent on computers.
- Others may use technical knowledge against us.
- Another fear is found with respect to human cloning.

Brain Simulation

Natural Brain	Virtual Brain
Input: Through the natural neurons	Input: Through the artificial neurons or silicon chips.
Interpretation: By different states of the neuron in the brain.	Interpretation: By a set of bits in the set of registers.
Output: Through the natural neurons	Output: Through the silicon ship
Processing: Through arithmetic and logical calculations.	Processing: Through arithmetic and logical calculations and artificial intelligence.
Memory: Through permanent states of neurons.	Memory: Through secondary memory.

How to Build a Blue Brain?

It includes the following steps:

Statistics Series

It entails collecting mind quantities, taking them below a microscope, and gauging the form and electrical behavior of neurons personally. This approach of reading and cataloging neurons is very familiar and global. The neurons are captured by their form, electrical and physiological hobby, the site within the cerebral cortex, and their population density. These observations are translatedInto specific algorithms which describe the system, feature, and positioning strategies of neurons. Then, the algorithms are used to generate biologically actual-looking digital neurons geared up for simulation.

Information Simulation

The simulation step includes synthesizing digital cells using the algorithms that were determined to explain actual neurons. The algorithms and parameters are adjusted for the age, species, and ailment stage of the animal being simulated. Every single protein is simulated, and there are approximately 1000000000 of those in one cell. First community skeletons are constructed from all of the distinctive kinds of synthesized neurons. Then the cells are connected collectively in line with the rules That have been determined experimentally. Eventually, the neurons are functionalized and the simulation is brought to existence. The patterns of emergent behavior are regarded with visualization pc and vice versa. Very effective Nanobots to act as the Interface between the natural mind and the laptop.

Conclusion

In conclusion, we can be capable of switch ourselves into computer systems sooner or later Very soon this generation can be surprisingly typical entire over the arena but knowledge lies inside the proper use. Generation does now not create the brain but the brain creates generation. We are able to be able to transfer ourselves into the pc at some point. In addition, within the destiny, the real dreams would be the realization of the brain-in-pc and chip-in-mind association We consider that the connection with blue mind and Soul Catcher may additionally exceed human intellectual potential by way of round 2017 and that it is in all likelihood that we are able to be able to down load the human mind at someday around 2050. Polygraphy trying out may be performed with the assist of these technologies. The criminals and terrorists can be made to undergo this take a look at for you to recognize more approximately their mind stand activities for you to help us to take important precautions to save our country from the black palms.

Future Works

Blue mind technology can be utilized in absolutely paralyzed people to speak with the arena. We have all heard about the very well-known scientist Stephen William Hawking who has a motor neuron ailment and is completely paralyzed. 67is through a speech-generating tool that he communicates with the world. He could be able to make contributions more to the sector of science if he were bodily sound. Via the blue brain technology, we'd be able to make use of the intelligence of such outstanding men for future developments.

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DEEPFAKE DETECTION MODEL TO DETECT VIDEO FORGERY USING CONVOLUTIONAL NEURAL NETWORK (CNN) AND RESNET

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Abstract

Video forgery is constantly rising in the digital world due to information security breaches, so need to creating picture and video content monitoring approach for forgery identification. The proliferation of false films increases societal chaos and security dangers. The reason for video forgery is to the augmentation in the malware, which has facilitated user (anyone) to upload, download, or share objects online comprising audio, images, or video. Recent years have seen a significant increase in media manipulation due to the advancement of technology and simplicity of producing fake information.

Applications for video forgery detection include media science, forensic analysis, digital investigations, and video authenticity verification. The goal of video forensic technology is to extract characteristics that can be used to tell false content frames apart from genuine videos. The production and dissemination of deep fake image via social media platforms has created a serious danger to media integrity, and the discovery of which is seen to be a major challenge. Proposed, an approach for Deep fake detection has been provided for forgery detection in video. ResNet is a convolutional neural network (CNN) algorithm that employed as a method to identify Deep fake movies. The model aims to enhance the performance of detecting forgery videos produced by a certain method as well as enhance the accuracy of the detector. In this paper I proposed approach only uses the deep features extracted from the ResNet CNN model then applies the conventional mathematical approach on these features to find the forgery in the video. In an effort to address deep fake video detection, the detector will offer a preliminary solution and be updated frequently with data from the real world.

Introduction

Deep learning is a subset of machine learning that uses neural networks to learn and make predictions from data. There are several types of deep learning algorithms, each designed for a specific task or application. The first type of deep learning algorithm is the feed forward neural network. Feed forward neural networks are the most basic type of neural network, consisting of an input layer, one or more hidden layers, and an output layer. Each layer contains a set of neurons that process the input data and pass it to the next layer. Feed forward neural networks are commonly used in applications such as image and speech recognition. The second type of deep learning algorithm is the convolutional neural network (CNN). CNNs are designed to process data with a grid-like structure, such as images or time-series data. CNNs use a technique called convolution to extract features from the input data, allowing them to identify patterns and objects in images.

CNNs are commonly used in applications such as image and video recognition, autonomous driving, and medical imaging. The third type of deep learning algorithm is the recurrent neural network (RNN). RNNs are designed to process sequential data, such as text, speech, or time-series data. RNNs use a feedback loop to pass information from one step in the sequence to the next, allowing them to capture temporal dependencies in the data. RNNs are commonly used in applications such as natural language processing, speech recognition, and music generation. The fourth type of deep learning algorithm is the generative adversarial network (GAN). GANs are designed to generate new data that is similar to the training data. GANs consist of two

networks: a generator network that generates new data, and a discriminator network that distinguishes between real and generated data. GANs are commonly used in applications such as image and video generation, text generation, and style transfer.

Finally, the fifth type of deep learning algorithm is the deep reinforcement learning (DRL). DRL combines deep learning with reinforcement learning, a branch of machine learning that focuses on decision-making and control. DRL algorithms learn to make decisions by interacting with an environment and receiving rewards for good behavior. DRL has been used in applications such as game playing, robotics, and autonomous driving. Deep learning algorithms come in several types, each designed for a specific task or application. By understanding the different types of deep learning algorithms, researchers and practitioners can choose the most appropriate algorithm for their particular application.

ResNet (short for Residual Network) is a type of Convolutional Neural Network (CNN) architecture that has achieved state-of-the-art performance on various computer vision tasks, including image classification, object detection, and face recognition. In this context, ResNet can also be used for deepfake detection, where the goal is to detect manipulated images or videos that have been generated using deep learning techniques. Below architecture shows the representation of deepfake detection. At first need to prepare a dataset of real and fake images or videos. This dataset should be diverse and representative of the types of deepfakes that are currently being generated. We also need to split the dataset into training, validation, and testing sets. Then preprocess the images or videos before feeding them into the ResNet CNN. This can include resizing, normalization, and standardization. Train a ResNet CNN on the training dataset using supervised learning. The ResNet CNN should take the images or videos as input and output a probability score indicating whether the input is real or fake. Finally evaluate the ResNet CNN on the validation and testing datasets to assess its performance.

Problem Description

The rapid advent of computationally cheap and cross-platform video editing software has enabled the huge volume of video content available to a large number of users via the Internet. In recent years, the abundance of video data, AI techniques, and readily available, high-performance easy to use video editing tools have given rise to fake videos. Fraudulent activities are carried out using fake images and videos to bypass facial authentication, to publish fake news, and for entertainment as well. Video forgery is continuously increasing in the digital world due to breaches of information security, consequently establishing a scenario for image and video content monitoring for forgery identification. The spread of fake videos raises security risks and anarchy in society. Video forgery detection has applications in media science, forensic analysis, digital investigations, and authenticity verification of a video. The purpose of video forensic technology is to extract features to distinguish fake content frames from original videos. The developing computational force has made deep learning so incredible that would have been thought unthinkable just a modest bunch of years prior. Like any extraordinary innovation, this has made new difficulties. Purported "DeepFake" created by deep generative adversarial models that can control video and brief snippets.

For identification of the DF (Deep Fake), it is very essential to recognize the manner Generative Adversarial Network (GAN) creates the DF.GAN takes as input a video and a picture of a particular individual ('target'), and outputs some other video with the goal's faces changed with the ones of some other individual ('source'). The spine of DF is deep adversarial neural networks trained on face images and target films to robotically map the faces and facial expressions of the source to the target. With the right post processing, the ensuing films can gain an excessive degree of realism. The GAN breaks up the video into frames and replaces the input picture in each frame. Further, it reconstructs the video. This interaction is generally accomplished by utilizing auto encoders. Existing approaches in the literature

suffer from low accuracy rates, low efficiency, and high computational complexity. Further, most of the existing approaches are trained on datasets with a limited sample size; which is not enough to unleash the potential of deep learning performance. Moreover, most of the existing work does not address variable frame rates for sample videos.

Existing System

Exiting system implemented a method based on meta-learning called the meta-deepfake detection (MDD) algorithm. With a meta-optimization objective, in order to learn efficient face representations on both synthetic source and target domains. The MDD shifts the source domain to the target domain. So as to increase model generalization, the gradients from the meta-train and the meta-test are combined using meta-optimization. The MDD can handle unseen domains without model updating for unseen domains. Here separated the source domains into the meta-train domain Ttrains and the meta-test domain Ttests during training to obtain domain generalization. In order to simulate the domain shift problem that existed when used in real-world situations, the model is driven to acquire generalizable information about how to generalize well on the new domains with different distributions. We also create meta-batches for training and testing by randomly splitting N source domains of TS. These data contain both real and fake face pairs and these patterns are not duplicated across domains. These pairs increase collation and comparison of information between real and fake images. Therefore, it also increases inter-class separability, which can be interpreted as a distinct dispersion of the feature distribution of samples, increasing differentiation during training as well as enhancing the model's quality. More distinguishable characteristics may be learned by the network with less effort during optimization. The fact is that features learned by supervised learning have much less ability to generalize when subjected to unseen manipulation techniques. Therefore, the model is easier to generalize when the source domain is split into meta-train and meta-test. In addition, samples in the meta-train and meta-test are also shuffled and selected at random, which minimizes the problem of overfitting. Additionally, the data in the unseen domain is very diverse in reality, which the model has never seen or been trained in before. Thus, meta-splitting makes the model easier to train and also to generalize to unseen data.

Disadvantages of Existing System

- Due to the rapid advancement of face forgery generation algorithms, some samples seem extremely similar to one another and only differ from one another by a few small features.
- It is getting harder to determine the difference between fake and real features in fake images.
- It is inefficient and perhaps impracticable to calculate the mean of the embedding of each class in each iteration, when taking into consideration the entire training set.

Proposed System

Implement a brand new deep learning based approach that could successfully distinguish AI-generated fake videos (DF Videos) from actual videos. It's incredibly essential to broaden technology that could spot fakes, so that the DF may be recognized and averted from spreading over the internet. Recently, Convolution Neural Network (CNN) has turn into a de-facto technique for classification of multi-dimensional data and it renders standard and also highly effectual network layer arrangements. But these architectures are limited by the speed due to massive number of calculations needed for training in addition to testing the network and also, it might render less accuracy. To trounce these issues, this paper proposed to ameliorate the image and video forgery detection's efficiency utilizing hybrid CNN. Initially, the intensive along with incremental learning phase is carried out. After that, the hybrid CNN is implemented to detect the image together with video forgery. Recently, Deep learning methods and specifically Convolution Neural Networks (CNNs)

have gained tremendous success due to its powerful ability of automatic learning of features for large-scale video classification. The purpose of this proposed system is to investigate deep learning method for video forgery detection on large datasets with varied frame rates. A deep neural network approach is presented to classify the forged videos by finding duplicated frames in a video. The first step is to design a Convolutional Neural Network (CNN) that can work as a backbone for feature extraction. The feature extractor generates feature maps of different sizes. Then, these extracted feature maps help the classifier (another neural network) predict the image's nature (i.e., real or fake). In this work, inverted residual blocks and linear bottlenecks are used as intermediate layers to prevent the loss of spatial information. The residual blocks are also memory efficient as they reduce the representations' dimensionality. The network performance is improved by adding different modern techniques and micro design changes during training. These changes help the model learn discriminative features faster with less inference time.
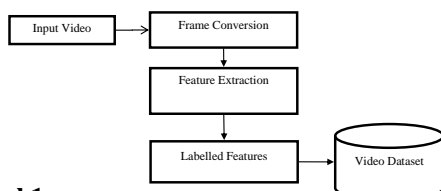
Advantages of Proposed System

- Proposed technique effectively classifies the forgery videos from the original video.
- Proposed ResNet with CNN based feature classification achieves high performance on forgery detection.
- ResNet helps the model learn discriminative features faster with less inference time.
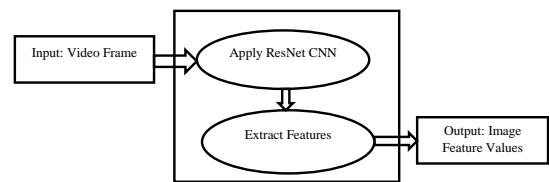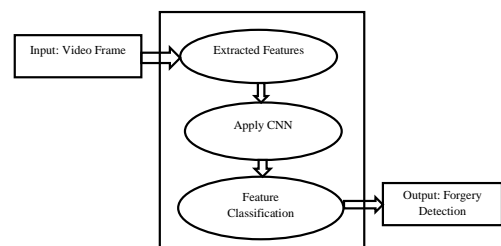
System Design
Data Flow Diagram
**Level 0**

Level 1

Level 2

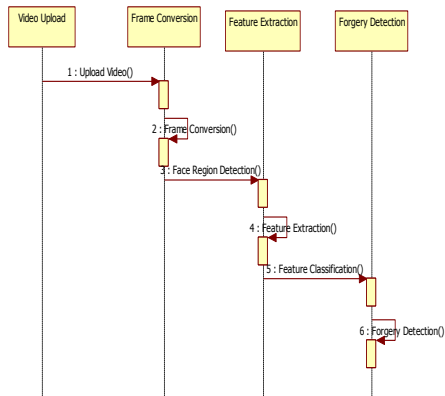**Level 3**

Use Case Diagram

A use case is a list of steps, typically defining interactions between a role (known in Unified Modeling Language (UML) as an "actor") and a system, to achieve a goal. The actor can be a human, an external system, or time. In systems engineering, use cases are used at a higher level than within software engineering, often representing missions or stakeholder goals.
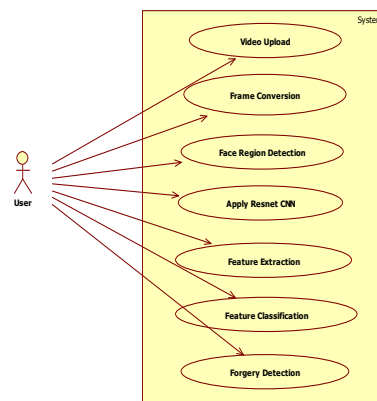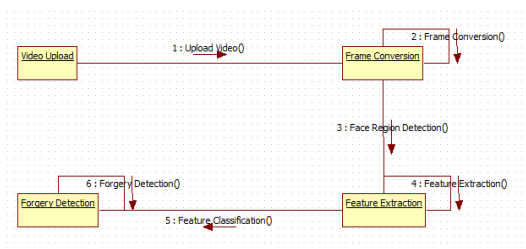

Sequence Diagram

A Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions

arranged in time sequence. Sequence diagram is sometimes called event trace diagrams, event scenarios, and timing diagrams. A sequence diagram shows, as parallel vertical lines, different processes that live simultaneously and horizontal arrows. The messages exchanged between them.

are intended to model both computational and organizational processes Activity diagrams show the overall flow of control.
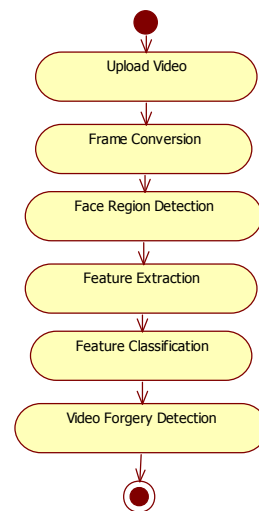

Collaboration Diagram

A collaboration diagram resembles a flowchart that portrays the roles, functionality and behavior of individual objects as well as the overall operation of the system in real time. Objects are shown as rectangles with naming labels inside. These labels are preceded by colons and may be underlined. The relationships between the objects are shown as lines connecting the rectangles. The messages between objects are shown as arrows connecting the relevant rectangles along with labels that define the message sequencing.

Activity Diagram

Activity diagrams are graphical representations of workflows of stepwise activities and action with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams

System Implementation
Video Upload and Training

Implement a method to train the classifier based on video frames as input. The frames are passed through face extraction and alignment fragment and then passed to the classifier for training. The dataset is pre-processed before training the model. This involves face alignment and extraction. Perform CNN with ResNet for extracting features from video and create video feature dataset. In this module DeepFake dataset images are collected and trained for further classification.

Input Video Processing

Most image detection methods cannot be used for videos because of the strong degradation of the frame data after video compression. Videos have temporal characteristics that are varied among sets of frames and they are thus challenging for methods designed to detect only still fake images. This approach focuses on Deepfake video detection methods with the help of frame conversion and face region identification for feature extraction process.

Feature Extraction

Feature extraction is the process of extracting meaningful features from face region. Feature Extraction Process using the ResNet CNN classifier for extracting features and reliably recognizing frame-level characteristics instead of rewriting the classifier. Following that fine-tune the network by adding extra layers as needed and setting a correct learning rate to ensure that the gradient descent of the model is properly converged. This reduces filter sizes and factorizes filters aggressively. Convolutions to reduce and expand the number of feature maps judiciously. Features are extracted with the help of multiple layers associated with convolutional properties.

Forgery Detection

An detection and localization model has been developed using ResNet and CNN that can detect and localize inter frame forgeries.CNN technique has been proposed which utilizes features from input video to measure variation among adjacent frames.During forgery detection process, image features are collected from the face region of input video frames.The feature extractor generates feature maps of different sizes. Then, these extracted feature maps help the classifier predict the image's nature. Then the selected features are passing to the procedure of detecting forgery by comparing these selected features with feature database.Finally CNN based Classifier used to distinguish between real and forged images.

Training Process
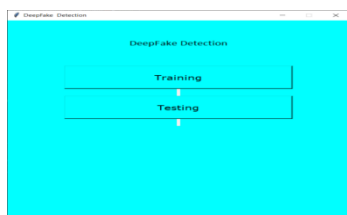
G:\PycharmProject\DeepFakePy\venv\Scripts\python.exe G:/PycharmProject/DeepFakePy/Model.py

2023-03-29 09:06:25.578147: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not found

2023-03-29 09:06:25.580592: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudartdlerror if you do not have a GPU set up on your machine.

2023-03-29 09:07:44.927692: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudart64_110.dll'; dlerror: cudart64_110.dll not found

2023-03-29 09:07:44.929224: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cublas64_11.dll'; dlerror: cublas64_11.dll not found

2023-03-29 09:07:44.930675: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cublasLt64_11.dll'; dlerror: cublasLt64_11.dll not found

2023-03-29 09:07:44.932483: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cufft64_10.dll'; dlerror: cufft64_10.dll not found

2023-03-29 09:07:44.933935: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'curand64_10.dll'; dlerror: curand64_10.dll not found

2023-03-29 09:07:44.935404: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cusolver64_11.dll'; dlerror: cusolver64_11.dll not found

2023-03-29 09:07:44.937498: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cusparse64_11.dll'; dlerror: cusparse64_11.dll not found

2023-03-29 09:07:44.938957: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'cudnn64_8.dll'; dlerror: cudnn64_8.dll not found

2023-03-29 09:07:44.951222: W tensorflow/core/common_runtime/gpu/gpu_device.cc:1850] Cannotdlopen some GPU libraries. Please make sure

the missing libraries mentioned above are installed properly if you would like to use GPU. Follow the guide at https://www.tensorflow.org/install/gpu for how to download and setup the required libraries for your platform.

Skipping registering GPU devices...

2023-03-29 09:07:44.960004: I tensorflow/core/platform/cpu_feature_guard.cc:151] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX AVX2

To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags. G:\PycharmProject\DeepFakePy\venv\lib\site-packages\keras\optimizer_v2\adam.py:105:

UserWarning: The `lr` argument is deprecated, use `learning_rate` instead. super(Adam, self).__init__(name, **kwargs)

Model: "sequential"

_____
_____

 Layer (type) Output Shape Param #
===
==============================

 inception_resnet_v2 (Functi (None, 2, 2, 1536) 54336736
onal)

 global_average_pooling2d (G (None, 1536) 0
 lobalAveragePooling2D)
 dense (Dense) (None, 2) 3074
===
==============================

Total params: 54,339,810
Trainable params: 54,279,266
Non-trainable params: 60,544

_____
_____

Epoch 1/5
30/30 [==============================] - 278s 9s/step - loss: 0.6433 - accuracy: 0.6832 - val_loss: 0.7427 - val_accuracy: 0.4873

Epoch 2/5
30/30 [==============================] - 253s 8s/step - loss: 0.5446 - accuracy: 0.8241 - val_loss: 0.6887 - val_accuracy: 0.5607
Epoch 3/5
30/30 [==============================] - 256s 9s/step - loss: 0.4615 - accuracy: 0.8725 - val_loss: 0.6504 - val_accuracy: 0.5941
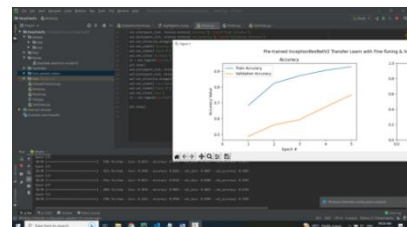Epoch 4/5
30/30 [==============================] - 260s 9s/step - loss: 0.3876 - accuracy: 0.9065 - val_loss: 0.6063 - val_accuracy: 0.6742
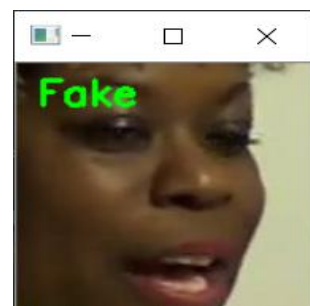Epoch 5/5
30/30 [==============================] - 258s 9s/step - loss: 0.3261 - accuracy: 0.9296 - val_loss: 0.5589 - val_accuracy: 0.7503

Process finished with exit code 0

Testing Process

Conclusion

In this work implemented DeepFake detection model to detect video forgery using DeepFake video dataset. A deepfake detection method using convolutional neural network (CNN) and ResNet to extract temporal features of a given video sequence is presented, in which features are represented via the sequence descriptor. The detection network consisting of fully connected layers is employed to take the sequence descriptor as input and calculate probabilities of the frame sequence belonging to either authentic or deepfake class. Proposed model when trained with a large data set gave quiet impressive results compared to other deep learning models. Novel approach of combining feature extraction capability of Convolutional Neural Network and ResNet gave better results when compared with existing models. This shows that a simple model which uses ResNet convolutional neural networks can be used to check if a video has been subjected to any kind of manipulation. Proposed work can offer a first line defence in the detection of AI based fake videos.

Future Enhancements

Deepfakes are constantly evolving, and new techniques are being developed to create more convincing fakes. Need to develop ResNet CNNs that are capable of detecting a wider range of deepfakes, including those created using new techniques. Real-time detection of deepfakes is critical for preventing the spread of misinformation on social media platforms. Future researchwork focus on developing ResNet CNNs that can detect deepfakes in real-time, using limited computational resources.

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INTRODUCTION TO GEOMETRIC GROUP THEORY

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Abstract

In this project, we will try to perceive groups as geometric objects to study their properties relatively easily. We begin with introducing the notions of Cayley graphs, and the action of groups on trees endowed with a path metric. By studying the action of SL (2,Z) on the Farey tree, we show that form ≥3, alevelm congruence sub group of SL (2,Z) is free. Further, we show that if a group acts freely and transitively on the edges of a tree, the nitisisomor phic to the free product of the stabilizers of the vertices under the action. Finally, applying this result to the action of PSL (2,Z) on. The Farey tree, we prove that $PSL(2,Z)\widetilde{} = Z_2 * Z_3$. We will goon to define the geometric realizations of Cayley graphs, and look at how Cayley graphs for the same group with two different generating set saree quivalent to eachother through the notion of quasi-isometry. Further, we discuss the word problem for a group and how Dehn functions can be used to measure the complexity of its solvability. We will then try to validate the importance of Dehnfunctions, as a measure for the complexity of the word problem. Finally, we will discuss hyperbolic groups and the word problem for these groups.

Introduction

The emergence of geometric group theory as a distinct area of mathematics is usuallytraced to the late 1980s and early 1990s. The 1987 monograph of Mikhail Gromovtitled "Hyperbolic groups", introduced the notion of a hyperbolic group, whichcaptures the idea of a finitely generated group having large-scale negative curva-ture, and by his subsequent monograph "Asymptotic Invariants of Infinite Groups", that outlined Gromov's program of understanding discrete groups up to quasi-isometry. The work of Gromov had a transformative effect on the study of discretegroups and the phrase "geometric group theory" started appearing soon afterward.

An important aspect of mathematics consists of the study of symmetries of an object, whether the object is a simple 3-dimensional object seen in daily life such as a cubeora complicated abstract object such as a group. Geometric group theory tries to study every group as a group of symmetries of some object so that we caninfer some of its properties which are relatively harder to study with respect to the abstract group structure [4]. This idea is illustrated in Figure1.1.
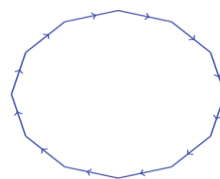
(a) ThegroupZ/nZasrotationsofaregularn-gon.
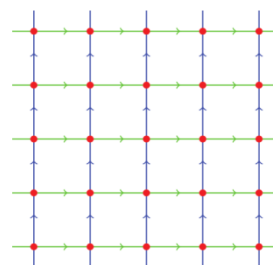
Thegroup Z^2 as translationsin R^2

Figure 1.1: Representation of two groups as groups of symmetries of mathematical objects.

The object that captures the symmetries of a group is called a Cayley graphas sociated with the group.

Using the notion of group actions on spaces, geometric group theory tries to understand the properties of that group by studying the geometric properties of its associated Cayley graphs. That is why it is important for us to study how a group act

son graphs and trees. We will study this notion in then ext Chapter. Later,we will study the notions of quasi-isometries,word problems,ends of groups andasymptotic dimensions to work with such groups and graphs.These chapters in the thes is are mostly based on [4] "Office hours with a geometric group theorist."

Group Actions on Trees
Group Action on Sets

We start by introducing the action of a group on a set.

Definition 1.1 An action of a group G on a set X is a function $G \times X \to X$

where the image of (g, x) is written g • x and where

(i)   1 • x = x for all x ∈ X and

(ii) g • (h • x) = (gh) • x for all g, h ∈ G and x ∈ X.

If the group SX is the group of symmetries of X, thought of as a set. An action of G on X is the same thing as a homomorphism $G \to SX$. So an action of G on X is the formal way to realize G as a group of symmetries of the set X.

We need the notions of graphs which can be naturally perceived as metric spaces that helps us understand the properties of groups via their actions on them.

Definition 1.2. A graph G is a pair (V, E) where:

(i) $V /= \varphi$ is a set of vertices and

(ii) every e ∈ E joins a pair of (not necessarily distinct) v1, v2 ∈ V .

A type of graph which encodes the information about a group is called a Cayley graph. Before diving into the notion of Cayley graphs, we first understand the action of a group on a graph.

1.2 Cayley Graphs and Group Actions on Graphs

Definition 1.3. Let G be an arbitrary group and let S be a generating set for G. The Cayley graph for G with respect to S is a directed, labeled graph τ (G, S) := (V, E) where, V = G, and E = {(g, gs) : g ∈ G and s ∈ S}.

Definition 1.4. An action of a group G on a graph (V, E) is a homomorphism

$G \to Aut((V, E))$ with the following properties.

(i)   Any g ∈ G acting on v ∈ V takes it to some g • v ∈ V ;

(ii) Any g ∈ G acting on e ∈ E takes it to some g • e ∈ E;

(iii) For any x ∈ V or x ∈ E, we have 1 • x = x;

(iv) For g, h ∈ G and x ∈ V or x ∈ E, g.(h.x) = (g.h).x;

(v) If e ∈ E connects v, w ∈ V then g • e connects g • v and g • w.

Example 1.4.1. Z/3Z acts on a regular 3–valent tree T3 such that image of 1 ∈ Z/3Z is the identity map, the image of 2, 3 ∈ Z/3Z maps each vertex to its two descendants.

Free Groups

Definition 1.5. A free group Fn of 'nJ letters is ⟨a1, . . . , an⟩ with no defining relations.

The set {a1, . . . , an} is said to be the generating set for the free group.

Definition 1.6. An action of G on a set X is said to be free if ∀g ∈ G and ∀x ∈ X, if g • x = x then g = 1.
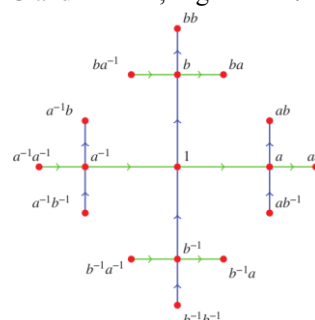

Figure 1.1 Cayley Graph for a Free Group of Two Letters

Theorem 1.7. If a group G acts freely on a tree, then G is a free group. Before trying to prove this theorem, we need to define the tiling of a tree.

Quasi-Isometries

One of the problems we encounter when using Cayley graphs as a geometric repre- sentation of a

group is that there can be different Cayley graphs for the same group with respect to different generating sets. These graphs are not isometric to each other. So, we need to define another form of equivalence called quasi-isometries or "coarse isometries".

The Need for Defining Quasi-Isometries

Definition 2.1. The geometric realization of a Cayley graph is defined as follows

(i) Each edge in the graph is associated to an inteval [0, 1]

(ii) All points on the edges are now a part of the metric space.

(iii) Distance between two points on the same edge is the corresponding on the real line w.r.t Euclidean metric.

(iv) Distance between two points not on the same edge can be calculated by sum- ming up the smallest distance between the endpoints of the two concerned edges and the distance of the points from those two endpoints.

Definition 2.2. If (X, dX) and (Y, dY) are metric spaces, a function f : X → Y is called an isometric embedding if f preserves distances, that is, for all x1, x2 ∈ X,

dY (f (x1), f (x2)) = dX(x1, x2).

An isometric embedding f is called an isometry if it is also surjective.

Theorem 2.3. Let G be a finitely generated group and let S and SJ be two finite generating sets for G. Then the identity map f : G → G is a bi-Lipschitz equivalence from the metric space (G, dS) to the metric space (G, dS′).

Proof. Since S is finite, we can define a constant M ≥ 1 by

M = max{dS′ (1, s)|s ∈ S ∪ S−1}.

Now consider any g ∈ G. Suppose g has word length n with respect to S, so we can write

g = s1s2 . . . sn,

where each si is in S ∪ S−1 . Using the triangle inequality, we get:

dJS (1, g) = dS′ (1, s1s2 ……

≤ dS′ (1, s1) + dS′ (s1, s1s2 . . . sn)

≤ dS′ (1, s1) + dS′ (s1, s1s2) + dS′ (s1s2, s1s2 . . . sn)

≤ dS′ (1, s1) + dS′ (s1, s1s2) + dS′ (s1s2, s1s2s3) + . . . dS′ (s1s2 . . . sn−1, s1s2 . . . sn).

Since the action of a group element preserves the distances between the elements of the same group with respect to word metric we can rewrite this as

dS′ (1, g) ≤ dS′ (1, s1) + dS′ (1, s2) + • • • + dS′ (1, sn)

≤ M + M + • • • + M

= Mn.

But n is the word length of g with respect to S, that is, dS(1, g) = n. Therefore, we have shown that ∀g ∈ G, dS′ (1, g) ≤ MdS(1, g). We can just reverse the roles of S and SJ to find another bound N and the larger of two values can be assigned to K.

We have shown that the Cayley graphs of a group with respect to two different generating sets will be equivalent to each other under the bi-Lipschitz equivalence.

Example 2.3.1. Consider the Cayley graphs of R2 and Z2 with respect to the generating set {(1, 0), (0, 1)} with the natural Taxicab metric for their geometric realizations. We can take a function f : Z2 → R2 such that each point is marked onto itself, that is, f (x, y) = (x, y). The distances are preserved by Taxicab metric and we get an isometric embedding. But this map is not surjective. Hence this is not an isometry. Intuitively there should be some equivalence relation between the two metric spaces which make Z2 ∈ R2 different from Z ∈ R2

We have a similar problem with regards to the Cayley graphs and their geometric realizations not being equivalent to each other in any sense.

Geometric Realizations of Cayley Graphs of a Group

Theorem 2.4.1 Let G be a finitely generated group and let S and SJ be two finite generating sets for G. Then the geometric realization of the Cayley graph τ (G, S) is quasi-isometric to the geometric realization of the Cayley graph τ (G, SJ)

Proof. First, there is a quasi-isometry from the

geometric realization of any graph to its set of vertices (with the path metric) obtained by sending every point on an edge to the nearest vertex. In Theorem 3.4, we showed that there is bi-Lipschitz equivalence between two Cayley graphs of the same group. Therefore, we can obtain a quasi-isometry τ $(G, S) \rightarrow \tau (G, SJ)$ as a composition of three quasi-isometries.

Since we have proven that all Cayley graphs and their geometric realizations for a given group are equivalent to each other, we can now talk about the geometric representation of a group being equivalent to some other group without being con- cerned about the choice of generating set influencing our geometric image of that group. In the next chapter, we will try to solve the other problem we encounter while perceiving groups as geometric objects.

Word Problem and its Solvability
When we have a finitely presented group, we face the problem of being able to tell if two words $w1$, and $w2$ represent the same group element. This can be equivalently stated as the problem of being able to tell whether or not $w1−1w2$ is the identity element. This complexity is captured by the notion of a word problem of a group.

Definition 3.1. A group $G = \langle X \mid R \rangle$ is a finitely presented if it is finitely generated, i.e., $|X| < \infty$ and has a finite number of relations defined on them, i.e. $|R| < \infty$.

Definition 3.2. The word problem for a finitely generated and presented group is the problem of determining whether or not a given word in the group represents identity.

A word problem is called solvable in finite number of steps if we are able to devise an algorithm to find whether or not a word of certain length represents identity.

The complexity of word problem for a group presentation is governed by the Dehn function. The faster the Dehn function grows, the greater the number of times relations must be used to reduce the problem.

Dehn Function
A word w on $S \cup S−1$ represents the identity in G when it can be converted to the empty word via

- a finite sequence of free reductions ($aa−1 \rightarrow 1$)
- free expansions ($1 \rightarrow aa−1$ for some $a \in S \cup S−1$)
- applications of defining relators (elements of R) or their cyclic permutations

Such a sequence is called a null-sequence for w. The number of applications of defining relators or its permutations is the length of that null sequence.

Counting the number of such moves it can take for the word of a given length to be reduced to identity gives us a measure of the difficulty in working with the particular presentation for a group. The Dehn function estimates this measure thereby measuring the complexity of the solution to the word problem.

Definition 3.1. The Dehn function $f : N \rightarrow N$ maps n to the minimal number N such that, if wi is a word of length $\leq n$ that represents the identity, li is the length of minimal null-sequence for wi, then $N = \max\{li\}$.

Since there are only finitely many words of length at most n (S is finite) the Dehn function is well–defined.

Definition 3.2. A recursive function $f : M \rightarrow N$ is a function defined on a discrete, well ordered domain with a least element that calls itself, that is, $f (n)$ is defined in terms of $f (m)$, where $m < n$ and $m, n \in M$.

A Semigroup with an Unsolvable Word Problem
It is not common to encounter a group with an unsolvable word problem. Alan Turing [5] studied the importance of semigroups with unsolvable word problems in cryptography and cryptanalysis. We conclude this chapter with an example of one such semigroup.

Example 3.2.1. One of the simplest example of a semigroup with an unsolvable word problem is $G = \langle a, b, c, d, e|ac = ca, ad = da, bc = cb, bd = db, ce = eca, de = edb, cdca = cdcae, caaa = aaa, daaa = aaa\rangle$

given by C´etjin [5]. Collins [5] came up with another presentation for this semigroup.

Recently, Wang [6] reduced the number of generators to two. But, there were 27 defining relators for that presentation the smallest of which had a word length of about 100.

Hyperbolic Groups

Curvature is a fundamental way of understanding the intrinsic geometry of mani- folds. There are three curvatures on 2-dimensional manifolds, namely zero, positive, and negative. The most trivial examples for these three are the plane, the sphere, and the saddle.
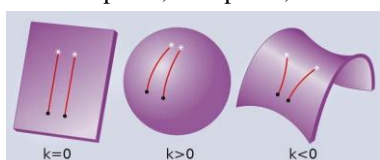

Figure 4.1: 2-dimensional manifolds with zero, positive and negative curvatures.

δ–hyperbolicity

In the Euclidean metric, we define the incircle of a triangle to be the largest in- scribed circle. The points of tangency are called inpoints, and they cut the three sides of the triangle into six pieces that come in length-matched pairs. Now in a more general space, we cannot necessarily find an inscribed circle in any nice way, but we can generalize the other property. Let the inpoints of a geodesic triangle be the uniquely determined three points that divide the sides into pairs of equal lengths, as shown in Figure 5.2.
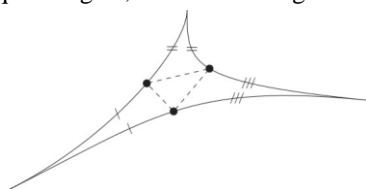

Figure 4.2: Inpoints of a Geodesic Triangle

They are uniquely determined because we are just solving the system $a = r + s$, $b = s + t$, $c = r + t$, and the triangle inequality guarantees a solution. If we consider our space to be a tree, any 'triangle' has actually the same inpoints. So the 'insize' of our 'triangle' is zero.

Definition 4.1. We will call a metric space δ−hyperbolic if all geodesic triangles have insize ≤ δ, where δ ∈ R, and δ ≥ 0.

Example 4.1.1. A tree is a 0−hyperbolic space because if we try to take any geodesic triangle in a tree, the insize would be zero as the tree has no closed loops and thus no triangles.

This definition works fine on geodesic spaces. For a general space, we say a space is δ−hyperbolic if all four-tuples for any four points x, y, z, w in that space satisfy

$(x \Delta y)w \geq \min\{(y \Delta z)w, (x \Delta z)w\} - \delta$,

where (x.yw) is the shortest distance between the line joining x, y and w.

A crucial property is that δ−hyperbolicity is stable under quasi-isometry but, it does not preserve the constant δ. So a quasi isometry on one δ−hyperbolic space can take it to some other δJ−hyperbolic space.

Hyperbolic Groups

Definition 4.2. A finitely generated group is called hyperbolic if any of its Cayley graphs (for a finite generating set) is δ−hyperbolic.

Example 4.2.1. Since trees are always 0−hyperbolic, natural examples of hyper- bolic groups are free groups Fn of any rank, as their Cayley graphs with respect to any finite generating set S with |S| = n are just (2n)−regular trees.

Example 4.2.2. As proven in Chapter 2, PSL(2, Z) = ⟨v, w | v2w3⟩ With this pre- sentation, the Cayley graph looks just like a tree of triangles as in Figure 5.3, a graph that clearly has the δ–hyperbolic property with δ = 1.

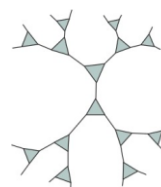**Figure 4.3 Cayley graph of PSL(2, Z)**

Since PSL(2, Z) is a quotient group derived from SL(2, Z) and this induces a quasi- isometry between the two, this implies that SL(2, Z) should also be a hyperbolic group.

Surface Groups

Surface groups are fundamental groups of closed hyperbolic surfaces. Each manifold S has an associated group $\pi1(S)$, called the fundamental group, which can be said to be group-theoretically encoding information about the topology of S. The idea started as an attempt by Poincar´e [8] to classify manifolds by associating a group to them which could be distinguished from other groups relatively easily.

Definition 4.3. The fundamental group of a topological space X with some chosen base point x0 , denoted by $\pi1(X, x0)$, is the group of homotopy classes of loops, which are closed paths on X starting and ending at x0 .

Example 4.3.1. A tree has no loops, so its fundamental group is trivial.

Example 4.3.2. All loops on a circle from a point to itself are just complete rota- tions around the circle, so the fundamental group will be isomorphic to Z.

Example 4.3.3. Let Σg denote the closed orientable surface of genus g. $\pi1(\Sigma2)$ can be generated by the four loops in Figure 5.4.
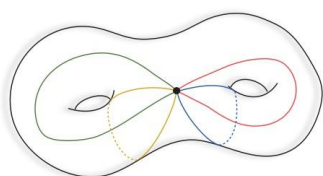

Figure 4.4 Generating set for the fundamental group of $\Sigma2$

Its fundamental group can be written as
$\pi1(\Sigma2) \sim= \langle a, b, c, d \mid [a, b][c, d]\rangle$.
In general, for a surface of genus $g \geq 1$,
$\pi1(\Sigma g) \sim= \langle a1, b1, a2, b2 \ldots ag, bg \mid [a1, b1][a2, b2] \ldots [ag, bg]\rangle$.

Since these surfaces are closed hyperbolic surfaces for $g \geq 2$, their groups are surface groups. Surface groups are important examples of hyperbolic groups them- selves and their construction can lead us to an important result about word problem for hyperbolic groups.

Word Problem for Hyperbolic Groups

Definition 4.4. A presentation G = ⟨a1, ..., an | r1, ..., rm⟩ for a group G is called a

Dehn presentation of G if the following conditions hold true:

(i) There is a set of strings u1, v1, ..., um, vm and each relator ri is of the form

ri = uiv−1. (Relator ri encodes the equivalence in the group of ui and vi.)

(ii) For each i, the word length of vi is shorter than the word length of ui .

(iii) For any nonempty string w in S = {ai} that represents the identity element, if w has been reduced by canceling all occurrences aia−1 , then at least one of ui or u−1 must appear as a substring.

Theorem 4.5. Hyperbolic groups admit Dehn presentations.

Proof. Fix any K > 8δ and consider a Cayley graph for G with respect to a (finite) generating set S = {ai | i ∈ N} for G. Now consider the list of all reduced words ti with word length at most K. Now, we can check which of the ti represent the same word by just following them in the graph. Let ui be the non-geodesic words from that list, and for each ui , let vi be some geodesic word from that list reaching the same point in the graph, so it is guaranteed to be strictly shorter. Then put R = {ri = uiv−1 | i ∈ N}. We claim G = ⟨S | R⟩ is a Dehn presentation. Conditions (i) − (ii) of Definition 5.4 are satisfied by construction. For Condition (iii), we can rule out 8δ−local geodesic loops of length at least 8δ. So any long loop has a non-geodesic subsegment of length at most K, which is one of ui. This completes the proof.

Corollary 5.6. Hyperbolic groups have solvable word problems.

Proof. By construction of Dehn presentations, they have a solvable word problem, and by Theorem 5.5 all hyperbolic groups have a solvable word problem.

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CONVERGENCE ANALYSIS OF DETERMINISTIC AND STOCHASTIC METHODS FOR CONVEX OPTIMIZATION

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Abstract

Numerous scientific problems can be formulated in terms of optimizing a convex objective function. As such, the study and developement of algorithms designed to solve these problems is of considerable importance. This project attempts to act as an introduction to a selected number of well known optimization algorithms by examining convergence results of deterministic and stochastic algorithms. The concept of momentum is discussed and shown to have significant impact on convergence. Throughout, it should become clear that deterministic methods which have been known for decades are of fundamental importance for developing methods which noticably reduce the computational complexity while preserving fast convergence.

Introduction

Motivation Optimization problems arise throughout a diverse range of fields within applied science, from ctroller and filter design in control and electrical engineering to optimizing stochastic processes emanating from economics and finance. In particular, many fields of machine learning revolve around minimizing a convex function for efficient model estimation. In this scenario, the most convenient problem formulation is min $x \in X$ f (x), (1.1) where X $\in$ Rd is a convex space and f : X $\rightarrow$ R is a continuously differentiable convex function. The solution of this problem is called the minimizer of f and is denoted $x * \in$ X simplicity of gradient descent is quite attractive, however it has been shown that it converges with rate O (1/k) which is sub-optimal for first order methods [1]. In addition, full gradients are required for each update which can become problematic for large systems due to high computational cost. These issues have led researchers to design algorithms that either speed up convergence, lower computational complexity, or both.

Definitions and Inequalities

Lipschitz Continuity This property is extremely useful for convergence analysis as it provides access to several convenient inequalities, especially when paired with convexity. It will be assumed throughout that f(x), and in the case of stochastic optimization, each sub-function fi (x) will have Lipschitz continuous gradient.

Definition

A function f : R d $\rightarrow$ R is Lipschitz Continuous with Lipschitz factor L if and

Convexity

If a function is known to be convex then it satisfies several inequalities that are practical when deriving convergence rates for optimization algorithms. Since this project's focus is convex optimization these inequalities are listed below for convenience. As mentioned previously, the combination of convexity and Lipschitz continuity implies a function satisfies a wide selection of inequalities. The definition for convexity and subsequent inequalities now follows. Definition 2.0.3.

A function f : R d $\rightarrow$ R is strongly convex with convexity parameter μ if and only if the following

hold. $f(y) - f(x) - \nabla f(x) \cdot (y - x) - \mu 2 ky - xk 2 \geq 0$ (2.10) $(\nabla f(y) - \nabla f(x)) \cdot (y - x) - \mu ky - xk 2 \geq 0$ $\forall x, y \in$

Deterministic Methods
Gradient Descent
In all likelihood, Gradient Descent was the first known method for finding optimal values of a function. Whether or not this is the case, gradient descent is the foundation for most determinsitic optimization methods as well as many well known stochastic schemes. As such, it is appropriate to begin any general discussion of optimization algorithms with the gradient descent method. The method is described by the iterative scheme below

General Convexity
A simple manipulation of the definition for Lipschitz continuity, given by (2.2), through the gradient descent update rule yields another helpful inequality for this section. $f(xk+1) - f(xk) \leq - 1 L (\nabla f(xk), \nabla f(xk)) + 1 2L \|\nabla f(xk)\|2 = - 1 2L \|\nabla f(xk)\|2$ (3.2) The algorithm, which the proceeding analysis is based upon, is given below for both the weakly and strongly convex scenarios. The analysis follows a procedure which is analogous to the original proof published.

Strong Convexity
The method shown here is primarily taken from Nesterov's book on convex optimization [1]. To begin, it is convenient to derive an inequality to use as a starting point for the proof. $kxk+1 - x * k 2 = kxk - x * - \alpha \nabla f(xk) k 2 = kxk - x * k 2 - 2\alpha h \nabla f(xk), xk - x * i + \alpha 2 k \nabla f(xk) k 2 \leq kxk - x * k 2 - 2\alpha \mu L \mu + L kxk - x * k 2 + \alpha 2 - 2\alpha \mu$

Nesterov Accelerated Gradient In recent years, momentum methods have come to play a powerful role in optimization. Intuitively, momentum arises by adding a weighted version of the previously iterated step of an algorithm to the current one. Applied to the gradient descent scheme, whose continuous time counterpart is represented by the gradient flow dynamics $\dot{x} = \nabla f(x)$, momentum leads to a second-order DE when transitioning to continuous time. In a sense, one can interpret this physically as a massive particle moving in a potential well as noted in [8]. This system exhibits acceleration due to the presence of a second derivative term. As such momentum methods are said to accelerate an algorithm towards the minimizer and are therefore expected to obtain faster convergence than methods without momentum. In fact, for first order methods the optimal convergence rate is $O(1/k2)$ which is indeed quicker than gradient descent which achieves $O(1/k)$ convergence

Strong Convexity
In constrast to the analysis for weak convexity, a lyapunov style approach is taken here that follows the work done in [8]. The idea was to find a general differential equation for momentum methods and then chose an appropriately discretization so as to obtain an algorithm that is equivalent to Nesterov's original algorithm for strongly convex functions in [1]. The derivation of the DE, which was originally published in [9], is not covered since the interest is to study discrete time convergence. For this purpose only the Lyapunov function and the algorithm are required.

Bohachevsky- function As per the list provided in [11] there are three Bohachevsky functions, however the focus will solely remain on the first of these. The function, shown below, is two-dimensional an bowl shaped. A typical domain to test on is $xi = [−100 100]$ and the global minimum $f(x *) = 0$ can be found at $x * = [0 0]$. A plot of (5.2) is provided.

Additional Functions
Beale Function
The Beale function is characterized by sharp peaks on the corners of the domain $xi \in [−4.5 4.5]$. There is one global minimum of $f(x *) = 0$ at $x * = [3 0.5]$. This function simply adds a high order polynomial to the list of test examples. $f(\sim x) = (1.5 − x1 + x1x2) 2 + 2.25 − x1 + x1x 2 2 2 + 2.625 − x1 + x1x 3 2 2$ (5.7) This function was chosen to illustrate that some

algorithms will determine that a stationary point is the global minimizer when in fact it is n

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EXAMINATION OF DIGITALLY MANIPULATED VISA USING IMAGE PROCESSING SOFTWARE

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Abstract

*Occurrence of criminal activities are increasing day by day with the development of the technology. The crimes such as counterfeiting, altering government official documents, wills, educational certificates and are committed by the criminals behind the keyboard for the financial gain. Thus, it is highly essential for the Forensic document examiner to have the knowledge of the latest technologies and their working principles so that detectionof the manipulations and alterations in the digital documents would become easy.The present study focuses on the analysis of digitally manipulated Visa using image processing software. The document was collected and altered by the non-professional individuals as well as experts, later the examination of document wascarried out using **Adobe photoshop 20.1.0**. The obtained results presented the number of observed features,such as multiple number of layers, disturbances in background and overlapping of photos, correlated with the image manipulation and are detectable using image processing software. The proposed technique gives over 90% accuracy in detection of digital manipulations by image processing software.*

Keywords*: digitally manipulated documents; adobe photoshop 20.1.0; multiple number of layers; disturbances in background; overlapping of photos*

Introduction

The examination of digital document is one of them the forensic questioned document community has confronted challenges as a result of the tremendous expansion and broad adoption of document digitalization.[14] Cases of manipulated documents in soft copies and hard copies are increasingly encountered in all the sectors of the world. The forgers commonly use the insertion of text, the substitution of pages, manipulations done by cut and paste mechanism, and the use of different original documents to form the new duplicate composite. So, depending upon the person's skill and ability on that software, decides the perfectionism of the manipulations. It is varied from one person to another as well as from one software to another.[11]

Digital image processing has been used to analyse documents since before forgeries first appeared using these programs. The method ofexamination of the contested documents for manipulations with the image processing software is non-destructive, quicker and more accurate.[10] The examination of digital document can revolutionize the field of Questioned document examination.Most of the people are aware about the features of image processing software due to easy availability on internet and their readability. For Example, Adobe photoshop, MALTA B, Paint, Instagram editing tools, Picasa, Picsart, etc. At the broad level, other than image editing, the image processing software is used to enhance the quality of digital documents. The same software can be used for both alterations and examinations depending upon their features.[11] This study deals with the examination of digitally manipulated documents using adobe photoshop 20.1.0 software and the basic objective of the study is to Evaluate the application of image processing software in the examination of digitally fabricated documents. Adobe photoshop is extensively available materialistic software having wide application features in processing and correction of images.The documents were altered by using image processing software and later examined with the same software. In Adobe Photoshop there are some features which can assist the Forensic document examiner to analyse the altered document[11].

Materals and Methodology

The examination of the digitally manipulated document involves following steps;

1. Sample Collection

The visa and different photos were collected from different individuals. The original documents were scanned using Adobe scanner with the 600 dots per inch resolution and saved in joint photographic group (.jpg) format.

2. Alteration of Collected Documents

To alter, the addition of the text, deletion of data and adding new matter, copy and paste manipulations, insertion of the photo to the plain area or over the existing photo, transplantation of the photo or text, etc were done. Adobe photoshop 20.1.0 (2020) were used to alter the document.

3. Examination of Altered Documents

The similar software is used to examine the digitaldocument. There are common examination features that are present in digitally manipulated documents such as font size, font style, the dissimilarities in date and numerals, inconsistency of watermark, pixelation, alignment of text, layout of the paper, and condition of the paper.

Examination of Digitally Manipulated Documents using Adobe Photoshop

Irrespective of the type of the document, there are certain features encountered for different manipulations which are as follows;

- Addition: Disturbances in the background, Dissimilarities in font style, Discrepancies in font size, Uneven spacing, Irregular text and Crowding of the letters.
- Copy and paste manipulation: Disturbances in the background in the form of dots, Changes in the pixel colour and Irregularities in the text.
- Deletion: Discrepancies in the text, Colour differences of erased area and background, Deterioration of the adjusting letters and Plain or white background exhibiting pale colour.

- Transplantation: Malalignment of the lines and disturbances in the background.

Inbuilt Identifying Features of Adobe Photoshop Software used to Analyse the Document

Adobe photoshop is extensively available materialistic software having wide application features in processing and correction of images.The documents were altered by using image processing software and later examined them with the same software. In Adobe Photoshop there are some features which can assist the Forensic document examiner to analyse the altered document[19]. In Adobe Photoshop there are some features which can assist the Forensic document examiner to analyse the altered documents such as the Layers. If the altered document is saved in PSD format, the number of layers were visible on the layer bar of the adobe photoshop. Each layer showed the type of modification and the series of the activities that has occurred. The list of activities on the layer bar can be used to show the changes made by the forger. The original document presented as a background layer with locked icon. The layers have names and on the left side of each layers haveone eye indicated the layer visibility. In the case of .jpeg images, the layers are joined and appeared like a single image. So, it may not be possible to detect the layers analysis for examination of manipulation.[19]

Results

To obtain the results, digital questioned documents were examined using Adobe photoshop 20.1.0. The obtained results from the examination using image processing software revealed that the software had extreme capability for forensic document examination. In this study, the five different original documents were collected, altered and examined with respect to nature of the documents.

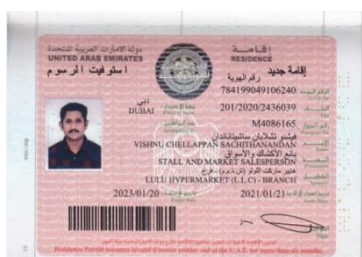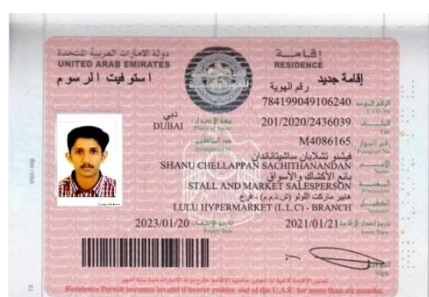The obtained results are discussed below:

Figure 4.1.1: original document

FOR EXPERIMENTAL PURPOSE

The VISA was examined thoroughly and the following results were obtained

1. Multiple number of layers: Details of the layers were showed on the menu bar in adobe photoshop software, while examining the manipulated document that are saved in photoshop document (.psd) format. Apart from background layer, the presence of other layers indicates the alterations in the document. The visibility of three layers were noted in the photo and name i.e., letters 'A' and 'SH' as shown in figure 4.1.3 and 4.1.4.
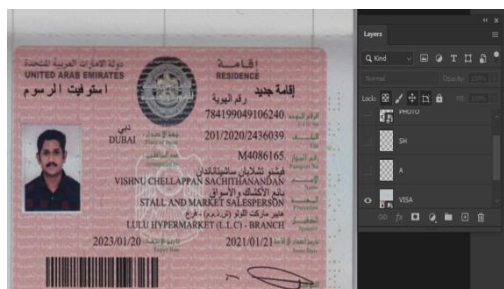
2. Overlapping of the photos: As shown in figure 4.1.7, the presence of margin on above and left side of the photo showed a concealment of original photo.

3. Disturbances in the background: In figure 4.1.9 (SHANU), the disturbances in the background were observed. An aligned set of the micro-lettering was present on the original document and discrepancies were noted due to possible alterations. It indicated that the letters 'S', 'H' and 'A' were copied from the same document and pasted to that position to make a new name.

As per the above observations, it is revealed that every alteration possesses its own peculiar features. The main advantage of using Adobe Photoshop 20.1.0 is the visibility of the layers that indicate the possible alterations in the document. In Addition, the difference in the font style, font size and pixel colour were found.Disturbances of watermarks and discrepancies in the background were observed in the case of copy-paste mechanism.

Discussion

This study dealt with the possibility of the examination of digitally manipulated documents using image processing software (Adobe photoshop). The alterations made in the digital documents such as addition, erasure, obliteration, copy paste mechanism, transplantation etc., which possess different type of the characteristicsare easily observable by using the zoom tool in adobe photoshop, along with that it also showed the differences in the pixel.

Earlier studies[10,18,19] utilized different software to alter and examine the documents such as Corel Photopaint version 5.0, MATLA-B, Paint software, Picasa, and Adobe Photoshop respectively and already proved that the advantage of the image processing software in examination of digitally manipulated documents. Similar results were obtained after this study and it was encouraging to know that by using image processing software analyses of digital documents is easy and fast. In this study, the Adobe photoshop 20.1.0 was used to

manipulate and examined the documents. It can detect the manipulations by using the information of the availability of the layers. The forensic document examiners can rely upon them for obtaining the results.

Conclusion

The main objective of this study was to examine the digitally manipulated documents by using image processing software.In this study, the documents were altered by both laymen and experts in adobe photoshop and saved as Photoshop documents (.psd). It is easier to study the layers if the image of the document is saved in .psd format which on the other hand is not possible with other image formats. Though the degree of the manipulation is purely depended upon the skill of the forger and ability of the software but the skills of the examiner also play a crucial role.

The obtained results presented that a number of observed features were correlated with the image manipulation and detectable using image processing software. On the basis of this study, it was concluded that the proposed technique gives over 90% accuracy in detection of digital manipulations by image processing software. The results of this particular study are encouraging and satisfied. Further exploration of this field can make more revelations in the field of forensic document examination. If this technique is used properly then used in near future analysing digital documents will be easier.

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OPIUM & ITS ALKALOIDS AS BIOCHEMICAL MARKER IN BODY FLUIDS

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Abstract

Biochemical marker is a molecule present in the body fluids and the body parts. It is identified as an end product of a parent drug that last longer than parent molecule. Opium has various alkaloids and from these alkaloids, there markers are identified that confirm alkaloid presence. Biochemical markers of opium alkaloids are morphine -6-glucoronide, codeine-6-glucoronide, oxymorphone-3-glucoronide, hydromorphone. Certain presumptive test and Confirmatory test are performed to identify these biochemical markers.

Keywords: opium, biochemical markers, narcotic, drug abuse, alkaloids, adolescents, forensic toxicology, punjab.

Introduction

Opium is a crude material that is obtained from the unripe seedpods of the opium poppy (Papaversomniferum). It is a plant of family Papaveraceae. It is obtained by incising the seed capsules of poppy after the plants flower petals have fallen. The slit seedpods exude a milky latex that coagulates and change color into gumlike brown mass upon exposure to air. This raw opium is used to obtain derivates such as morphine, codeine, heroine, thebaine and papaverine. Opium and the drugs obtained from it are called opiates.Opium and its alkaloids are, Morphine it is found naturally in the opium, belongs to the class of drug known as opioid analgesics. It belongs to the group of medicines called narcotic analgesic.it acts on central nervous system to relieve pain. Heroine it is known as diacetyl morphine and diamorphine, illegal drug made from morphine. Heroine can be smoked or snorted up the nose, It is a depressant drug slow down function of brain and nervous system. Codeine is an alkaloid prepared from opium or morphine by methylation. It is used as a central analgesic, sedative, hypnotic, antinociceptive and antiperistalsis. it is an opioid pain reliver used to treat mild to moderately severe pain.

Materials and Mehodology
Research Aim

To identify the Route Administration of opium drugs and its abuse among youth in Punjab state.

Route Administration of Opium Drug in Punjab

Punjab have become a major part of opium drug route that is now used for transporting heroin as well. Most commonly abused drugs in Punjab are the opium derivatives – raw opium, poppy husk and Heroin. Opium Poppy cultivation in Punjab is ban by Punjab government, drugs in Punjab come from the poppy fields of Afghanistan , cultivate under the patronage of Taliban. The drugs from Afghanistan first reaches to Africa then comes to Delhi and Punjab.The total area under opium poppy cultivation in Afghanistan was estimated at 177,000 hectares in 2021. The average opium yield in 2021 was estimated at 38.5 kilograms per hectare. The south-western region continued to produced most of the opium in Afghanistan (82%), followed by western and northern regions (9% and 4%). Punjab districts are Amritsar, Tarn Taran, Firozpur and Fazilka sharing the border with Pakistan are part of the drug smuggling route which the Pakistan or Afghanistan based drug smugglers use to route their consignments. Punjab serves as a transit and a

market for drug smugglers.Opium poppy cultivation is legal in Rajasthan districts are Kota,Baran, Jhalawar, Chittorgarh, Udaipur and Bhilwara. Fazilka have Rajasthan to thesouth, as opium cultivation illegal drug syndicates do smuggling of drugs from Rajasthan to fazilka. The Afghanistan heroin is smuggled from the porous Indo – Pak border, opium and poppy is smuggled from Rajasthan. The residents of villages located on the borders work as couriers for smugglers, they get Rs 3000 to Rs 4000 to receive and forward drug. As farmers permits to grow crops near the fence at many places, they receive shipment via plastic pipes or either directly thrown from other side . It remains with the local courier for some time and then is handed over to other courier to deliver further to New Delhi or to local towns to sell the same in small in quantities.

Opium & It's Alkaloids Abuse in Youth of Punjab

Drug abuse occur all over the world, affecting every country. In Punjab drug abuse occur at high level that tremble the whole society in the state . It is noticed that opium & its alkaloids abuse in Punjab enraged extensively, particularly in youth.Study conducted by the All India Institute of Medical Sciences states that Punjab have population of 28 million, has 232,000 0pioids – dependents and 86,0000 opioids users. Punjab was home to 56 % of Indian opium &its alkaloid users said by United Nations on Drugs and Crime. Opiates and their derivatives are used by 70 % of addicts in Punjab.Heroin is abuse at high rate in Punjab. Four year study is conducted which show that heroin was used by 67% participants, 14 % other opiates were abused and 7 % addicted to poppy husk . Opiates are administrated in body through different routes, 51 % of addicts injecting drugs, 32% ingest orally and 15 % inhale the drugs.[26] The cross-sectional study was run on 400 adolescents and young adults from 15 villages from Jalandhar District. Result show that Heroin abusers are 20.8 % and nonalcohol and non-tobacco abusers was 34.8%. A Study published in the British Journal of Addiction 19 % of a sample of Chhajli's village in Punjab

district of Sangrur, 6,699 population using opium & it's alkaloids.

Results and Discussion

Major findings of the study of opioids – addicts in Punjab

76 % are in the age group of 18 to 35 years

99 are males and 89 % literate.

56 % belong to rural areas.

53% are addicted to heroin, 33 % opium, 14 % pharmaceutical opioids

29 % injected drugs, 90 % inject heroin

Chemical Biomarker in Body Fluids and Body Parts for Opium

Table indicatesthe opium & its biochemical markers in the body fluids blood, saliva, urine and in body parts hair. Opium and its alkaloids consist different type of biomarkers that specify the presenceof alkaloids.

Opium Metabolites	Urine Sample	Blood Sample	Saliva Sample	Hair sample
Morphine	Morphine-6-glucoronide (M6G) Morphine -3-glucoronide (M3G) Hydromorphone	Morphine-6-glucoronide Morphine-3-glucoronide	Morphine-6-glucoronide	Morphine-3-glucoronide Morphine-6-glucoronide
Codeine	Codeine- 6 -glucoronide (C6G), Norcodeine, Normorphine	Morphine	Hydrocodone Hydromorphone Norhydrocodone	Oxymorphone-3- glucuronide Hydromorphone -3-glucuronide
Heroine	6 – Acetyl morphine (6- AM)	Morphine	6-Monoacetylmorphine (6- MAM)	6-acetylmorphine
Thebaine	Oripavine (3-o-dimethylthebaine) Nororipavine (3-O-N-di-demethylthebain)	Buprenorphine	Norhydrocodone	Nor-buprenorphine
Papaverine	6-Desmthylpapaverine (6- DMP) 4, 6-didesmethyl papaverine (4,6 DDMP)	Monodemethy lated	Papaverine	Papaverine hydrochloride

Validation of Opiates & Its Alkaloids

Opium & its alkaloids presence can be confirmed after week and month. Alkaloids are parent's drug they absorb in body readily but their biochemical markers stay for a long time in body, give the presence of parent drug.

Detection Limit	Urine	Blood	Saliva	Hair
Morphine	3 days	12 hours	4 days	90 days
Codeine	1-2 days	24 hours	21 hours	10 weeks
Heroine	48 hours	48-72hours	5 -6 hours	3 months
Papaverine	48 hours	1-2 hours	1 to 2 hours	72 hours
Thebaine	3-6 days	48 hours	3 days	3monts

Conclusion

The content present in this article demonstrate abuse of opium & alkaloids in Punjab. Opioids abuse is at high level especially in youth. Opium & opioids biochemical markers are identified in the body fluids and body parts. Detection limit of opids & concentration of opioids biochemical marker are detected. Biochemical importance mentioned as the parent drug absorbed in body rapidly but biomarkers stay for long time. Biomarker help in identification of particular drug. Certain techniques are mentioned in this review which detect the biochemical markers. Drug abuse of opium & opioids profile in youth have disused in this article. This article informs the adverse effect of opium & opioids on the individual health. Drug abuse in youth is a matter of serious concern.

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AN EMPIRICAL STUDY ON OCCUPATIONAL STRESS OF POLICE HEAD CONSTABLES AND CONSTABLES IN TRICHY DISTRICT

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Abstract

This study is much important for Occupational stress among police constables is a significant issue, stemming from the high demands and inherent risks of their duties. This stress can lead to mental and physical health problems, negatively impacting job performance and personal well-being. Contributing factors include exposure to traumatic events, long working hours, and administrative pressures. Effective stress management strategies and organizational support are crucial to mitigate these adverse effects and promote the overall health of police personnel.

Introduction

The rate of crime and violence is steadily increasing. The burden on law enforcement also has a multi-disciplinary responsibility to deal directly or incidents related to petty crimes. While doing so, their duty makes them vulnerable to health problems like stress, anxiety, depression, etc. The crime of guards is very important and many studies have been conducted in this regard. In one study, Walker and Katz (2000) noted. The role of the police in any particular society is not clearly defined.

Police are asked to perform various tasks. Many of them include crime prevention order maintenance and law enforcement. As mentioned by the author, there is also the issue of role conflict between politicians and citizens. According to AGOLLA (2009), the role of the police is to do so, they face challenges such as fighting and preventing crimes and require physical and mental abilities to deal with that circumstances firmly and effectively (ROLLINSON,2005 and MORASH et al., 2006). Differences in gender roles and responsibilities at the community and family level reflect the ability to balance between social / family and occupational roles and in doing one's job in family and services. Gender differences play an equally, important role in determining the coping skills for psychological distress and mental health. Police personnel to under

stress due to workload, poor work-life balance, and deficiency of resources. Although precise figures are unavailable, police department officials have reported informally that as many as 25 percent of the officers in their respective departments have serious alcohol problems.

Material and Methods
Research Design

The researcher design used for the current study was empirical research design. Empirical research typically involves a systematic and structural approach to data collection and analysis, using methods that are designed to minimize bias and maximize the validity and reliability of the results.

Universe of the Study

This study was conducted within Trichy District.

Sample

Police Head Constable and Constable work stress in Trichy district were the sample for this study.

Sample Size

The researcher has proposed as 100 achieved 45 samples from Trichy District.

Sample Technique

Researcher has used Purposive Sampling Technique, a form of Non- probability sampling used in the study.

Research Tool

A Personal Distribution Questionnaire (PDQ) was developed by the researcher in Google Form and data was collected.
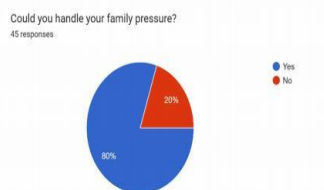
Result and Discussion

Fig 1 The above picture chart Could you handle your family pressure. 80% (30) respondents of Yes; then 20% (14) respondents of No.
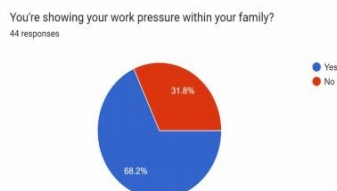

Fig 2 The above picture chart You're showing work pressure within your family. 68.2% (30) respondents of Yes; then 31.8% (14) respondents of No.
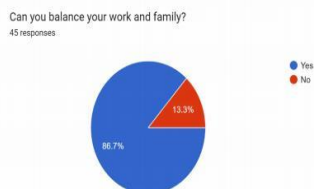

Fig 3 The above picture chart Can you balance your work and family. 86.7% (36) respondents of Yes: then 13.3% (6) respondents of No.
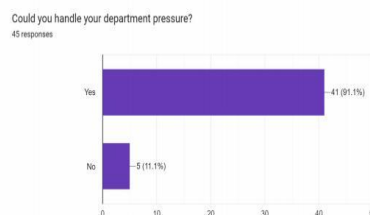

Fig 4 The above picture chart Could you handle your department pressure. 91.1% (41) respondents of Yes; then 11.1% (5) respondents of No.
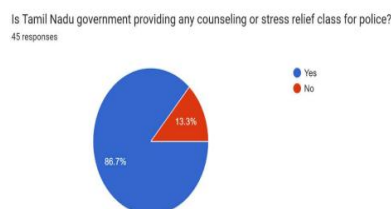
Fig 5 The above picture chart Is TamilNadu government providing any counselling or stress relief class for police. 86.7% (39) respondents of yes; then 13.3% (6) respondents of No.

Major Findings

- 93.2% (41) respondents were Yes. Can you handle family responsibilities
- 88.9% (40) respondents were Yes. Will your family support your work.
- 66.7 %(30) respondents were Yes. Have you experienced family problem because of night shift
- 60% (27) respondents were Yes. Could you all attend your family function . 80% (30) respondents were Yes. Could you handle your family pressure.
- 71.1% (32) respondents were Yes. Can you spend time with your family.
- 68.2% (30) respondents were Yes. You're showing work pressure within your family.
- 86.7% (36) respondents were Yes. Can you balance your work and family.
- 80% (36) respondents were Yes. Could you handle your family pressure.

- 91.1% (41) respondents were Yes. Could you handle your department pressure.
- 86.7 % (39) respondents were Yes. Have you ever felt your working hours are too long.
- 60% (27) respondents were Yes. Will you get vacation when you need. . 68.9% (31) respondents were Yes. Do you feel safe during night shift.
- 72.7% (32) respondents were Yes. Do you have ever been Threatened while you are at work
- 53.3% (24) respondents were Yes. Is public obey your order.
- 60% (27) respondents were Yes. If public has co - operate with you. . 88.6% (39) respondents were Yes. Is public giving you same respect.
- 86.7% (39) respondents were Yes. Is Tamil Nadu government providing any counselling or stress relief class for police.

Conclusion

Police officers are often exposed to traumatic and distressing situations, which can take a toll on their mental health. For example, they may witness accidents, violent crimes, or other traumatic events, and they may also be required to use force or engage in physical altercations with suspects. Additionally, the constant pressure to maintain public safety and protect communities can be emotionally taxing. The effects of police occasional stress can be significant, both for individual officers and for their departments. Studies have shown that police officers have higher rates of depression, anxiety, and PTSD than the general population and that they are at an increased risk of suicide. In addition to the personal toll, police occasional stress can also impact job satisfaction, employee turnover, and overall departmental morale. In conclusion, while police occasional stress is an inevitable part of the job, it is important for police departments to take proactive steps to mitigate its impact on officers' well- being and job performance. By providing resources and support for officers to manage stress and maintain their mental health, departments can create a healthier and more effective workforce.

Suggestions

- Duty hours should be reduced so that they can work without any tension and stress.
- Public should change their negative perspectives of the police
- Facilities like drinking water and restrooms should be made easily available and easily accessible for the police constables and head constables
- Training for stress management should be made compulsory at regular routines to ensure their mental health.
- Psychologists should be consulted if the constables and the head constables have any problems or issues related to their mental health.
- Promotions at right time, increment, house rent allowance, PF should be maintained strictly and correctly.

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ANALYSIS AND EVALUTION OF NETWOR SECURITY

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Abstract

Network and computer security is essential to any organization's ability to make money. Internet-enabled business, or e-business, has significantly increased revenue growth and efficiency in recent years. Applications for e-business, like supply chain management, e-commerce, and remote access, let businesses improve customer satisfaction, cut expenses, and streamline operations. Mission-critical networks that handle data, video, and audio traffic are necessary for these applications. These networks also need to be scalable in order to handle growing user numbers and the demand for higher performance and capacity. But as networks support an increasing number of applications and are made available to an increasing number of users, they also become increasingly susceptible to an increasing number of security risks. Security technology is used to counter those risks and make sure that e-business transa.

Introduction

The military, businesses, and individuals using personal computers now place a higher priority on network security.Gaining insight into the origins of security technologies is made possible by studying the history of security.Modifications to the internet's architecture may lessen the likelihood of assaults being transmitted via the network. Being aware of the attack techniques enables us to respond with the proper security. In order to stay connected to the internet while protecting themselves from potential dangers, organization Establishan "Intranet." As a result, they are examined for security technologies, internet. Attack methods, and vulnerability issues. The security of computers and networks is essential to any organization's ability to make money. Internet-enabled business, or e-business, has significantly increased revenue growth and efficiency in recent years. Applications for e-business including.

Literature Review

Roy Pails and BanraplangJyrwa [1]. In order to maintain source code integrity, many techniques such as cryptography, steganography, water veiling, and scrambling have been developed for the improved Rijndael computation using 128 piece keys. It focuses on the AES calculation's structure, equipment operation, and execution testing.

Hoang Trang [2]: An Advanced Encryption Standard execution proposed for FPGAs.This results in minimal unpredictability engineering and efficiently achieves both high throughput and low dormancy. Results from simulations and executions are provided, and previous detailed structures are considered.

Jalel Rajeb [3] This paper presents an overview of our efforts to organize an efficient use of the Rijndael algorithm; it is the new Advanced Encryption Standard that NIST has adopted; two unique equipment executions are shown and examined.

N. Sklavos, P. Kitsos[4] This study proposes a start-to-finish security design and its VLSI execution for the GPRS. The security provided by the Global Mobile System (GSM) and GPRS are similar.

Mallika Srivastava, Aparna Mishra, and Abhijith P.S.[5] Many engineering suggestions exist for the AES Rijndael calculation; nevertheless, many of them are lacking in terms of both territory and speed. This research suggests an alternative approach to increase speed that makes use of smaller FPGA asset accessibility.

Muhammad Rehan, Muhammad Farhan Wali[6] This document discusses the Advanced Encryption Standard (AES), a potent Rijndael coding algorithm in Verilog, the Hardware Description Language. The

paper provides the foundation for each and every adjustment made to the computation.

Sanchez-Avilaf, C., and Sanchez-Reillot, R. (2007) In this work, we examine the architecture and design of the new AES based on three criteria: (a) resistance to all known attacks; (b) speed and code reduction across a broad range of stages; and (c) structure simplicity, including similarities and differences with other symmetric figures.

N. Shivasankari [8] The symmetric figure that is being used the most frequently is the Propelled Encryption Standard. A combination of line and section turns, octet replacement with an S-box, Selective OR operations (XOR), and a Mix Column are used in the calculation. AES was developed with balance in mind, using modified key advancement and fixed Mix Column/Inverse Mix Column operations to reduce the chip district.

Bhalerao, Prachi V. [9]In this study, we demonstrate how a modified structure in these devices' equipment leads to a significant increase in the structure's productivity. The standard AES design is vulnerable to cryptanalysis.

B. Nageswara Rao [10] For the encryption and decoding process of the AES computation, we increase the number of rounds (Nr) to 16 in our task, adding to the framework's security. Theoretical analysis and exploratory results showed that this AES technique provides quick but little information flow over unbound channels.

Gielata Artur[11] This study looks the FPGA innovation in the AES-128 figure standard's equipment implementation. Programming executions of cryptographic calculations are inefficient and wasteful in many organized applications. Custom design of reconfigurable equipment was suggested as a solution to address those problems and speed up the Rijndael calculation's execution and flexibility.

Ahmed[12] Developing necessities for fast, high volume secure correspondences joined with physical security, equipment usage of cryptography happens. A FPGA usage is a halfway arrangement between broadly useful processors (GPPs) and application explicit coordinated circuits (ASICs).

Mr. Atul [13] Altera instruments coordinated and carried out our AES 128-piece encryption/decoding computation framework. Table provides itemized correlations with the other designs and condenses the equipment assets needed for basic building squares.

Network Security

Network security refers to any measures taken to protect the accuracy and value of your data and network. Stated differently, network security is the action taken to safeguard the data and network integrity.The process of defending a computer network against attacks, misuse, and illegal access is known as network security. In order to guarantee that data moving across the network is safe and secure and keeps sensitive information safe from hackers and other threats, it entails utilizing tools, technologies, and rules. One needs to have a basic understanding of computer networks in order to understand the principles of network security. In this section, we'll cover some of the basic principles of computer networking before providing a quick overview of various popular networks. Next, we'll delve further.
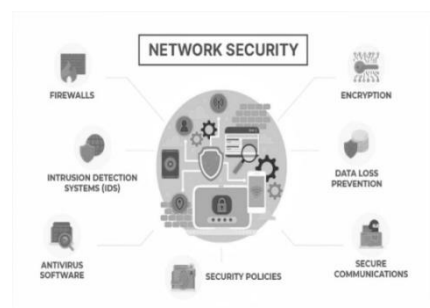
Network security

Difference between Information Security and Network Security
Information Security

- Sensitive data is shielded by information security from unwanted actions such as disruption, alteration, recording, scrutiny, and destruction.

- Ensuring the security and privacy of vital information, including financial information, customer account details, and intellectual property, is the aim.
- The term "information security" describes the precautions taken to keep data and information systems safe against unwanted access, use, disclosure, disruption, alteration, or destruction.
- This involves safeguarding data and information using administrative, technical, and physical means to guarantee its availability, confidentiality, and integrity.
- Information security plays a crucial role in safeguarding against cyberattacks, preventing sensitive data theft, and maintaining privacy.

Examples and Inclusion of Information Security are as follows
1. Procedural Controls
2. Access Controls
3. Technical Controls
4. Compliance Controls

Network Security
- Network security is a branch of information security that deals with shielding networks—including their hardware and software components—from damage, misuse, and unwanted access.
- The goal of network security is to safeguard the availability, confidentiality, and integrity of data that is transferred across a network.
- Firewalls, intrusion detection and prevention systems, encryption, and secure protocols like VPN and HTTPS are examples of common network security methods.
- Network security plays a crucial role in safeguarding confidential data transferred via the internet and in preserving the availability and integrity of networked devices and systems.
- Every business or organization that deals with a lot of data has some sort of defense against various cyberthreats.

- Threats including virus, hacking, and denial-of-service assaults that target networked systems are the main emphasis of network security.
- range of strategies, such as encryption, safe backups, access controls, and disaster recovery plans, are necessary for information security.

Examples and Inclusion of Network Security are as follows
1. A firewall
2. Division of Networks
3. VPN for Remote Access
4. Security of Emails
5. Systems for Preventing Intrusions (IPS)
6. Using sandboxes
7. Security of hyperscale networks
8. Preventing Data Loss (DLP)
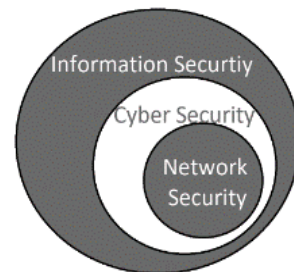
Internet Architecture and Vulnerable Security Aspects
- Organizations are employing intranets or secured private networks out of fear of security breaches on the Internet. Security measures have been added to the Internet Protocol Suite at several tiers by the Internet Engineering Task Force (IETF) [4].
- Data units that are exchanged over a network can be logically protected thanks to these security measures.
- The security implications of both the new and present versions of the Internet Protocol are examined.
- IP security, or IP sec, protects both the present IP version (IPv4) and the upcoming IP generation (IPv6).
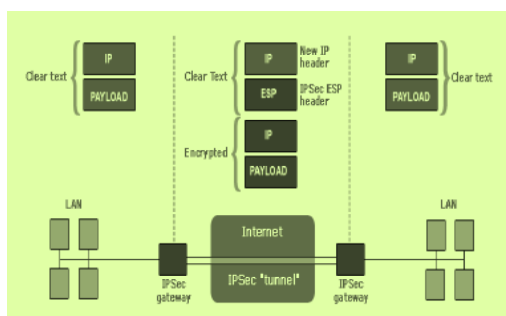
Attacks through the Current Internet Protocol IPV4

- IPv4 maps to the MAC address via the Post Address Resolution Protocol.
- Common Techniques for Cyberattacks.
- There are categories for common methods of internet attacks. Certain assaults, including phishing and eavesdropping, get system knowledge or personal information.
- Numerous IP spoofing attacks exploit the data present in the IP packet header.
- For instance, in the Christmas Day attack on Tsutomu Shimomura3, the IP packets' source address was forged to make it appear as though they were coming from Shimomura's network.

Eavesdropping

- Viruses
- Worms
- Trojans
- Phishing
- IP Spoofing Attacks
- Denial of Service

Technology for Internet Security

- Cryptographic systems
- Firewall
- Intrusion Detection Systems
- Anti-Malware Software and Scanners
- Secure Socket Layer (SSL)

Security Issues of IP Protocol IPV6

- IPv6 is the next thing everyone's talking about. From a security point of view, IPv6 is a considerable advancement over the IPv4 internet protocol Despite the IPv6's great security mechanisms.
- Some areas of the IPv6 protocol still pose a potential security issue.
- The new internet protocol does not protect against is configure servers, poorly designed applications, or poorly protected sites.

The possible security problems emerge due to the following

1. Header manipulation issues
2. Flooding issues
3. Mobility issues

Security in Different Networks

1. Firewalls that detect and report intrusion attempts.
2. Sophisticated virus checking at the firewall.
3. Enforced rules for employee opening of e- Mail attachments.
4. Encryption for all connections and data transfers.
5. Authentication by synchronized, timed passwords or security certificates.

Current Developments in Network Security

- The network security field is continuing down the same route. The same methodologies are being used with the addition of biometric identification.
- Biometrics provides a better method of authentication than passwords.
- The software aspect of network security is very dynamic. Constantly new firewalls and encryption schemes are being implemented.
1. Hardware Developments
2. Software Developments

Future Trends in Security

- More than anything else, the applications are what will power Internet security.
- It's possible that in the future security will resemble an immune system.

- The immune system defends against assaults and fortifies itself to take on more formidable adversaries.
- In a similar vein, network security will have the capacity to operate as an immune system.
- Although the trend toward biometrics may have started some time ago, it doesn't appear to be being aggressively pursued.

Conclusion

As the internet grows, network security is a crucial topic that is receiving more and more attention. To ascertain what modifications to security technologies are required, an analysis was conducted on the internet protocol and security risks.

Although several popular hardware devices are used, the majority of security technology is software driven. There hasn't been much progress in network security recently. In order to address the risks that may arise in the future, the field of network security may need to adapt more quickly.

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DATA SEND FROM SOURCE TO DESTINATION THROUGH NETWORK NODES USING LINK STATE ALGORITHMS AND ROUTING PROTOCOLS

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Abstract

A link-state routing protocol is capable of generating a topological view of large networks. It gathers data from all interconnected routers, resulting in an identical image of the network topology. The ideal path for seamless traffic communication across the hops is determined by a topology-map of the network that has been constructed. The primary goal of this study is to compare the performance of two link-state routing protocols: Open Shortest Path First (OSPF) and Intermediate System to Intermediate System (IS-IS-IS) (IS-IS). We build an enterprise network to compare OSPF and IS-IS performance under various conditions. The full analysis of the aforementioned routing protocol will aid in the development of enterprise network models and the selection of an appropriate routing protocol for various traffic scenarios. Routing, in general, relates to the difficulty of determining the most efficient path for sending data packets from source to destination in a MANET. The router employs the link state routing paradigm for this purpose, flooding their data to all other routers in the network. It boosts traffic between nodes that aren't participating in the conversation. To address this issue, this paper proposes a new method called Secure-dEed-Reflection-Inducement-eState (SERIeS), which supports both MANET security and link stability. After network formation, the route from the source to the destination is discovered with the help of a learning agent. This agent searches the link state database for the correct route, which includes precise information about the route.

Keywords: manet (mobile ad hoc networks), rip (routing information protocol),link state routing protocol, open shortest path first, is-is – "intermediate system to intermediate system" [2]

Introduction

"MANETs (Mobile Ad hoc Networks)" [1] are escaping the confines of research labs and finding a home in real-world deployments. Outside of specialized domains (military, vehicular, etc.), city-wide community-networks are forming, using MANETs to connect regular Internet users with one another and with the Internet. MANET protocols are consequently confronted with more realistic application situations and constraints, such as the need for gateways to interface with other networks, security concerns, and protocol interoperability. When a MANET is connected to external networks via multiple gateways that use ingress filtering (i.e., a gateway only accepts and forwards data packets originating from specific source addresses), data packets must be forwarded within the MANET to the correct gateway – that is, a gateway that accepts and forwards data packets with the given source address and provides connectivity to the destination address. As a result, routing protocols must include topologies and topological information in order for such routing to be possible.

Routing protocols are a set of rules and methods for transferring data from source to destination across an internetwork, and routing is at the heart of every data network. The protocols are capable of exchanging data across routers across the network in an effective and efficient manner [1]. There are two types of routing protocols: distance vector routing protocol and link state routing protocol, both of which are explained below:

A. "Distance Vector Routing Protocol" [4]

Routes are marketed as distance vectors, and the direction is known as the distance vector, which is

described in terms of metrics such as hop count, and the next hop or exit interface is considered the direction. The Bellman-Ford algorithm [4], which can maintain a database of reachable networks, is used by the distance vector for the optimum path discovery. As a result, the technique is inefficient in determining the actual topology of an internetwork [5]. "Routing Information Protocol" [5] (RIP), "Interior Gateway Routing Protocol" [5]l (IGRP), and "Enhanced Interior Gateway Routing Protocol" [5] are the distance vector routing protocols (EIGRP). The distance vector routing technique is appropriate in the following situations:

1. A straightforward network.
2. There is no need for a complex hierarchical structure, and there is less administrative participation.
3. Convergence time is not an issue.

B. "The Link State Routing Protocol (LSRP)" [6]
Each router creates a network connectivity map in the form of a graph that shows how each router is connected to the others, as well as a personal directory of connected networks. Link state routing protocol maintains its own Link State Packet (LSP) that contains information about the routers such as bandwidth, link type, and neighbour identification. The Link State Routing Protocol (LSRP) keeps a topological database in the form of Link State Advertisements (LSAs) and sends data to adjacent routers [6]. Each router in the network's closest neighbours is announced through link state routing protocols. In large networks, the ability to converge is extremely quick.

"The link state routing protocol communicates from one location to another using the shortest path first (SPF) algorithm [4] and keeps a database of network topology." Utilizing the OPNET modeller, we compared and analysed link state routing protocols such as Open Shortest Path First (OSPF) and Intermediate System to Intermediate System (IS-IS) using characteristics such as IP back ground traffic delay, Point-to-Point delay, Throughput (pack/sec), and Utilization. The link state routing

protocols are capable of being used in the following two protocols.

Start with the shortest path (OSPF) OSPF is a link state routing protocol that belongs to the group of interior routing protocols. It uses Dijkstra's algorithm [4] to discover the shortest path to send data from source to destination. The fundamental benefit of OSPF is that it detects and corrects faults [7]. It has scalability to much larger network implementations and allows for fast convergence of routing tables. When a change occurs in the network, OSPF will send a message (hello) to all routers and receive hello messages from all neighbours to maintain a database of all routers. Every router broadcast link state update message when the network topology changes.

(ii) Intermediate System to Intermediate System I (IS-IS). IS-IS is a routing protocol designed to efficiently send data traffic in an enterprise network. It uses link state routing algorithms to send traffic at high speeds, Dijkstra algorithms to find the best and shortest path for communication in a network, and it creates a separate database in each router [8].

Literature Review
Archana Kudtarkar et al conducted a performance investigation of many routing protocols, including RIP, OSPF, EIGRP, and IGRP, in which EIGRP routing protocol is based on real-time application, and the author concluded that EIGRP will be the best choice for FTP, email, and database access[9]. Whereas the authors [7] to [8] conducted a simulation-based comparison analysis of RIP, OSPF, and EIGRP, the author concluded that using OPNET modeller to design an ideal routing topology would be the best choice for network designers to implement routing protocol, and that EIGRP performed better than RIP and OSPF.

The authors [10] to [11] compared RIP, IGRP, EIGRP, OSPF, and integrated IS-IS using the following parameters: traffic sent, CPU utilisation, end-to-end delay, end-to-end variance, and point-to-point throughput. It has been determined that the link state protocol has addressed the distance vector

deficiencies, and that EIGRP is superior than the others. While it has been discovered through a literature analysis that there is room to focus on both link state protocols, such as OSPF and IS-IS, by comparing routing behaviour in the enterprise network using various parameters.

Methodology

The state of the art in adopting the step-by-step approach for successfully completing the performance evaluation of a link state routing protocol in an enterprise network is shown in Fig-1.
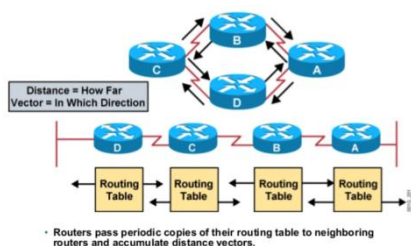

Fig – 1 "Link state routing protocol in an enterprise network" [13]
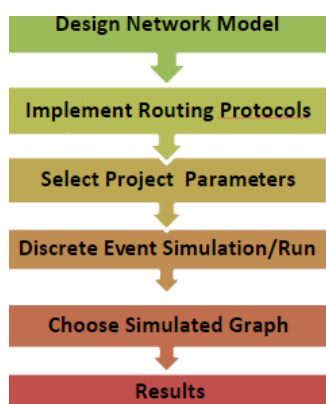

Fig – 2 "Methodology Implementation" [1]

Figure 2 depicts the methodology implementation of network models simulated network model in which the OSPF and IS-IS – "Intermediate System to Intermediate System" [2] routing protocols are enabled for routers to share routing information with one another. The model depicts routers in relation to their nations, each of which comprises many subnets connected through point-to-point protocol (PPP) utilising Digital Signal

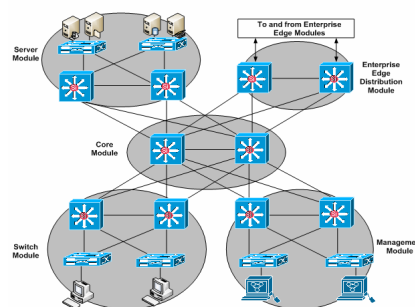3 (DS3 44.736 Mbps) and packet formats ip3 diagram.

Fig – 3 "OSPF Simulated Network Model" [2]

Link Stating Routing

Link state routing is a mechanism in which each router in the internetwork communicates its knowledge of its neighbourhood with all other routers.

The following are the three keys to comprehending the Link State Routing algorithm: "Knowledge of the neighbourhood" [12]: Rather than providing its routing table, a router merely provides information about its immediate surroundings. To other routers, a router broadcasts its identity and the cost of directly associated links.

"Flooding" [12]: Every router on the internetwork provides information to every other router except its neighbours. Flooding is the term for this process. Each router that gets a packet replicates it and transmits it to all of its neighbours. Finally, a copy of the identical information is sent to each router.

"Information sharing" [12]: A router only sends information to all other routers when the information changes.

There are two stages to Link State Routing:
Flooding that is dependable

The initial state is that each node is aware of the costs of its neighbours.

Final state: Each node has a complete understanding of the graph.

Calculation of the Route

The optimum routes to all nodes are calculated using "Dijkstra's algorithm" [12] on the network by each node.

The "Dijkstra's algorithm" [12], also known as the Link state routing algorithm, is used to discover the shortest path from one node to all other nodes in the network.

The "Dijkstra's algorithm" [12] is iterative, and it has the characteristic that after k iterations, the least cost paths for k destination nodes are well known.

Let's look at some examples of notations: c (i, j): Cost of a link from node I to node j. If the nodes I and j are not directly connected, then c (i, j) = ∞.

D(v): It specifies the cost of the path between source code and destination v that is currently the cheapest.

P(v): It specifies the preceding node (neighbour of v) as well as the current least expensive path from source to v.

The total number of nodes in the network is denoted by the letter N.

Algorithm

Initialization

A is a root node, hence N = A is a root node.

D(v) = c (A, v) for all nodes v if v is near to A, otherwise D(v) = infinity loop Find w not in N where D(w) is the smallest.

To N, add w

D(v) should be updated for any v next to w that aren't in N:

D(v) = min(D(v), D(w) + c (w, v)) D(v) = min(D(v), D(w) + c (w, v)) D(v) = min (

Until all nodes in N have been reached. The loop is followed by an initialization step in the above algorithm. The total number of nodes available in the network equals the number of times the loop is executed.
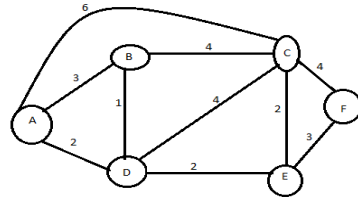
Let's have a look at an example:

Fig – 4 Node with Link state Graphs

Step 1

The startup stage is the first step. The current least cost path between A and its directly related neighbours, B, C, and D, is 3,6,2. The cost from point A to point B is set to 3, from point A to point D is set to 2, and from point A to point C is set to 6. Because they are not directly linked to A, the costs from A to E and F are set to infinity.

Step	N	D(B), P(B)	D(C), P(C)	D(D), P(D)	D(E), P(E)	D(F), P(F)
1	A	3, A	6, A	2, A	α	α

Step 2

In the above table, we observe that vertex D contains the least cost path in step 1. Therefore, it is added in N. Now, we need to determine a least-cost path through D vertex.

a. Finding the quickest route from point A to point B

V=B, W=D

D(B)=min(D(B), D(D)+C (D, B))

=min (3,2+1)

=min (3,3)

The bare minimum is three. As a result, the shortest route from point A to point B is currently 3.

b. Finding the quickest route from point A to point C

V=C, W=D

D(C)=min(D(C), D(D)+C (D, C))

=min (6,2+4)

=min (6,6)

The bare minimum is 6. As a result, the shortest path from A to C is currently 6.

C. Finding the shortest route from A to E
V=E, W=D

D(E)=min(D(E), D(D)+C (D, E))

=min(α,2+2)

=min(α,4)

The minimum is four. As a result, the shortest path from A to E is currently 4.

Step	N	D(B), P(B)	D(C), P(C)	D(D), P(D)	D(E), P(E)	D(F), P(F)
1	A	3, A	6, A	2, A	α	α
2	AD	3, A	6, D		4, D	α

Step 3:

In the above table, we observe that have the least cost path in step 2. Let's consider the B vertex. Now, we determine the least cost path of remaining vertices through E.

a. Finding the quickest route from point A to point B.
V=B, W=E

D(B)=min(D(B), D(E)+C (E, B))

=min(3,4+α)

=min (3, α)

The minimum value is 3. Therefore, the currently shortest path from A to B is 3.

b. Finding the quickest route from point A to point C.
v=C, w=E

D(C)=min(D(C), D(E)+C (E, C)

=min (6,4+2)

The bare minimum is 6. As a result, the shortest path from A to C is currently 6.

c. Finding the quickest route from point A to point F.
v=F, W=E

D(F)=min(D(F), D(E)+C (E, F)

=min(α,4+3)

The minimum value is 7. Therefore, the currently shortest path from A to F is 7.

Step	N	D(B), P(B)	D(C), P(C)	D(D), P(D)	D(E), P(E)	D(F), P(F)
1	A	3, A	6, A	2, A	α	α
2	AD	3, A	6, D		4, D	α
3	ADE	3, A	6, E		4, D	7, E
4	ADEB		6, E		4, D	7, E

Step 5:

In step 4, we can see that E vertex has the lowest cost path in the table above. As a result, it is included in N. Now we use E to find the least expensive path for the remaining vertices.

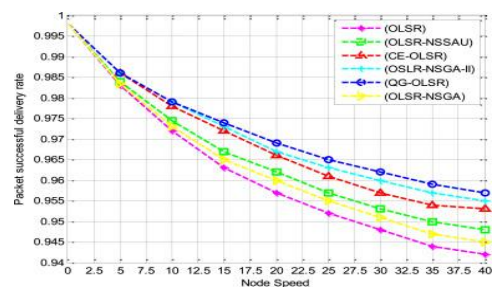### a. Finding the quickest route from point A to point F.
V=F, W=E

D(F)=min(D(F), D(E)+C (E, F)

=min (7,4+3)

=min (7,7)

The bare minimum is 7. As a result, the shortest path from A to F is currently 7.

Step	N	D(B), P(B)	D(C), P(C)	D(D), P(D)	D(E), P(E)	D(F), P(F)
1	A	3, A	6, A	2, A	α	α
2	AD	3, A	6, D		4, D	α
3	ADE	3, A	6, E		4, D	7, E
4	ADEB		6, E		4, D	7, E
5	ADEBC					7, E

Conclusion

Distance vector methods deliver large updates exclusively to neighbouring routers, whereas link-state algorithms transmit little updates everywhere. Link-state algorithms are less prone to routing loops than distance vector algorithms because they produce a consistent image of the internetwork. Link-state protocols provide for smooth routing when a network is in a stable or steady state.

On the negative, link-state algorithms can result in a substantial amount of general control traffic, such as when a network event happens and needs to be flooded over the network. The quantity of flooding that can occur as networks grow larger is the fundamental problem in today's networks.

In comparison to distance vector algorithms, link-state methods are more computationally challenging, needing more CPU power and memory. However, as router processing skills have grown, this has been less of an issue.

As a result, link-state algorithms may be more costly to build and maintain. Despite their differences, both algorithm types perform well in situations and networks that play to their strengths while also acknowledging their weaknesses.

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பாரதியார் கவிதைகளில் பெண்ணிய சிந்தனைகள்

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அறிமுகவுரை

மகாகவிபாரதியார் பெண்களை கட்டுப்பாடுகளை அறுத்து எறிந்து வீட்டை விட்டு வெளியேறி உரிமையுடன் அரசியல் வேலைவாய்ப்பு வாழ்க்கை கல்வி போன்றவற்றிலும் மேலும் சமூகபணிகளிலும் ஈடுபடவேண்டிய கட்டாயத்தை உணர்த்தினார். இந்த மாற்றத்தை காலத்தின் தேவையை அறிந்து கொண்டிருந்தமையால் தான் நவீன இந்தியாவைவடைக்கும் புதுமைப் பெண்களை பாரதிபடைத்தார். பெண்களின் விடுதலைக்குக் கல்விஅறிவுஅவசியம் என்பதைஅறிவுறுத்தும் நோக்கில் பாரதியின் சிந்தனை பற்றி இவ்வியலில் ஆராயப்படுகின்றது.

பெண்ணிய சிந்தனை வித்துக்கள்:

பாரதியார் ஒருசிறந்தகவிஞராவார் . ஆற்றுப்பெருக்குப் போல் உணர்ச்சிமிக்ககவிதை இயற்றும் ஆற்றல் கைவரப் பெற்றவர். நாட்டுக்கு உழைத்தல் அவரது முதன்மை நோக்கமாகும். தேச விடுதலை சமூக முன்னேற்றம் பெண்விடுதலைக்கு உழைத்ததல் ஆகியன அவரது தலையாயப் பணியாகும்.

"நமக்குத் தொழில் கவிதைநாட்டுக்குழைத்தல்
இமைப்பொழுதும் சேராதிருத்தல்"

என்ற வரி அவரது குறிக்கோளை காட்டுகின்றது. பெண்களின் தாழ்ந்தநிலையைப் பற்றிப்பாடும் போது தனக்கு கோப உணர்ச்சி மிகுந்து தோன்றுவதாக குறிப்பிடிகிறார் பாரதி. பாரதிக்குபெண் விடுதலையைப் பற்றிபாடும் போது உற்சாகமும் எக்களிப்பும் தோன்றுகிறது என்று அவரை சந்தித்த பேராசிரியர் வையாபுரி பிள்ளையும் அவருடன் நெருங்கிப்பழகிய ராமசாமியும் குறிப்பிடுகின்றனர்.

தூய்பெண்ணேயல்லளோ? தமக்கைதங்கை
வாய்க்கும் பெண் மகவெல்லாம்
பெண்ணேயன்றோ?
தாய்க்குலத்தைபெண்மையடிமையுற்றால்
மக்களெல்லாமடிமையுரல் வியப்பொன்றாமோ?"

என்று பாரதிபெண் விடுதலை பெண் முன்னேற்றம் பெண் உரிமைக்குக் குன்றாத ஆர்வம் மிக்கவர் என்பதை இதன் மூலம் அறியமுடிகிறது.

விடுதலை வேட்கை:

தம் கவிதைவரிகளில் பெண் விடுதலைவேட்கைளப்படி இருக்கவேண்டும் என்பதை...

"விடுதலைக்குமகளிரெல்லோரும்
வேட்கைகொண்டனர் வெல்லும் என்றே
திடமனத்தின் மதுக்கிண்ணமீது
சோர்ந்துநாம்பிரதிக்கினைசெய்வோம்"

என்று உணர்ச்சித் ததும்பப் பாடுகின்றார்.பெண் கல்வியின் இனிறியமையாமை பாரதிபெண் கல்வியைப் பலவாறுவற்புறுத்துகிறார். கவிதைகள் கட்டுரைகள் கதைகள் சொற்பொழிவுகள் போன்றவற்றில் பாரதிபெண் கல்வியைப் போற்றுகின்றார். ஊலகம் பேதைமைநீங்கிவாழப் பெண் கல்வியேவழிவுகுக்கும் என்பதைப் பாரதி…

"பெண்கள் அறிவைவளர்த்தால் - வையம்
பேதைமைஅற்றிடும் காணீர்"

பெண்கள் கல்வியால் பெறும் பயன்கள் கல்வியில்லாமையால் பெறும் துன்பங்கள் என இரு நிலைகளிலும் பாரதி பெண் கல்வியின் முக்கியத்துவத்தை எடுத்துக் கூறுகின்றார்.

பெண் கல்வியின் தனித்துவம்:

பாரதியார் பெண் கல்வியைப் பலவாறுவற்புறுத்துகிறார். குவிதைகள கட்டுரைகள் கதைகள் சொற்பொழிவுகள் போன்றவற்றில் பாரதியார் பெண் கல்வியை போற்றுகிறார். உலகம் பேதைமை நீங்கி வாழப் பெண் கல்வியே வழிவகுக்கும் என்பதைப் பாரதி…

"பெண்கள் அறிவைவளர்த்தால் - வையம்
பேதைமைஅற்றிடும் காணீர்"

பெண்கள் கல்வியால் பெறும் பயன்கள் கல்வியில்லாமையால் பெறும் துன்பங்கள் என இருநிலைகளிலும் பாரதிபெண் கல்வியின் முக்கியத்துவத்தை எடுத்துக் கூறுகிறார். கல்வி கற்ற பெண்ணே நல்ல மனைவியாய் வாழ்க்கைத் துணையாய் அமைவாள். ஆதமட்டுமின்றிநன் மக்களைப் பெற்று அவர்களை நற்குடிமக்களாய் வளர்த்து ஆளாக்கி நல்ல தாயாக விளங்குவாள். கல்வி அறிவு அற்றவளும் நிலத்தின் தன்மைக்கு ஏற்பவேபயிர் விளையும்என்பதையே..

"நிலத்தின் தன்மைபயிர்க்குளதாகுமாம்
நீசத் தொண்டும் மடமையும் கொண்டதாய்
தலத்தில் மாண்புயர் மக்களைப் பெற்றிடல்
சாலவேஅரிதாகுமோர் செய்தியாம்"

எனத் தாய் நற்புத்திரர்களையே பெறவேண்டும். நன்மக்களே பிறக்கவேண்டும் என்று மபெரிதும் விரும்பவேண்டும். தன் மக்கள் உயர்வும் பெருமையும் மனமகிழ்வும் வேண்டும் என்று பாரதியார் குறிப்பிடுகிறார்.

திருவிகாவும் பாரதி கூறியதுபோலவே கூறுகிறார். இந்தநாட்டில் வாள்மீகிகள்வியாசர்கள் நக்கீரர்கள் திருவள்ளுவர்கள் தோன்றாமைக்குக் காரணம் என்ன? தாயை கல்வி இழக்குச் செய்துஅவள் உரிமையை மகன் கடிந்தமையின்றி வேறென்ன? பயிரின் பலன் நிலத்தின்மான்மையைப் பொறுதத்தன்றோ? கல்விபெண்ணின் ஒழுக்கத்தையும் கற்பை போற்றி வளர்க்கவும் காக்கவும் துணைசெய்யும் என்பதைப் பாரதிதமதுகவிதையில் தெளிவாகஉணர்த்துகிறார்.

"நிமிர்ந்தநன்னடையும் நேர்கொண்டபார்வையும்
நிலத்தில் யார்க்கும் அஞ்சாதநெறிகளும்
திமிர்ந்தஞானச் செருக்கும் இருப்பதால்
செம்மைமாதர் திறம்புவதில்லையாம்"

எனப் பெண்களின் நிலையைபாரதியார் எடுத்துரைக்கின்றார். சமூகத்திலும் பெண்களின் நிலையுள்ளது. பெண்களின் மிகவும் கொடுமையான நிலை என்பது விதைவைகளின் நிலைஆகும். ஒருபெண் எத்தனையோ எதிர்பாப்புகளுடன் வாழ்க்கையில் அடியெடுத்துவைக்கும் போதுமணம் முடித்த சில ஆண்டுகளில் தம் கணவனை இழக்க நேரிட்டால் விதவைக் கோலம் தாங்கிஅவள் படும் வேதனையை பாரதியார் வெளிப்படுத்தியுள்ளார்.

"பெண்டிரைக் கணவர் தம் பிணத்துடன்
எரித்தலும்
எனப்பலதீமைகள் இறந்துபட்டன வால்"

என்றுபெண் கொடுமைகளையும் அவர்கள் அனுபவிக்கும் மனவேதனையையும் பாரதியாரின் கவிதைமூலம் அறியமுடிகிறது.

புதுமைப்பெண்:

ஒருதேசத்தின் பெருமைமாதர்களின் அறிவையும் ஆற்றலையும் பொறுத்து இருக்கிறது. ஆண் இனத்திற்கு அடிமைப்பட்டுக் கிடக்கின்ற பெண்கள் புதுமைப் பெண்களாய் வீறுகொண்டு எழுந்து புதிய சமுதாயத்தை உருவாக்க வேண்டும் என்று விரும்பிய பாரதி புதுமைப் பெண்களைப் படைத்தார்.

"நிலத்தில் யார்க்கும் அஞ்சாதநெறிகளும்
திமிர்ந்தஞானச் செருக்கும்..."

எனப் பாரதிபுதுமைப் பெண்ணைப் போற்றுகிறார். மேலும்

"மூத்தபொய்மைகள் யாவும் அழிப்பாராம்
மூடக் கட்டுக்கய் யாவும் தகர்ப்பாராம்"

இவ்வாறுசாத்திரங்கள் பலகற்றுசவுகரியங்கள் பல செய்து பொய்மைக்கும் புரட்டுக்கும் முற்றுப் புள்ளி வைத்து வெற்றி வாகை பல சூடுவார்களாம் என பாரதி பெண்ணினத்தை போற்றுகிறார்.

காவியபாத்திரத்தில் புரட்சி:

பாஞ்சாலிசபதம் என்றகவிதைப் படைப்பில் இருபதாம் நூற்றாண்டின்பெண்ணிய இலக்கியத்தின் உரிமைக்குரல் வெளிப்படுகின்றன. கணவன் தருமனால் பாஞ்சாலி சூதில் பணயம் வைக்கப்பட்டு தோற்று துரியோதனனுக்கு அடிமையாக்கப் படுகின்றாள். ஆவளை அவமானம்படுத்தும் நோக்கத்தால் சபை நடுவேகொணர்ந்து அவள் துகிலை உரிந்து பெருமையும் மகிழ்ச்சியும்பெறக் கௌரவர்கள் முயல்கின்றனர். கண்ணன் அருளால் பாஞ்சாலிகாக்கப்பட்டால் என்பதுகதைஆகும். மன்னன் ஆனையால் தன்னை அவைக்கு வரவேண்டும் என்றுஅழைக்கவந்தஅதேர்ப்பாகனிடம் என்னைத் தோற்றப்பின் என் கணவர் தம்மைப் பணயம் வைத்துத் தோற்றாரா? அறிந்துவா என்றாள் பாஞ்சாலி. மீண்டும் வந்தபாகனிடம் நாயார் தம்மைதோற்று உரிமை இழந்த அடிமையானப் பின்னால் என்னைப் பணயம் வைக்கும் உரிமை அவர்க்கில்லை? தாம் அடிமையானப் பின் எந்தசாத்திரத்தின் அடிப்படையில் என்னைப் பணயம் வைத்துத் தோற்றார். தாயகத்தில் விலைப்பட்டு அடிமையான அவர்க்கு என்னிடம் மனைவிஎன்ற உரிமையே இல்லை என்று கூறும் அளவில் பாஞ்சாலி புரட்சிப் பெண்ணாகப் படைக்கப்பட்டுள்ளால்.

"தக்கதுநீ செய்தீர் தருமத்துக்கு இச்செய்கை
ஒக்கும் என்று கூறிடஎகந்தனராம் சாத்திரிமார்
பேயரசுசெய்தால் பிணந்தின்னும் சாத்திரங்கள்"

வீட்டுமன் உரைத்த நீதிக் கேட்டுப் போய் அரசு செய்தால் பிணந்தின்னும் சாத்திரங்கள் எனக் கண்டனம் செய்கின்றாள் பாஞ்சாலி. தனக்கு வந்த துன்பத்தை ஏற்றுத் தாங்கி துணிவுடன் வாதாடுகிறாள். தருமத்துக்கு மாறான காரியங்களையோ தன் உயிருக்கே கேடு வரக் கூடிய செயல்களையோ செய்யுமாறு கணவன் கட்டளையிட்டால் அவற்றை மனைவி நிறைவேற்ற வேண்டும் என்று கூறும் இந்து பத்தினித் தருமத்தைப் புறக்கணிக்கிறாள் பாஞ்சாலி. பழைய இதிகாசத்தில் வரும் பெண் உருமாற்றம் பெற்றுபுரட்சிப் பெண்ணாகவும் இலட்சியப் பெண்ணாகவும் உருமாற்றம் பெற்றுள்ளனர் என்று மகாகவி பாரதியார் குறிப்பிடுகிறார்.

நிறைவுரை:

பாரதியார் ஒரு மகாகவி மட்டுமன்று அவர் ஒருசிந்தனையாளர் தேசியவாதி விடுதலை போராட்டவீரர், பத்திரிக்கையாளர் புரட்சியார் புதுமையாளர் பன்மொழியாளர் பொருளாதார ஆர்வம் உடையவர் இக்கல்விமுறைகளைப்பற்றி எழுதிய கல்வியாளர் கதையாசிரியர் கட்டுரையாளர் மொழி

துணைநூற் பட்டியல்

1. இராமலட்சுமணன், பாரதியார் கவிதைகள், உமா பதிப்பகம், சென்னை.600 001. இரண்டாம் பதிப்பு, மே 2011.

2. சுப்ரமணிய பாரதி, சி.-பாரதிஅறுபத்தாறு — பகுதி 07, பாரதி பிரசுராலயம், திருவல்லிக்கேணி, சென்னை. ஆறாம் பதிப்பு, 1943.

அறிஞர் எல்லவற்றிற்கும் மேலாக பாரதி ஒரு பெண்ணியவாதி. பாரதியின் ஆளுமையின் பன்முகத்தன்மைகள் அனைத்தும் அவரது பெண்ணியச் சிந்தனைகள் அவரது ஆர்வத்தாலும் அறிவுத்திறத்தாலும் பெண்ணின் மாண்புகளை எடுத்தியம்பியுள்ளார் என்பதை மேற்கண்ட தரவுகளின் அடிப்படையில் அறியலாகிறது.

3. மகரந்தன், (தொ.ஆ.)- வாணிதாசண் கவிதைத் திரட்டு, சாகித்திய அகாதெமி, புது தில்லி 110 001. முதல் பதிப்பு, 2014.

4. இராஜ சேகரன் (தொ.ஆ.) - பாரதிதாசன் கவிதைகள், ராமையாபதிப்பகம், சென்னை 600 014. முதல் பதிப்பு, ஜூலை - 2012.

அற இலக்கியத்தில் வாழ்வியல் விழுமியங்கள்

முனைவர் பெ.செந்தில்நாதன்
பேராசிரியர் , தமிழ்த்துறை
சீனிவாசன் கலை மற்றும் அறிவியல் கல்லூரி, பெரம்பலூர்

முனைவர்த. மரகதம்
இணைப்பேராசிரியர்
தமிழாய்வுத்துறை, அரசுகலைக்கல்லூரி, அரியலூர்

தமிழர்கள் நாகரிகத்திலும், பண்பாட்டிலும் தலைசிறந்தவர்கள். தமிழர்களின் வாழ்க்கை முறைப்படுத்தப்பட்டவை. மனிதனை மனிதனாக்குவதற்காகப் படைக்கப்பட்டவையே நெறிமுறைகள். மனிதன் மனிதனாக வாழவும், மாமனிதனாக எணஉயரவும் வழி காட்டியது மட்டுமல்லாது, 'யாதும் ஊரே யாவரும் கேளிர்' என்ற உயர்ந்த சிந்தனையை உருவாக்கியது வாழ்வியல் விழுமியங்களே. இவை அற இலக்கியங்களில் பொதிந்து காணப்படுகின்றன. தமிழ் மக்களுக்குரிய சிறந்த ஒழுக்கங்களையும், பண்புகளையும், உயர்ந்த நாகரிகத்தையும், பழக்க வழக்கங்களையும் எடுத்துரைப்பவையாக அற இலக்கியங்கள் விளங்குகின்றன. மனித வாழ்வைப் பெருமையுடையதாகவும் மாண்புடையதாகவும் மாற்றி நல்வழிப்படுத்துகின்ற வாழ்வியல் சார்ந்த சில அறக்கோட்பாடுகளை அல்லது அறக்கருத்துக்களை விழுமியங்கள் என்று கூறலாம். அவ்வகையில் அறம் சார்ந்த வாழ்வியலின் விழுமியங்கள் அறநூல்களில் அதிகமாகவே காணப்படுகின்றன.

எண் வகை வாழ்வியல் அறம் :
மக்களுடையநல்லொழுக்கங்களுக்கு அடிப்படையான குணங்கள் எட்டு என்றும் ஆசாரக்கோவை அவைகளைப் பின்பற்றி வாழ்பவரே ஒழுக்கம் தவறாமல்என்றும் கூறுகின்றது . இதனை ,

"நன்றியறிதல் பொறையுடைமை
இன்சொல்லோடு
இன்னாத எவ்வுயிர்க்கும் செய்யாமை
கல்வியோடு
ஒப்புரவு ஆற்ற அறிதல் அறிவுடைமை
நல்லினத்தாரோடு நட்டல் இவை எட்டும்
சொல்லிய ஆசார வித்து" (பா.எ 01)

என்ற ஆசாரக்கோவை பாடல் வழி அறியலாம் .
'வித்தின்றி விளைவில்லை என்பார் தாயுமானவர். ஒழுக்கம் உயிரினும் மேலானது. மேற்கண்ட எட்டுக் குணங்களும்

நல்லொழுக்கத்தை வளரச் செய்யும் விதைகளாகும் .

தனி மனித ஒழுக்க நெறிகள் :
சமுதாயத்தில் மனிதனை நெறிப்படுத்தி நல்லவனாக அடையாளப் படுத்தக் கூடியவை அவனது நற்பழக்க வழக்கங்களே ஆகும். இப்பழக்க வழக்கங்கள் ஆத்திச்சூடியில் அதிகமாக காணப்படுகின்றன.

"அறஞ்செய விரும்பு, தந்தை தாய் பேண், வஞ்சகம் பேசேல், குணமது கைவிடேல், சான்றோரினத்திரு, ஊருடன் கூடி வாழ், தேசத்தோடு ஒத்துவாழ், சோம்பித் திரியேல், பீடு பெற நில், வைகறை துயிலெழு, சூது விரும்பேல், தெய்வம் இகழேல்" போன்ற தனிமனித ஒழுக்க நெறிகளை சுருங்கச் சொல்லி நெறிப்படுத்துகின்றது .

மனிதனுக்குச் சிந்திக்கும் ஆற்றல் இருக்கின்றது. நல்வழியில் சிந்திக்கும் ஆற்றலுடைய மனிதன், தன் வாழ்க்கைக்கு ஒரு சிறந்த குறிக்கோளை உருவாக்கிக் கொள்வான். அன்றாட வாழ்வில் ஒழுக்கம் அமைவதற்குச் சில இயல்புகள் உள்ளன. மனிதன் அன்றாடம் செய்யவேண்டிய நெறிகளை ஆசாரக்கோவை மிகத் தெளிவாக எடுத்தியம்புகின்றது.

" வைகறை யாமம் துயிலெழுந்து தான் செய்யும்

நல்லறமும் ஒண்பொருளும் சிந்தித்து வாய்வதில்

தந்தையும் தாயும் தொழுதெழுக என்பதே முந்தையோர் கண்ட முறை'' (பா.எ .. 4)

வைகறைப் பொழுதாகிய அதிகாலையில் எழவேண்டும். எழுந்தவுடன் அன்று செய்யவேண்டிய நற்செயல்களையும், ஒப்பற்ற பொருளான இறைவனையும் நினைத்து, பின் பெற்றோரை விழுந்து வணங்கி அன்றைய நாளைத் தொடங்கவேண்டும் என்பதே முன்னோர்கள் கூறிய வாழ்க்கை முறையாகும் என்று மேற்கண்ட ஆசாரக்கோவை பாடல் கூறுகின்றது .

உயர்ந்தோர் செயல்
அறிவில் சிறந்து விளங்குதல், உயர்ந்த எண்ணம் உடையவராக இருத்தல், பிறரிடம் அன்போடு பழகுதல், பிற உயிர்களுக்குத் தீங்கு செய்யாமை போன்ற நற்குணம் மிக்கவர்களைச் சமுதாயத்தில் உயர்ந்தோராகக் கருதப்படுவர். சமுதாயத்தில் நல்ல விருந்தினனாக இருப்பவனும், உயிரைக் கொல்லாது வாழ்பவனும், உயிரினும் இனிய ஒழுக்கத்தில் சிறந்த ஆசிரியனும் உயர்ந்தோர் என திரிகடுகம் கூறுகின்றது . இதனை,

"ஓல்வது அறியும் விருந்தினனும் ஆர் உயிரைக்

கொல்வது இடை நீக்கி வாழ்வானும் – வல்லிதின்

சீலம் இனிது உடைய ஆசானும் – இம் மூவர் ஞாலம் எனப் படுவார் '' (பா. எ .. 26)

என்ற பாடல் உணர்த்துகின்றது .

மேலும் நல்வர்களின் செயல்களாக சிலவற்றை அந்நூலிலுள்ள கீழ்க்காணும் பாடல் கூறுகின்றது.

"உண்பொழுது நீராடி உண்டலும் என்பெறினும்

பால்பற்றிச் சொல்லா விடுதலும் தோல்வற்றிச்

சாயினும் சான்றாண்மை குன்றாமை – இம் மூன்றும்

தூஉயம் என்பார் தொழில்"

(பா.எ..27)

இல்வாழ்க்கை
அறன் எனப்பட்டதே இல்வாழ்க்கை என்கின்றார் திருவள்ளுவர் . இல்லறம் என்பது கணவன், மனைவி ஆகிய இருவரின் அன்பாலும் வாழ்க்கை மேம்பாட்டாலும் அமையும் தன்மையது. வாழ்க்கைக்குத் துணையாக வரும் இல்லாளுடன் கூடி இம்மை, மறுமை ஆகியவற்றிற்குப் பயன்தரும் வகையில் நடத்தப்படும் அறவாழ்வே இல்லறம். இதனை திருவள்ளுவர் தம் குறளில் ,

"அன்பும் அறனும் உடைத்தாயின் இல்வாழ்க்கை

பண்பும் பயனும் அது " (கு.எ.. 45)

என்று கூறுகின்றார். அன்போடு அறனும் சேர்ந்த வாழ்யே பண்டய காலத் தமிழர்கள் விரும்பினர். இல்லறம் சிறந்து விளங்க வேண்டுமென்றால் அங்கே அன்பு மலர்ந்து மனம்வீச வேண்டும். ஒருவருக்கொருவர் விட்டுக் கொடுத்து வாழ வேண்டும். தலைவனும் தலைவியும் இணைந்து நடத்தும் நல்லறமே இல்லறம் இதனை ,

கணவனும் மனைவியும் கருத்தொன்றுபட்டு செய்யும் செயலே சிறக்கும் என்ற குடும்ப விழுமியத்தை,

"காதல் மனையாளும் காதலனும் மாறுஇன்றித்

தீதுஇல் ஒருகருமம் செய்பவரே ஓது கலை" (நன்னெறி- பா.6)

என்ற நன்னெறி பாடல் வழி அறியலாம்.

விருந்தோம்பல்

பண்டைய காலத்தில் பெரிதும் போற்றப்பட்ட பேரறம் விருந்தோம்பலாகும். குடும்ப வாழ்வில் விருந்தோம்பலை ஏற்றுக் கொண்டனர்.

இல்லறம் போற்றும் மனைவி விருந்தோம்பும் பண்பில் சிறந்தவளாக விளங்க வேண்டும். வீட்டிற்கு வரும் விருந்தினரை வரவேற்று, முக மலர்ச்சியுடன் உணவளித்து உபசரித்தலே நல்லறமாகும்.

ஒரு மனையாள் முகம் மலர்ந்து விருந்து கொடுத்தாள் என்றால் அவ்வீட்டில் அவ்வீட்டில் திருமகளே வந்து குடியிருப்பாள். இதனை

அகனமர்ந்து செய்யாள் உறையும் முகனமர்ந்து
நல்விருந்து ஓம்புவான் இல்"

(கு. எ –84)

என்று கூறுகின்றது .

விருந்தினர் சொல்லாமல் முகக்குறிப்பறிந்து வேண்டுவனவற்றை உபசரிக்கும் செயலை,

"சொல்லாமை நோக்கிக் குறிப்பறியும் பிண்பற்றம்
இல்லாளே வந்த விருந்தோம்பி"

(பழமொழி – பா.எ—331)

என்ற பழமொழி நானூறு பாடல் வலியுறுத்திக் கூறுகின்றது .

ஈகை :

சிறந்த மனிதப் பண்புகளுள் ஈகையும் ஒன்றாகும். ஈதல் இசைபட வாழ்தலும் உயிர்க்கு ஊதியமாகும் என்கின்றார் வள்ளுவர். ஒருவருடைய நல்மனத்தினை உறுதிப்படுத்துவது அவரிடமுள்ள ஈகைப் பண்பே. ஈதல் என்பது மனமுவந்து செய்வதாக அமைதல் வேண்டும் . ஒரு பொருளும் இல்லாத வறியவருக்கு ஒரு பொருளை கொடுத்து உதவுவதே சிறந்த ஈகைப் பண்பாகக் கருதப்படுகின்றது .

"இம்மியரிசித் துணையானும் வைகலும்
நும்மில் இயைவ கொடுத்துண்மின்--
நும்மைக்
கொடாஅ தவரென்பர் குண்டுநீர் வையத்து

அடாஅ அடுப்பினவர்"

(நாலடியார் .. பா.எ 94)

ஈகையாகப் பொருளைக் கொடுக்கின்ற அளவை விட கொடுக்கின்ற தன்மையே பெரிது. கேட்வருக்கு உதவும் ஈகைப் பண்பை விட சிறந்ததும், புகழ் மிக்கதும் இவ்வுலகில் வேரொன்றுமில்லை என்பதை முதுமொழிக்காஞ்சி,

"இரப்போர்க் கீதலின் எய்துஞ் சிறப்பில்லை" (6. இல்லைப் பத்து)

என்று கூறுகின்றது. *"ஈவது விலக்கேல்"* என்று ஆத்திசூடியும் ஈகையின் சிறப்பினை எடுத்துரைக்கின்றது.

கல்வி :

மனிதனுடைய வாழ்க்கை முறையையும், பண்பாட்டையும், மரபுகளையும் அடுத்த தலைமுறைக்குக் கொண்டு செல்வது கல்வியாகும். மனிதன் மனிதனாக வாழ அடிப்படையாகத் திகழ்வது கல்வியே. உலகிலுள்ள மக்கள் அனைவரும் வாழ்வாங்கு வாழ அடிப்படையாகத் திகழ்வது கல்வி. மனிதனுடைய மனதைத் திருத்தி, பண்படுத்துவதும்கல்வியே.

கற்றது கை மண்ணளவு. கல்லாதது உலகளவு. கல்விக்குக் கரையும் இல்லை. ஆகவே வாழ்கின்ற நாட்களில் பயனுடைய நூல்களைக் கற்றிட வேண்டும். பாலும், நீரும் கலந்திருக்கும் பாத்திரத்தில் பாலை மட்டும் பருகும் அன்னப்பறவை போல நல்ல நூல்களைக் கற்க வேண்டும் எனஅற நூல்கள் கூறுகின்றது.

"தேவரே கற்றவர் கல்லாதார் தேருங்கால்
பூதரே முன்பொருள் செய்யாதார்"

(சிறுபஞ்சமூலம் . பா.எ.20

அறிவு வளரக் கூடிய நூல்களைப் படித்தவர் தேவருக்கு ஒப்பாவார். அவற்றைக் கல்லாதவர் பேய், பிசாசுகளோடு ஒப்பிடத்தக்கவர் என்று மேற்கண்ட பாடல் கூறுகின்றது .

வாழ்க்கையில் கவலை வந்தவிடத்து உதவி புரிவதும், சில வாழ்நாட்களை உடைய உயிர்களுக்கு தக்கத் துணையாக அமைவது

கல்வி ஆகும். இதனைக் காட்டிலும் சிறந்த துணைஉலகில் வேறில்லை என்பதை,

"உற்றுழியுங் கைகொடுக்கும் கல்வியின்
ஊங்கில்லை
சிற்றுயிர்க் குற்ற துணை"

(பா.எ.02)

என்று குமரகுருபரர்கூறியுள்ளார். கல்வி இந்தப் பிறவியிலே நற்பயனைத் தரும். பிறருக்குச் சொல்லிக் கொடுப்பதினால் குறைந்து போகாது. அது அழியாது நிலைப்பெற்றிருக்கும். எனவே கல்வியைப் போல மன மயக்கத்தை நீக்கும் மருந்து எவ்வுலகிலும் இல்லை என்பதை ,

"எம்மை உலகத்தும் யாம்காணோம்
கல்விபோல்
மம்மர் அறுக்கும் மருந்து"

(நாலடியார் . பா.எ 132)

என்ற நாலடியார் பாடல் கூறுகின்றது .

எந்த உலகிற்குச் சென்றாலும் கல்வியைப் போல அறியாமையைப் போக்கும் மருந்து ஒன்றினை யாம் கண்டதில்லை என்பதை மேற்கண்ட பாடல் உணர்த்துகின்றது.

முடிவுரை:

மனிதனை நல்வழிப்படுத்தி சமுதாயத்தில் சிறந்து விளங்குவதற்கு அற இலக்கியங்களில் பல வாழ்வியல் விழுமியங்கள் காணப்படுகின்றன.

தனி மனித வாழ்க்கைக்கு ஒழுக்க நெறியே இன்றியமையாதது.

உயிரினும் சிறந்த ஆசிரியர் ஒழுக்கத்தில் தலைசிறந்தவராகக் கருதப்படுவர்.

குடும்ப வாழ்வில் கணவன் மனைவி இருவரும் ஒற்றுமையுடன் வாழ்தல் சிறப்பு. மனையாள் விருந்தோம்பும் பண்பில் சிறந்து விளங்கவேண்டும்.

ஈகைப் பண்பு வழிவழியாக வளரவேண்டும். கல்வி கற்றவர்களையே மேலோர் விரும்புவர். கல்வியால் தான் மனிதனைப் பண்படுத்த முடியும்.

எனவே மனித மனத்தை மேம்படுத்தவும், வாழ்வில் நிறைவு கண்டு உயர் நிலையை அடையவும் அற நூல்களின் பங்கு இன்றியமையாதது. உலக வாழ்விற்கு ஏற்றதை நாம் ஊக்கமுடன் கடைப்பிடித்தால் வீடும் நாடும் உயர்ந்து விளங்கும் என்பதில் ஐயமில்லை.

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பாரதிதாசன் பாடல்களில் அகப்பொருள் கூறுகள்

முனைவர். சா.செல்வி.

தமிழ்த்துறை, உதவிப்பேராசிரியர்
சீனிவாசன் கலை மற்றும் அறிவியல் கல்லூரி
பெரம்பலூர்

முன்னுரை

இருபதாம் நூற்றாண்டின் இணையற்ற கவிஞராக விளங்கிய பாரதிதாசன். பழந்தமிழர்களின் அகவாழ்க்கை முறையினைப் போற்றும் வகையில் தம் படைப்புகளில் பல அகப்பொருட் கூறுகளைள் கையாண்டுள்ளார். பாரதிதாசனின் 'காதற் பாடல்கள்' என்னும் தொகுப்பில் காணப்படும் அகப்பொருள் கூறுகளுள் ஒன்றாகிய பிரிவொழுக்கம் பற்றி மட்டும் விளக்குவதாக இக்கட்டுரை அமைகின்றது.

பிரிவொழுக்கம்

தலைவன் தலைவியை ஏதேனும் ஒரு காரணத்தின் பொருட்டுப் பிரிந்து செல்லும் மரபு பழந்தமிழகத்தில் வழக்கில் இருந்தது. இப்பிரிவை அகப்பொருள் இலக்கண நூல்கள், ஓதற்பிரிவு, பகைவயிற் பிரிவு, தூதிற்பிரிவு, பொருள்வயிற் பிரிவு, காவற் பிரிவு, பரத்தையிற் பிரிவு என ஆறாக வகைப்படுத்திக் கூறுகின்றன. தொல்காப்பியம் அகத்திணையியலில்,

'ஓதல் பகையே தூதிவை பிரிவே' (தொல். பொருள். 27) என வகைப்படுத்தியுள்ளது. மேலும் பொருள்வயிற் பிரிவு (தொல்.பொருள்.35) காவற்பிரிவு (தொல்.பொருள்.32), பரத்தையிற் பிரிவு (தொல்.பொருள். 220) பற்றியும் கூறியிருப்பது குறிப்பிடத்தக்கதாகும். தொல்காப்பியத்திற்குப் பின்னர் எழுந்த அகப்பொருள் இலக்கண நூலாகிய இறையனாரகப் பொருளும்,

'ஓதல் காவல் பகைதணி வினையே
வேந்தர்க் குற்றுழி பொருட்பிணி பரத்தையென்
றாங்க ஆறே அவ்வயிற் பிரிவே'

(இறை.35)

என வகைப்படுத்தியிருப்பதை சுட்டிக் காட்டத் தக்கதாகும். இவ்வாறு அகப்பொருள் இலக்கண நூல்கள் கூறியுள்ள பிரிவொழுக்கங்கள் பற்றி பாரதிதாசனும் தம் காதற்பாடல்களின் வழி வெளிப்படுத்தியுள்ளார்.

ஓதற்பிரிவு

கல்வியின் பொருட்டுத் தலைவன் தலைவியை விட்டுப்பிரிந்து செல்லுதல் ஓதல் பிரிவு என்பதாகும். அதாவது அயல் நாடுகளுக்குச் சென்று அந்நாட்டுப் பழக்கவழக்கங்கள், கலை நுட்பங்கள், தொழில் நுணுக்கங்கள், வணிக இயல்புகள், அரசியல் முறைகள் முதலியவற்றைக் கற்றுத் தெரிந்துவரும் பொருட்டுத் தலைவன் தலைவியைப் பிரிவான். இத்தகைய பிரிவு ஓதற் பிரிவைக் குறிக்கும், இப்பிரிவு பற்றிய குறிப்பினை.

'ஓட்டும் அன்பன் உடல் மருந்தும்
உறக்கம் கொள்ளுவ தெப்படி? நடை
ஓவியமே செய்படி! - அவன்
எட்டச் சென்றான் தமிழ் பரப்பிட
என்று சொல்வதும் தப்படி - என்
மன வீட்டினில் அவன் இருக்கையில்''.

(ப.76)

என்ற 'அவன்மேல் நினைவு' என்றும் தலைப்பின் கீழுள்ள பாடல் வரிகளின் வாயிலாக அறியலாம். இப்பாடல் வரிகள் தலைவனைப் பிரிந்த தலைவியின் கூற்றாக அமைந்திருப்பினும் தலைவன் தமிழ் மொழியைக் கற்றுவரப் பிரிந்தவனாக அல்லாமல் தமிழைப் பரப்பிடப் பிரிந்து சென்றவனாகக் காட்டப்படுகின்றான். இதன் மூலம் பாரதிதாசன் பழைய மரபைத் தம் காலச் சூழலுக்கு ஏற்பப் பின்பற்றியிருப்பதையும் தமிழ் மொழியின் மீது அவருக்கிருந்த பற்றினையும் அறியமுடிகிறது.

போர்வயிற் பிரிவு

தன் நாட்டின் மீது படையெடுத்து வந்த அயல்நாட்டவரோடு போரிட்டு அவர்களை அடக்கும்பொருட்டுத் தலைவன் தலைவியை விட்டுப்பிரிந்து செல்வான். இது 'பகைவயிற் பிரிவு' என்றும் 'பகை தணிவினைப் பிரிவு' என்றும் கூறப்படுகின்றது.

பாவேந்தர் தமிழின்பால் எந்த அளவு நீங்காத பற்றுக்கொண்டாரோ அதேஅளவு தமிழரின் மீதும் தமிழ்நாட்டின் மீதும் நீங்காத பற்றுக்கொண்டவர். அத்தகையவர் தமிழரின் நாடு மாற்றானிடத்தில் அடிமைப்பட்டுக் கிடப்பதைக் கண்டு வெகுண்டெழுகின்றார். இதனை ஒரு காதல் தலைவனின் கூற்றுவழிப் பின்வருமாறு வெளிப்படுத்துகின்றார்.

'நாட்டுக்கு மீட்சியடி
நம் தமிழர் ஆட்சியடி

நாட்டச்செல் வேன் அதற்குள்
வந்தால் வரச்சொல் - எனக்கே
நல்லபடி ஆசைமுத்தம்
தந்தால் தரச்சொல்” (.40)

இப்பாடல் வரிகள் ‘ வந்தால் வரச்சொல் ..... தந்தால் தரச்சொல்” என்ற தலைப்பின் கீழமைந்துள்ளவை. தமிழர் ஆட்சியை நாட்டும் பொருட்டுத் தலைவியைப் பிரிந்து செல்கின்ற தலைவனின் மனநிலையை விளக்குவதாக இப்பாடல் வரிகள் அமைந்துள்ளமையைக் காணலாம். மேலும் இப்பகைவயிற் பிரிவில் தலைவிக்கு ஏற்படும் கூற்றுநிலையை,

விலங்கறுத்தே தமிழ்நாட்டை
மீக்க நடந்தான் - அவன்
கலங்கரை விளக்கடி என்
காதல் நிலைக்கே   (ப.58)

என்ற பாடல் வரிகளின்மூலம் விளக்குகின்றார். இப்பாடல் வரிகள் ‘அவன் கலங்கரை விளக்கடி” என்ற தலைப்பின் கீழமைந்துள்ளன. போர்வயிற் பிரியும் தலைவனைப் பழந்தமிழ்ப் பெண்டிர் போற்றி வழியனுப்புதல் மரபு. இம்மரபைப் பாரதிதாசனும் போற்றியிருக்கிறார். என அறியலாம். பாரதிதாசன் தம் நாட்டுப் பற்றினையும் இதன் வழிப் புலப்படுத்தியுள்ளார் என்பதையும் அறியமுடிகிறது.

பொருள்வயிற் பிரிவு

தலைவியை மணக்கும் பொருட்டுத் தலைவன் பொருள் தேடிப் பிரிந்து செல்வான். இது ‘வரைவிடைப் பொருட் பிரிவு’ எனப்படும். தன் முன்னோர்கள் ஈட்டிய பொருள் தனக்கு நிறைய இருப்பினும் தனது முயற்சியால் ஈட்டிய பொருளைக்கொண்டு வாழ்க்கை நடத்த வேண்டும் என்ற நோக்கத்தோடு தலைவன் பிரிவான். இத்தகைய பிரிவைப் பாரதிதாசன் ‘என் அத்தான் எனக்குப் பொன் அத்தான்” என்ற தலைப்பின் கீழுள்ள,

மணக்கத்தான் பணத்தைத்தான்
குவிக்கத்தான் புறப்பட்டான்
மறப்பானோ தோழிப் பெண்ணே!
(ப.90)

என்ற பாடல் வரிகளின்வழி விளக்குகிறார். இவ்வாறு தலைவன் தன் திருமணத்திற்கான பொருளைத் தானே தேடிவந்து மணக்கின்ற மரபு தற்காலத்தில் இல்லையென்றாலும், பழங்கால மரபைப் போற்றும் வகையில் பாரதிதாசன் பாடல்வரிகளை அமைத்திருப்பது இங்கு குறிப்பிடத்தக்கதாகும்.

பரத்தையர் பிரிவு

பரத்தையிற் பிரிவு என்பது பொதுப் பெண்டிர் மாட்டுப் பிரியும் பிரிவைக் குறிப்பதாகும். இப்பிரிவில் தலைவிக்கு ஏற்படும் கூற்று நிலையை ‘போ என்றாள் பின், வா என்றாள்” என்னும் தலைப்பின் கீழுள்ள,

‘வயலாள் விரல்படினும்
மாசுபடும் ஆப்பால்!

ஆயலாள் விரல்பட்ட
ஆள்நீ, -மயலாகி
நண்ணாதேபோ என்றாள்”.
(ப.108)

என்ற பாடல் வரிகளின்மூலம் கூறுகின்றார். இதில் தலைவன் பசுவின் பாலுக்கு உவமையாகக் கூறப்படுகின்றான். பாலானது விரல் பட்டதும் மாசுபடுவதுபோலத் தலைவனும், பரத்தையின் விரல் பட்டால் மாசுபட்டுவட்டான் என்ற கருத்தினை எடுத்துக் கூறிப் பரத்தையிடம் இருந்து திரும்பி வந்த தலைவனைத் தலைவி வாயில் மறுப்பதாக மேற்கூறிய பாடல் வரிகளின்வழி அறிந்து கொள்ள முடிகிறது.

போனால் போகட்டுமே - பசும்
பொன்னா யிருந்தவன் பித்தனையாய் அங்கே
போனால்
போகட்டுமே
ஆனாலும் என்றன் அன்பை மறந்தான் - அந்த
ஆந்தைக் கூட்டிற் புறாவாய்ப் பறந்தான்
ஊனாய் வற்றிய பசுவைக் கறந்தான் - அவன்
உள்ளன்பி லாதவ ஏால்சீர் கலைந்தான்
போனால் போகட்டுமே. (ப.113)

என்ற தலைவி வருத்தம். என்னும் தலைப்பின் கீழுள்ள பாடல் வரிகள் தலைவனின் பரத்தையிற் பிரிவை வெளிப்படுத்தி நிற்கின்றன. தலைவி தலைவனின் பரத்தமை ஒழுக்கத்தை மறுத்தாலும் பின்பு அவனை ஏற்றுக்கொள்ளும் நிலையும் அக்காலத்தில் இருந்து, இத்தகைய வழக்கதைச் சுட்டும் வகையில் மேற்கூறிய போ என்றாள் பின் வா என்றாள் (ப.108),’தலைவி வருத்தம்” (ப.113) போன்ற தலைப்புக்களில் உள்ள மற்றவர்கள் விளக்கி நிற்கின்றன என்பதும் இங்குச் சுட்டிக்காட்டத்தக்கதாகும்.

இவ்வாறு பாரதிதாசன் தம் காலச் சூழலுக்கு ஏற்ப பழைய அகப்பொருள் மரபுகளைப் பின்பற்றியிருப்பதை அவர்தம் காதற்பாடல்களின் வழி அறிந்து கொள்ளலாம்.

துணைநூற் பட்டியல்

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   தொல்காப்பியர் காலத் தமிழர்,
   பாரிநிலையம், சென்னை, 1968.
2. சுப்பு ரெட்டியர்,ந.,
   அகத்தினைக் கொள்கைகள்,
   பாரிநிலையம், சென்னை 1981
3. பாரதிதாசன்,
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   சென்னை, 1977.
4. பாலசுந்தரம் பிள்ளை, தி.சு.,
   பண்டைத் தமிழர் இன்பியல் வாழ்க்கை,
   கழகவெளியீடு, சென்னை, 1960.

நாலடியார் சுட்டும் யாக்கை நிலையாமை

முனைவர் மு.சுரேஷ்
உதவிப்பேராசிரியர்,
சீனிவாசன் கலை மற்றும் அறிவியல் கல்லூரி, பெரம்பலூர்

அறிமுகவுரை

நம் மொழியானதமிழ் மொழியில் கிடைத்த இலக்கியங்களை அந்தந்தக்காலக் கட்டத்திற்கு ஏற்ப, சங்க இலக்கியங்கள், நீதி இலக்கியங்கள், பக்தி இலக்கியங்கள், இக்கால இலக்கியங்கள் என்று வகைப்படுத்தியுள்ளனர். காதலையும் வீரத்தையும் அடிப்படையாகக் கொண்டு அகப்பொருள், புறப்பொருள் எனப் பிரித்து வாழ்ந்து வந்த மக்களுக்கு அறம் உண்டு என்பதை உணர்த்தவும் மக்கள் அற நெறியின்கண் நின்று வாழ்தல் வேண்டியும் அற இலக்கியங்கள் தோன்றிற்று. சங்கம் மருவிய காலத்தில் தோன்றிய இலக்கியங்கள் நீதி இலக்கியங்கள் ஆகும்.

சங்க இலக்கியம்

சங்க இலக்கியமான 'பத்துப்பாட்டு, எட்டுத்தொகை' ஆகிய பதினெட்டு நூல்களுள் பெரும்பாலும் ஆசிரியப்பாவால் இயற்றப்பட்டு மூன்றடி முதல் நானூறு அடிகள் வரையிலானப் பாடல்களைக் கொண்டு விளங்குவதைப் பதினெண் மேற்கணக்கு நூல்கள் என்றும், வெண்பா யாப்பில் இயனற்றப்பட்டு இரண்டடி முதல் நான்கடி வரையிலானப் பாடல்களை கொண்டு விளங்கும் 'திருக்குறள், நாலடியார்' போன்ற பதினெட்டு நூல்களும் பதினெண் கீழ்க்கணக்கு நூல்கள் என்றும் வகைப்படுத்தியுள்ளனர்.

களப்பிரர் காலமும் நீதிநூல்களின் வளமும்

மூவேந்தர் ஆட்சியை வீழ்ச்சியடையச் செய்த களப்பிரர் ஆட்சியினை இருண்ட காலம் என்று வரலாற்று ஆசிரியர்கள் அழைப்பர். இக்களப்பிரர் ஆட்சி கி.பி மூன்றாம் நூற்றாண்டில் தொடங்கி, கிபி ஆறாம் நூற்றாண்டு வரை இருந்தது. ஆவர்களின் ஆட்சியில் சமணமும் பௌத்தமும் செல்வாக்குப் பெற்றிருந்தது. இக்காலக் கட்டத்தில் அற நூல்கள் பெருகின.

"தேரல் பருகிப் புலால் உண்டு இன்ப வாழ்வில் திளைத்த பழைய வாழ்க்கையை விடுத்துச் சமண பௌத்த மதச் செல்வாக்கால் பல்வேறு நோன்பு வாழ்க்கைமேற்கொள்ளப்பட்டது." நீதி இலக்கியம் பல்கிப் பெருக அதுவே காரணமாகும். (தமிழண்ணல் தமிழிலக்கிய வரலாறு. ப – 152). சங்க இலக்கிய காலத்திற்கும் பக்தி இலக்கிய காலத்திற்கும் இடைப்பட்ட காலமே நீதி இலக்கியத்தின் காலமாகும்.

"கி.பி. 470 – ஆம் ஆண்டில், வச்சிரநந்தி என்ற சமண முனிவர், திராவிடச் சங்கம் ஒன்றை நிறுவி, இருண்டக் காலத் தமிழ் மக்கள் தம் பண்டை அறவொழுக்கங்களைப் போற்றி அவற்றின் வழியே நல்வாழ்க்கை நடத்தச் சிறுசிறு நீதி நூல்களை, எளிய வெண்பாக்களில் எழுதி வெளியிடலானார்கள்."

(பேராசிரியர் எம்மார். அடைக்கல நாயகி தமிழிலக்கிய வரலாறு. ப – 102).

களப்பிரர்கள்

களப்பிரர்கள் நிலம் குறித்தவினாவிற்கு முழுமையான வரலாறு கிடைக்கவில்லை என்றாலும், ஒரு சில குறிப்புகளைக் கொண்டு யூகித்து அறிய முடிகிறது. "வேள்விக்குடிச் செப்பேடுகள் 'களப்பிரர்கள்'என்று குறிப்பிடுகின்றனர். வரலாற்று ஆசிரியர்கள் 'களப்பாளர்கள்' என்று கூறகின்றனர். இவர்கள் தமிழகத்தின் வடக்கில் வேங்கட மலைப்பகுதியில் வாழ்ந்த 'கள்வர்கள்' என்றும், கருநாடகக் கல்வெட்டுகளில் 'கலிகுலன், கலிதேவன்' என்று குறிப்பிடப்படும் 'களபேரா' இனத்தைச் சார்ந்தவர்கள் என்றும், கருநாடகத்தைச் சார்ந்தவர்கள் என்ற கருத்து பலராரும் ஏற்றுக்கொள்ளப்படுகிறது." (முனைவர் கி.இராசாதமிழிலக்கிய வரலாறு. ப – 44).

பதினெண் கீழ்க்கணக்கு

நா.கதிரைவேற் பிள்ளையின் தமிழ் மொழி அகராதி 'கணக்கு' என்ற சொல்லிற்கு 'எண். எழுத்து, காரியம், மட்டு, முடிவு'என்ற பொருளைக் குறிக்கிறது. (ப – 372). இதில் 'எழுத்து' என்பது நூலைக் குறிக்கும்.

அமைப்பிலும், தொகுப்பிலும் சங்க இலக்கியங்களின் தன்மையினின்றும் மாறுபட்டது. குறைந்த அடிகளில் முப்பொருள்களையும் ஒழுங்குப்படுத்திக் கூறுவது கீழ்கணக்காகும்.

பன்னிரு பாட்டியல்

"அறம் பொருளின்பம் அடுக்கி அவ்வகைத்
திறம்பட உரைப்பது கீழ்க்கணக்காகும்."

(முனைவர் சிற்பி பாலசுப்பிரமணியம் தமிழிலக்கிய வரலாறு. ப – 128).

மேலும் பதினெட்டுநூல்கள் குறித்து கீழ்வரும் வெண்பா உணர்த்துகிறது

**"நாலடி நான்மணி நானாற்ப தைந்திணைமுப்
பால்கடுகம் கோவை பழமொழி – மாமூலம்
இன்னிலை சொல்காஞ்சியுடன் ஏலாதி என்பவே
கைந்நிலைய வாங்கீழ்க் கணக்கு."** (பதினெண் கீழ்க்கணக்கு நூல்கள் மூலமும் உரையும். ப - iii).

நீதி நூல்கள்(11)

1. நாலடியார் - சமண முனிவர்கள் - நானூறு வெண்பாக்கள் - சமண சமயம்.
2. நான்மணிக்கடிகை - விளம்பி நாகனார் - நூற்றி ஒன்று வெண்பாக்கள் -
3. இன்னா நாற்பது – கபிலர் - நாற்பத்தி ஒன்று வெண்பாக்கள்,
4. இனியவை நாற்பது – பூதஞ்சேந்தனார் - நாற்பத்தி ஒன்று வெண்பாக்கள்,
5. திருக்குறள் - திருவள்ளுவர் - ஆயிரத்து முந்நூற்று முப்பது வெண்பாக்கள்,
6. திரிகடுகம் - நல்லாதனார் - நூறு வெண்பாக்கள்,
7. ஆசாரக்கோவை – பெருவாயின் முள்ளியார் - நூற்றி ஒன்று வெண்பாக்கள்,
8. பழமொழி நானூறு– முன்றுரை அரையனார் - நானூறு வெண்பாக்கள்,
9. சிறுபஞ்சமூலம் - காரியாசான் - நூற்றி நான்கு வெண்பாக்கள்,
10. முதுமொழிக்காஞ்சி – மதுரைக் கூடலூர்க்கிழார் - நூறு வெண்பாக்கள்,
11. ஏலாதி – கணிமேதாவியர் - எண்பது வெண்பாக்கள்.

அகப்பொருள் நூல்கள் (6)

1. ஐந்திணை ஐம்பது – கண்ணன் சேந்தனார் - ஐம்பது வெண்பாக்கள்,
2. ஐந்திணை எழுபது - மூவாதியார் - எழுபது வெண்பாக்கள்,
3. திணைமொழி ஐம்பது – மாறன் பொறையனார் - ஐம்பது வெண்பாக்கள்,
4. திணைமாலை நூற்றைம்பது – கணிமேதாவியர் - நூற்றைம்பது வெண்பாக்கள்,
5. கார் நாற்பது – மதுரைக் கண்ணங் கூத்தனார் - நாற்பது வெண்பாக்கள்,
6. கைந்நிலை – புல்லங்காடனார் - அறுபது வெண்பாக்கள்.

புறப்பொருள் நூல் (1)

களவழி நாற்பது – பொய்கையார் - நாற்பத்தி ஒன்று வெண்பாக்கள்.

தொல்காப்பியம்

"சின்மென் மொழியால் ஆய பனுவலின் அம்மை தானே அடிநிமிர்பு இன்றே". (தொல்காப்பியம் - செய்யுளியல் - 235). அடி குறைந்து வரும் கீழ்க்கணக்கு நூல்கள் **'அம்மை'**என்னும் அழகு உடையன. (அம் - அழகு, அம்மை – அழகுடன் இருப்பது).

நன்னூல் உரையாசிரியரான **மயிலைநாதரும்** தொல்காப்பிய உரையாசிரியரான **பேராசிரியரும் 'பதினெண் கீழ்க்கணக்கு'** என்று முதன்முதலில் குறிப்பிட்டுள்ளனர்.

வேளாண்வேதம்

நான்கு அடிகளைக் கொண்ட நேரிசை வெண்பாக்கள், இன்னிசை வெண்பாக்களால் அமைந்திருப்பதால் இதற்கு நாலடியார்(வேளாண்வேதம்) என்று பெயர் அமைந்துள்ளது. **'பதுமனார்'** என்னும் புலவர் திருக்குறளைப் பின்பற்றி நானூறுப் பாடல்களையும் **'அறம், பொருள், இன்பம்'** என்ற முப்பாலினுள் வகைப்படுத்தியுள்ளார்.

அறத்துப்பால் செல்வம் நிலையாமை, இளமை நிலையாமை, யாக்கை நிலையாமை போன்ற **பதிமூன்று அதிகாரங்களையும் நூற்றி முப்பது வெண்பாக்களையும்** கொண்டுள்ளது. பொருட்பால் **இருபத்தி ஆறு அதிகாரங்களையும் இருநூற்று அறுபது வெண்பாக்களையும்** கொண்டுள்ளது. காமத்துப்பால் **'காம நுதலியல்'** என்ற ஒரு அதிகாரத்தையும் **பத்து வெண்பாக்களையும்** கொண்டு திகழ்கிறது.

நாலடியாரின் ஆசிரியர் **சமண முனிவர்கள். 'பழகுத் தமிழ் சொல்லருமை நாலிரண்டில்','ஆலும் வேலும் பல்லுக்குறுதி நாலும் இரண்டும் சொல்லுக்குறுதி'** என்ற பழமொழிகளின் மூலம் இதன் பெருமையை உணரலாம்.

யாக்கை நிலையாமை

'யாக்கை' என்ற சொல்லிற்கு **'உடல், கட்டு'** என்ற பொருளை நா.கதிரைவேற் பிள்ளையின் தமிழ் மொழி அகராதி கூறுகிறது. (ப - 1221). யாக்கை என்ற சொல்லாடல் சங்க இலக்கிய காலந்தொட்டே தமிழ் இலக்கிய உலகில் இருந்து வருகிறது.

உயிரும் உடலும் ஒன்றோடொன்று ஒட்டிக்கொண்டிருக்கும் நிலைமையே யாக்கை எனப்படும். பஞ்சபூதங்களின் கலப்பால் ஆனதே உடல் ஆகும்.

சங்க இலக்கியங்களில் உடல்

இருபேர் உருவின் ஒருபேர் யாக்கை. (திருமுருகாற்றுப்படை 57). கு ரூ ஊ மயிர் யாக்கைக்குடா வடவுளியம் (திருமுருகாற்றுப்படை

313). புல்லென் யாக்கைப் புலவு வாய்ப்பாண! (பெரும்பாணாற்றுப்படை 22). சான்ற கொள்கை சாயா யாக்கை. (மதுரைக்காஞ்சி – 480). பிணம் தின் யாக்கைப் பேய்மகள் (பட்டினப்பாலை - 260). முறி மேய் யாக்கைக் கிளை (மலைபடுகடாம் - 313). சென்ற உயிரின் நின்ற யாக்கை. (தொல்காப்பியம் - 3-71). போன்ற இலக்கண இலக்கியங்களில் யாக்கை என்ற சொல்லாடல் பயன்படுத்தப்பட்டுள்ளதைக் காண முடிகிறது.

நிலையாமை–சொற்பொருள்

'நிலையாமை' என்னும் சொல்லுக்கு நா.கதிரைவேற் பிள்ளையின் தமிழ் மொழி அகராதி **'உறுதியின்மை, அகத்தியம்'** என்ற பொருளைக் கூறுகிறது. (ப - 912). நிலைத்து நிற்கும் தன்மை இல்லாமை. **"நிலையாமை மட்டுமே நிலைத்து நிற்கக் கூடியது.** எல்லா தத்துவங்களிலும் மதங்களிலும் அழியாது நிலைத்து நிற்கும் சிந்தனை நிலையாமையே." (மா.கி.இரமணனின் நலம்தரும் திருக்குறளும் திருமந்திரமும். ப - 201).

இரட்டைக் காப்பியங்களில் ஒன்றான மணிமேகலை நூலில் **"இளமையும் நில்லா யாக்கையும் நில்லா வளவிய வான்பெரும் செல்வமும் நில்லா."** என்றவர்கள் நிலையில்லாதப் பொருளை உணர்த்துகிறது.

"மலைமிசைத் தோன்றும் மதியம்போல யானைத்
தலைமிசைக் கொண்ட குடையர் - நிலமிசைத்
துஞ்சினார் என்றெடுத்துத் தூற்றப்பட் டாரல்லால்
எஞ்சினார் இவ்வுலகத் தில்."

(நாலடியார்– பாடல் - 21).

மன்னாதி மன்னர் எல்லாம் ஆட்சியமைத்து ஆண்டனர். உயர்ந்த மலையின் மேல் சந்திரன் அமர்ந்து இருப்பது போலத் தோன்றுகிறதோ, அதுபோல பெரிய யானை தலையின் மீது குடை வைத்து ஆண்ட அரசர்களும் இறந்துதான் போனார்கள் என்று இகழப்பட்டனர். எந்த அரசர்களுக்கும் யாக்கை நிலையில்லை என்பதை உணர்த்துகிறது.

இல்லற நிலையாமை

திருமணத்தில் சபையெல்லாம் கலியான வாத்தியங்கள் முழங்க, மக்கள் இன்பமாக இருப்பார்கள். அன்றைய பொழுதிலேயே அந்த மனிதனுக்குப் பிண வாத்தியமாய் ஓசைப்படுவதும் உண்டு.

"மன்றம் கறங்க மணப்பறை யாயின
அன்றவர்க் காங்கே பிணப்பறையாய் -
பின்றை."(நாலடியார்– பாடல் -23)

தன் சந்ததியை விருத்தியடையச் செய்வதற்கு திருமணம் செய்வர். சில பேருக்கு திருமணம் கைக்கூடும். சில பேருக்கு இறப்பு நேரிடவும் வாய்ப்பு உண்டு.

இல்வாழ்க்கை - நிலையாமை

கணவன், மனைவி, குழந்தைகள் என்று வாழும் மக்கள், வாழ்க்கை நிலையானது என்று வாழ்வார்கள். ஒருநாள் இறந்தும் போவார்கள். அவர்கள் இறந்த பிறகு உறவினர்கள் அனைவரும் கூடி அழுவார்கள். திருமணம் செய்து கொண்டு சுகமுண்டு சுகமுண்டு என்று வாழ்ந்தவனைப் பார்த்து, தொண் தொண் தொண் என்று அடிக்கும் பறையின் மூலம் இல்வாழ்க்கை நிலையில்லாததை உணர முடிகிறது.

"குணம்கொண்டு சுற்றத்தார் கல்லென் நலறப்
பிணம்கொண்டு காட்டுப்பார்க் கண்டும் -
மணங்கொண்டீன்
டுண்டுண்டுண் டென்னும் உணர்வினால் சாற்றுமே
டொண்டொண்டொ டென்னும் பறை."25.

நல்வழி என்னும் நீதி நூலை யாத்த ஔவையாரும், இறந்து போனவரை எண்ணி அழுவதால் பயனில்லை. எனவே அவர்களுக்காக அழுவதை விடுத்து அறத்தைச் செய்து வாழ வேண்டும் என்று உரைக்கிறார்.

"ஆண்டாண்டு தோறும் அழுது புரண்டாலும்
மாண்டார் வருவரோ மாநிலத்தீர் - வேண்டா
நமக்கும் அதுவழியே நாம்போம் அளவும்
எமக்குளென்என்று இட்டுஉண்டு இரும்."

(நல்வழி – 10)

கீழ் நோக்கி வீழ்கின்ற மழை நீரினது குமிழிபோல் பல காலங்களிலும் உண்டாகி அழிந்து போகும்படியான தேகத்தை உடைய மக்கள். தேகம் அழியாது என்றெண்ணி சம்சார வாழ்க்கையில் ஒன்றி இருப்பார்கள். ஆனால், ஞானிகளோ நிலையாமையை உணர்ந்து, சம்சார வாழ்க்கையை விடுத்து, தவம் செய்வர்.

"படுமழை மொக்குகளில் பல்காலும் தோன்றிக்
கெடுமிதோர் யாக்கையென் றெண்ணித் -
தடுமாற்றம்" (நாலடியார்– பாடல் - 27).

நீரில் எழும் குமிழி உடனே மறைவர் போல இளமை மறைந்துவிடும், நீரின் அலைகள் போல் செல்வம் குறையும், நீரில் எழுதும் எழுத்து போல் யாக்கை மறையும்.

"நீரில் குமிழி இளமை நீரில் சுருட்டு
திரைகள் செல்வம் நீரில் எழுத்தாகும் யாக்கை".

என்ற குமரகுருபரின் வரிகளின் மூலமும் யாக்கை நிலையாமையை அறியமுடிகிறது.

மேகம் போல் யாக்கை

நல்வினைகளின் பயனாக உடலை உறுதி உடையதாக பெற்ற ஒருவன் அவ்வுடலில் ஆற்றல் இருக்கும்போதே இயன்ற நற்காரியங்களை செய்துவிட வேண்டும். வாழ்க்கையைப் பற்றி உணர்ந்தவர்கள், நாளென்பது ஒருவரின் ஆயுளை அறுத்துக் குறைத்துக்கொண்டே இருக்கும் வாள் என்று உணர்வார்கள்.

"நாளென ஒன்றுபோற் காட்டி உயிரீரும்

வாள துணர்வார்ப் பெறின்." (திருக்குறள் - 334).

ஏனெனில் இந்த உடல் மலைமீது காணப்படுகின்ற மேகம்போல் சிலநேரம் இருந்துவிட்டு எப்பொழுது வேண்டுமானாலும் கலைந்து செல்லலாம்.

"யாக்கையை யாப்புடைத்தாப் பெற்றவர்

தாம்பெற்ற

யாக்கையா லாய பயன்கொள்க – யாக்கை."

(நாலடியார்— பாடல் - 28)

நிறைவுரை

இந்த மண்ணைக் காலம் காலமாக பல்வேறு மன்னர்கள் ஆண்டு வந்துள்ளனர். அதனால் இலக்கியமும் மாற்றமடைந்து வந்துள்ளது. ஆனால் நிலையாமை என்கிற தத்துவம் தவிர்க்க முடியாத ஒன்றாகிவிட்டது. 'நில்லா உலகின் புல்லிய

நெறித்தே'– (தொல்காப்பியம்) என்ற வரிகளில் நிலையாமையைக் காண முடிகிறது. அறஇலக்கியக் காலம் கி.பி. 3 – ஆம் நூற்றாண்டு முதல், கி.பி 6 – ஆம் நூற்றாண்டு வரை. அக்காலம் முதல் தற்காலம் வரை யாக்கை நிலையில்லாதது என்பதை உணர்த்தவே பல்வேறு நூல்களில் நூலாசிரியர்கள் குறிப்பிட்டுள்ளனர். '**தொல்காப்பியம், திருக்குறள், நாலடியார், மணிமேகலை, நல்வழி, நீதிநெறிவிளக்கம்'** போன்ற நூல்களில் நிலையாமை தத்துவத்தைக் காணமுடிகிறது. **திரையிசைப் பாடல்களிலும்** நிலையாமைத் தத்துவத்தின் கருத்தை உணர முடிகிறது.

துணைநூற் பட்டியல்

1. தெய்வப்புலவர்தமிழ்இயல்பியல் ஆராய்ச்சிகூடம் நாலடியார் சென்னை -600 041இரண்டாம் பதிப்பு- 1997
2. ந.அடைக்கலசாமி தமிழ் இலக்கிய வரலாறு ராசி பதிப்பகம் மூன்றாம் பதிப்பு -2000
3. கீ.ராசா தமிழ் இலக்கிய வரலாறு நியுசெஞ்சுரி புத்தகம் சென்னை-16
4. நா.கதிர்வேற்பிள்ளை தமிழ்மொழி அகராதி
5. சாரதா பதிப்பகம் சென்னை-16

திருமந்திரம் காட்டும் மனித உடலின் மேன்மைகள்

மு.சங்கீதா

உதவிப் பேராசிரியர், தமிழ்த்துறை
சீனிவாசன் கலை மற்றும் அறிவியல் கல்லூரி, பெரம்பலூர்

முன்னுரை

மனிதனுக்கு உடம்பே பல்வேறு நிலைகளில் வாழ்வியல் சிக்கலைத் தருகிறது. இதற்குத் தீர்வு காண முயலுகிறபோது உயிரும் சம பங்கைப் பெறுவதாக உணருகிறோம். உடம்பும், உயிரும் அவ்வளவு எளிதில் புரிந்து கொள்ளக் கூடிய ஒன்றல்ல. ஆய்ந்து அறிந்த தமிழ்ச் சான்றோர்களின் கருத்துக்களைப் பரந்துபட்ட நிலையில் ஆய்வுக்கு உள்ளாக்கும்போது பல்வேறு நிலைகளில் சிக்கலை ஏற்படுத்துகிறது. இந்நிலையில் உயிரியல் கோட்பாடு, உடம்பின் நிலை இரண்டையும் ஆய்வுக்கு உள்ளாக்க வேண்டிய கட்டாயம் ஏற்படுகிறது. இரண்டையும் சமமாகப் பேசுகிற திருமூலரின் கருத்துக்களை ஆய்வுக்கு உள்ளாக்குவதே பொருத்தமாக இருக்கும் என்ற அடிப்படையில் ஆய்வுக்கு எடுத்துக் கொள்ளப்படுகிறது.

நான்மறை யோகியர் ஒருவர் கயிலையிலிருந்து புறப்பட்டுப் பொதியமலை நோக்கி வந்தார் என்றும் அவர், இறந்து பட்ட மூலன் உடலிற் புகுந்து திருமூலராக வாழ்ந்து வந்தார் என்றும், அவர் வாழ்க்கை வரலாறு கூறுகிறது. பல திருக்கோவில்களையும் வழிபட்ட பக்தராக, அட்டாங்கயோக சாதனை மேற்கொண்ட யோகியாக, அணிமா முதலிய சித்திகள் கைகூடிய சித்தராக வாழ்ந்தவர் என்று சேக்கிழார் கூற்றின் வாயிலாக அறிய முடிகிறது. இவர், ஆகமப் பொருளைத் தமிழில் பாடினார் என்றும், சதியை, கிரியை, யோகம், ஞானம் என்னும் நான்கினையும் திருமந்திரம் மாலையாகப் பாடினார் என்றும் கூறுவர்.

"மறை மொழி கிளத்த மந்திரத்தானும்"[1]
(தொல். செய்.158),"

"நிறைமொழி மாந்தர் ஆணையிற் கிளந்த
மறை மொழி தானே மந்திரம் என்ப"[2]
(தொல். செய். 171)

என்னும் விதிகளுக்கு ஏற்ப மறைமொழி கிளத்த மந்திரமே திருமந்திரம். இதனைத் திருமூலரே,

நான் பெற்ற இன்பம் பெறுக இவ்வையகம்
வான்பற்றி நின்ற மறைப் பொருள் சொல்லிடின்
ஊன் பற்றி நின்ற உணர்வுறு மந்திரம்
தான் பற்றப் பற்றத் தலைப்படும் தானே" [3]

எனப் பாடுவர்.

ஏனைய கவிஞர்கள் போன்று திருமூலரும் தெய்வ அனுபவத்தைப் பாடினாலும். ஏனையோர் பாடல்களிலிருந்து இவர் பாடல்கள் வேறுபட்டனவாகவே உள்ளன. ஞான அனுபவத்தை இந்நூல் உணர்த்தும் பாங்கைக் கொண்டு, ஏனைய திருமுறைகளைத் தோத்திரங்களாகக் கொள்ளும் சிவநெறியினர், இதனைத். தோத்திரமாகவும் சாத்திரமாகவும் கொள்வர்

இவர் பாடல்கள் தேவாரப் பாடல்களைப் போல் திருக்கோவிலை மையமாகக் கொண்டெழுந்தனவல்ல. மணிவாசகர் பாடல்கள் போல் ஞான அனுபவத்தை உணர்ச்சி நிலையில் நின்று உள்ளம் உருகப் பாடியனவுமல்ல. அவர் பெற்ற அனுபவம் அட்டாங்க யோகத்தால் கைவரப் பெற்றிருப்பினும் ஞான அனுபவமே. ஆயினும், அதனை வெளிப்படுத்தும் பாங்கு, நீதி இலக்கியங்கள் போன்று அறிவுரை கூறும் பாங்கே ஆகும். தாம் பெற்ற தெய்வ அனுபவத்தை தெய்வ நீதியாகவே உணர்த்துகிறார்.

திருமூலர் கூறும் தெய்வ நீதி உலகியல் மறந்த ஒன்றன்று. நீதி, உலகியல் நீதி, தெய்வ நீதி என இருதிறத்ததுமன்று. பொதுவாக நாம் நீதி என்னும் போது, சமயச் சார்பற்ற ஒன்றையே கருதுகிறோம். "தமிழில் பெரும்பாலான நீதி இலக்கியங்கள் சமயச் சார்பற்ற நீதியினைக் கூறலாம். உண்மையில் இவை வற்புறுத்துவது சமயச் சார்பற்றதன்று, கடவுட் சார்பற்றதே. இதற்குக் காரணம் பல நீதி இலக்கியங்கள் கடவுள் உண்மையை மறுக்கும் சமணர்களால் படைக்கப்பட்டமையே. திருமூலரைப் பொறுத்த அளவில் நீதி கடவுள் இயல் அடிப்படையில் அமைந்த ஒன்றேயாகும். சைவ நீதியே நீதி: அது உலகமெல்லாம் விளங்கவே பாடுகிறார்.

திருமூலரின் நோக்கம்:

பல்வேறு சைவ நெறிக் கருத்துக்களை எடுத்துரைத்தாலும், உடம்பை உருக்க வேண்டும். உள்ளொளியைப் பெருக்க வேண்டும். அப்பொழுது தான் இறைவனின் திருவருளைப் பெற முடியும் என்னும் போது, திருமூலர் மட்டும் உடலை அளித்த இறைவனுக்கு நன்றி சொல்ல விளைவது நோக்கத்தக்கது.

எலும்பினால் பின்னி நரம்பினால் வரிந்து கட்டி இரத்த நீர் கொண்டு கையால் ஒழுங்காக

அமைக்கப்பட்ட உடல் என்னும் வீட்டில் இன்பத்தோடு உயிர் நிலை பெறச் செய்த இறைவனுக்கு நன்றியோடு வணக்கத்தைச் செலுத்த நினைக்கும் பாங்காகக் கீழ்க்கண்ட பாடல் அமைகிறது.

"என்பால் மிடைந்து நரம்பு வரிகட்டிச்
செம்பால் இறைச்சி திருந்த மனைசெய்து
இன்பால் உயிர் நிலை செய்த இறை ஓங்கும்
நண்பால் ஒருவனை நாடுகின்றேனே." (126)

என்று பாடிகிறார், இப்பிறவியைப் போக்க இறையடியை நாடித் திரியும்போது, இப்பிறப்பிற்கு உடலைக் கொடுத்ததால் இறைவனை நாடுகிறேன் என்று பாடியிருப்பது அறியத் தக்கது.

உடலும் உயிரும் நீடு வாழ வழிமுறைகள்:

தமிழில் சிவாகமங்களை உரைத்த திருமூலர், உடலை எப்படி வைத்துக் கொள்ள வேண்டும் என்றும் விளக்கம் தருகிறார்.

"ஒத்திவ் ஒன்பது வாயுவும் ஒத்தன
ஒத்திவ் ஒன்பதின் மிக்க தனஞ்சயன்
ஒத்திவ் ஒன்பதில் ஒக்க இருந்திட
ஒத்த உடலும் உயிரும் இருந்ததே"

இப்பாடலின் வாயிலாக ஒன்பது வாயுக்களான பிராணன், அபானன், வியானன், சமானன், நாகன், கூர்மன், கிருகரன், தேவதத்தன், உதாணன் ஆகியவை தம்முள் மிகுதல் செய்யாமலும், குறைதல் செய்யாமலும் சமமான இவ்வொன்பது வாயுக்களும் தம்முள் ஒத்தன. இவ்வாறு தம்முள் ஒத்த வாயுக்களிலும் சிறந்த தனஞ்சயன் என்னும் வாயுவும் சேர்ந்து, ஒன்பது வாயுக்களும் ஒன்பது நாடிகளில் சமமாக இருந்தால் உடம்பும் உயிரும் தம்முள் ஒத்து நீண்ட காலம் இருக்கும்.

உடம்பார் அழியின் உயிரார் அழிவர்

"திடம்பட மெய்ஞ்ஞானம் சேரவும் மாட்டார்
உடம்பை வளர்க்கும் உபாயம் அறிந்தே
உடம்பை வளர்த்தேன் உயிர்வளர்த் தேனே"
(211)

உடம்பு அழிந்தால் உயிரும் அழியும், உறுதியான மெய்ஞ்ஞானத்தை அடைய முடியாது. ஆகவே உடம்பை வளர்க்கும் உபாயம் அறிந்து கொண்டேன். எனவே உடம்பை வளர்த்தேன். அதனால் உயிரையும் வளர்த்துக் கொண்டேன். என்கிறார்.

உடம்பை வளர்க்கும் உபாயம் ஞானமே! அந்த ஞானத்தை யோக நெறியிலடைந்தால் உயிர் வளரும். உடம்புக்குத் தீங்கு நேரிட்டால் உயிர் நீங்கி விடும். உயிர் நீங்கியவன் செத்தவன். செத்த நிலையில் ஞானம் பயன் தராது. ஞானம் பயன்தர வேண்டுமானால் உடம்பைப் பேணி உயிரை வளர்க்க வேண்டும். இதனைத் திருமூலர் உடம்பை வளர்க்கும்

உபாயம் அறிந்தேன், உடம்பை வளர்த்தேன் உயிர் வளர்த்தேன் என்கிறார். அத்தோடு நில்லாமல்,

"உடம்பினை முன்னம் இழுக்கென் றிருந்தேன்
உடம்பினுக் குள்ளே உறுபொருள் கண்டேன்
உடம்புளே உத்தமன் கோயில் கொண்டான்என்று
உடம்பினை யான் இருந்து ஓம்புகின் றேனே"[4].
(212)

உடம்பின் அருமை தெரிதற்கு முன்பு அதனை குற்றமுடைய பொருளாக எண்ணியிருந்தேன். பின்னர் உடம்புக்குள்ளே சிறந்த பொருள் இருப்பதை அறிந்தனன். உடம்புக்குள்ளே சிறந்தவனாகிய இறைவன் கோயில் கொண்டிருக்கின்றான். என்பதை உணர்ந்து கொண்டனன். ஆகவே இவ்வுடம்பை நான் கண்ணும் கருத்துமாகக் காத்துக் கொண்டிருக்கின்றேன். என்கிறார்.

உடலும் உள்ளமும் நல்லமுறையில் செயலாற்றத் தேவையான மிக சத்துள்ள உணவு வேண்டும் உட்கொள்ளும் உணவே ஒருவனுடைய விளக்கத்துக்கு காரணமாக அமைகின்றது.

உணவின் வேறுபாட்டால் உடம்பு வேறுபடுகிறது. உடம்பின் தேவை குறித்து இவ்வாறு அழுந்தக் கூறும் நிலையில் வள்ளுவரின் கூற்றையும் நிராகரிக்க முடியாது.

"மற்றுந் தொடர்ப்பா டெவன்கொல் பிறப்பறுக்கல்
உற்றார்க் குடம்பும் மிகை"[5]

என்கிறார். இங்கு இக்கருத்து நோக்கத்தக்கது.

வேதாத்திரி மகரிஷி உடலும் உயிரும் இணைந்த கூட்டுறவிலே இந்த வாழ்க்கை அமைந்துள்ளது. உடல் இயக்கம், உயிர் இயக்கம் இரண்டிற்கும் இடையே எப்போது பிணக்கு அல்லது முரண்பாடு ஏற்பட்டாலும் அந்த முரண்பாட்டின் விளைவாக நோய் ஏற்படுகிறது. உடலுக்கும், உயிருக்கும் நட்பு நீடித்தால் வாழ்க்கை. பிணக்கு ஏற்பட்டால் நோய். உடலுக்கும் உயிருக்கும் பிரிவு ஏற்பட்டால் அதை மரணம் என்கிறோம் என்று கூறுகிறார்.

இதுவரை ஆராய்ந்தவற்றால் மெய்யுணர்வு பெறுதலாகிய குறிக்கோளை எய்துவதற்கு முதன்மையுடைய வழிகள் மனவளத்தை மேம்படுத்துவதும், உயிர்வளத்தை மேம்படுத்துவதும் ஆகும் ஆயினும் அவ்விரண்டையும் பெறுதற்குரிய ஆயத்தப்படுத்துவது யோகசாதனையின் சிறப்புடையதுமாகிய வழியாகும். எடுத்துக் கூறுகின்றமையை அறிய முடிகிறது.

இவ்வாய்வில் வெளிப்படும் கருத்துக்களாவன:

உடல், உயிர், மனம் என்ற மூன்றும் ஒருங்கிணைந்து வளர்தல் வேண்டும்.

உடம்பினுள் இறைவனைக் காணுதற்குத் தேடல் யோகமாகும். அதற்குத் தேவைப்படுவது அகமுகச் சிந்தனை.

முதிய நிலையில் மனம் தளரும். உடல் வலிமையுடன் இருந்தால் மனம் வலிவு பெறும். உடல் வலியற்றோ, வலிகுன்றியோ இருக்குங்கால் உரனிழக்கும். உடல் வலி குன்றுவது போல் உள்ளத்துக்கும் உண்டு. உரம்பெறவே யோகநெறி வழிகாட்டுகின்றது.

உடல் அழுக்கைப் போக்க நீராட வேண்டும். அதுபோன்று உள அழுக்கு இறைவனைப் பக்தியுடன் வழிபடுவதால் அகலுகிறது. மனம் ஒன்றுபடுகிறது. நமது பிறவி ஒருநாளும் பக்திக்கு இடையூறாக இருந்ததில்லை. இயற்கையில் எந்த உயிரை அல்லது எப்பொருளைப் பார்த்தாலும் அவை அழியும் தன்மையுடையன என்ற உண்மையையே அது இடைவிடாது அறிவுறுத்திக் கொண்டிருக்கிறது. ஆகவே யோக நெறி நிற்பார் மனம் என்னும் இறைவனையே எண்ண வேண்டும். அந்நெறி நிற்போர் முயன்று உணவு முதலியவைகளைக் குறைத்து உடம்பைப் பேண வேண்டும். உயிர் நீண்டகாலம் வாழ நல்லுடல் தேவை. பன்னிரண்டாவது பாடல் விளக்குகிறது. இதனையே,

இரவு, பகல், இறப்பு, பிறப்பு இயற்கையின் இயற்கை மாற்றங்கள் இவற்றின் நோக்கம், வாழ்வில் மக்கள் கடைப்பிடிக்க வேண்டிய நெறி, அறம், அன்பு, இறைவனை அடையச் சரியை, கிரியை, தவ, யோக, ஞானப் பாதைகள், இறைஅனுபவம் ஆகியவற்றையெல்லாம் திருமூலநாயனார் முற்றிலும் உணர்ந்தவராய். அனுபூதியாய், எங்கும் எதிலும் காணப்படும் பரம்பொருளைச் சிவத்தைத் தம்முள் கண்டு தாம் பெற்ற அனுபவத்தை, இன்பத்தைப் பிறரும் பெற வேண்டிய கொள்கையுடையவராய் ஆன்மிக அனுவத்தை நமக்கு அளித்துள்ளார் என்பதில் இரண்டாம் கருத்திற்கு இடமிருக்க முடியாது.

மக்கள் அன்றாட வாழ்வில் உலகத்தோடு இணைந்து வாழ முற்படுகிறார்கள். அவ்வழியாக இன்பம் அடைய முயலுகின்றனர். இதில் வியப்பொன்றுமில்லை. உடலைப் பெற்ற சீவன் மக்கள் கூட்டத்துடன் ஒத்து வாழ்ந்து அதன் மூலமாக கிடைக்கும் அனுபவங்களைப் பெற்றுத் தனது ஆன்மிக நிலையை உயர்த்திக் கொள்ள முற்படுகின்றது. அவ்வாறில்லாவிடில் பிறப்பின்

நோக்கம் நிறைவேறாது. அதை அறிந்தும் மக்கள் இவையெல்லாம் தேவையற்றது என்கிற ஒன்றை அவ்வப்பொழுது கண்டாலும் வலுவான பாசத்தால் கட்டப்பட்ட நிலையில், பேரின்பத்தைப் பெறும் முயற்சிகளில் ஈடுபடத் தனது முழு வலுவினையும் செலுத்துவதில்லை. எனினும், எல்லையற்ற கருணை கொண்ட ஈசன் எல்லா சீவராசிகளுக்கும் பேரின்பத்திற்கான வழிகளை வகுத்துக் காட்டுகின்றான். அருளினால் சீவனுக்குத் தகுந்த நேசம் கிட்டும்பொழுது உலக அனுபவங்களின் உண்மையான நிலையினை உணருவதாக அறிகிறோம். மனச் சேட்டைகள் அடங்குகின்றன. பிறவித் துயரைக் கொடுக்கும் அறிவு மாறி, அகத்தில் பேரொளி புலப்படத் தொடங்குகிறது. வாழ்க்கையின் உண்மையான நோக்கம் அக்கண்களுக்குப் பளிச்செனத் தோன்றுகிறது. இதற்கான வழிகளையெல்லாம் திருமந்திர மாலை தெளிவுற விளக்குகிறது.

நிறைவுரை

எல்லாச் சமயங்களும் உடல், உயிர், உலகம் இவற்றிற்கு அடிப்படையாக நிற்கும் பரம்பொருளையே காண முயலுகின்றன. சிறு சிறு தத்துவங்களை முன்னிறுத்தி அவற்றையே தலையாயதாகக் கொண்டு மற்ற தத்துவங்களில் இறைகளைக் காணத் துடிக்கின்றன என்ற வடி.வி. வேங்கடராமன் கூற்று நினைவு கூறத்தக்கது. தெளிந்த நிலை பெற்ற திருமூலர் எல்லாச் சமயங்களுக்கும் அடிப்படையான உண்மையை அகத்தே உணர்ந்து பிறருக்கு அறிவிக்கும் நிலைதான் உடம்பே பிரதானம் என்று கூறும் நிலைப்பாடு ஆகும். ஆணவம், கன்மம், மாயை எனும் மும்மலமும் உடலால் நிகழ்த்தப்பெறுகிறது. உடல் உணர்ந்து தான் உயிரை உணர்த்த வைக்கிறது என்று கருத்து வெளிப்படுகிறது.

அடிக்குறிப்புகள்

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XYLAZINE POISONING

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Abstract

Xylazine is listed as a controlled drug in Asian countries such as Malaysia, Thailand, Singapore; but countries like Australia and Canada were n't listed as controlled drug So if there is any prescription the pharmacists have to give. Some studies show the uncontrolled uses of Xylazine in the animals meant for sports and food production, so the relevance of forensic science is coming in this case. Xylazine is misused in homicidal and suicidal cases as a recreational drug, adulterant to other drugs. The objective of this study is to understand the properties, effects, pharmacokinetics and pharmacodynamics, and the forensic importance of Xylazin.
Keywords: *xylazine, pharmcodynamics, pharmacokinetics.*

Introduction

Pharmacology is the part of toxicology which studies the pharmacokinetics and pharmacodynamics of drugs. Pharmacokinetics is a process in which what a body does to a drug and includes the movement through and out of the body.It includes four processes: absorption, distribution, metabolism and excretion. Pharmacodynamics is what a drug does to the body (Geoffrey, 2018) The purpose of this study is to understand the properties, effects, pharmacokinetics and pharmacodynamics of the xylazine.Basically xylazine is used as a medicine for animals.Its use in the food and drugs for human being are restricted due to the severe side effects.

The administration of Xylazine is only allowed in animals such as dogs, horses, cats, deers etc.

It can be used as a Central nervous system relaxant, painkiller and also as a sedative.

Xylazine can be used for synergies that means when two drugs are allowed to interact together, it can double the effects. So this Xylazine can be combined with other chemical substances.An inhibitory effects means the drugs will bind towards the receptors of neurotransmitter and it inhibit the receptors from receiving the neurotransmitter. Like that xylazine has high affinity towards the neurotransmitter receptors such as cholinergic, serotonergic, piate receptors and this Xylazine will show inhibitory effects like it inhibit the receptor from receiving the neurotransmitter. The way which we are administering a drug into our body is the route of administration, it will be different for each drug. For Xylazine the best way for administering towards the body is the intravenous, intramuscular and subcutaneous. Actually the Xylazine is only used for animals as medicine somehow human were using it as illicit drug because of analgesic, sedative characteristics. There will be some limit for the usage of any kind of drug.

In this Xylazine if it is administered more than twice of the prescribed amount it can be fatal. (Bayramoglu, 2016)

Although in the field of veterinary Xylazine is used as sedative agent and for disabling the wild animal and as a vomit causing agent for cats if it's intoxicated with any kind of toxin.

The effects of any kind of drug varies according to the species and route of administration.

Xylazine is listed as a controlled drug in Asian countries such as Malaysia, Thailand, Singapore; but countries like Australia and Canada were n't listed as controlled drug So if there is any prescription the pharmacists have to give. Some studies show the uncontrolled uses of Xylazine in the animals meant for sports and food production, so the relevance of forensic science is coming in this case.

Xylazine is misused in homicidal and suicidal cases as a recreational drug, adulterant to other drugs. (Way, 2022).

Xylazine is commercially known as tranq, tranq dope or sleep cut.Illicit usage of Xylazine is increasing tremendously. Apart from that the death due to overdose is more reported that is mainly with heroin and or fentanyl. Most commonly found drug along with Xylazine are cocaine and fentanyl. Because of the insufficient source for analyzing the drugs, the cases related to the various forensic instrumentation were carried out for the detection of presence of Xylazine such as gas chromatography-mass spectrometry.Appropriate antidote is not present for the intoxication of Xylazine poisoning, but some reports pointing towards the use of naloxone as antidote, but the efficiency of naloxone for reversing the effects of Xylazine is not accurate. Some antidote for reversing the toxic effects on animals are Yohimbine, Atipamezole. When a person was intoxicated with Xylazine poisoning gave support for the respiratory function and also for stable blood pressure. (Andrew, 2021).

The objective of this study is to understand the properties, effects, pharmacokinetics and pharmacodynamics, and the forensic importance of Xylazin.

Methods and Methodology

There are some studies which is based on reviewing 43 xylazine poisoning cases. According to this study around 49% of the cases were non- fatal and the rest 51% were fatal.The important fact is the availability of the xylazine poison in the market, it is not a controlled substance.Out of these 43 cases most of the people had undergone through some kind of treatments.This study also shows that the toxic effects shown by the xylazine were also shown by heroine.The continuous use of this substance has been resulted in ulcerations and skin allergies. In these years, the use of xylazine has increased and most of the people are using it as a recreational drug.

There are some studies to determine the quantities of ketamine and xylazine in the brain of the rat using GC-MS, liquid-liquid extraction. In this experiment, they have taken only 0.5g of sample and the internal standard used is xylazine.The results have shown 87 nanograms. The procedure was conducted to analyze the quantity of xylazine.

This study is focusing on every aspect of xylazine poisoning. They have discussed the signs and symptoms of xylazine poison. Apart from these they have discussed the fatal dose and fatal period of xylazine poison. They have discussed various aspects of xylazine poisoning, it is because it has been used globally and has created severe issues.

Discussion

Xylazine is a vetenary drug, which is used as sedative, analgesic and muscle relaxant. This drug is basically used in treating animals for tetanus and it is not used in treating humans. In the present situation the people were using it for recreational purpose and that made the experts to study about the sign, symptoms and other adverse effects of this drug. This drug is actually central nervous system depressant and widely used with any other drugs like coccaine which shows a synergic effects, that will double the effect of the drug. Most of the studies regarding this topic is done by reviewing the case studies and by testing with instruments such as GC-MS and liquid-liquid chromatography. Xylazine can be combined with other chemical substances.An inhibitory effects means the drugs will bind towards the receptors of neurotransmitter and it inhibit the receptors from receiving the neurotransmitter. Like that xylazine has high affinity towards the neurotransmitter receptors such as cholinergic, serotonergic, opiate receptors and this Xylazine will show inhibitory effects like it inhibit the receptor from receiving the neurotransmitter.

Result

The purpose of this study is to understand the properties, effects, pharmacokinetics and pharmacodynamics of the xylazine. Basically xylazine is used as a medicine for animals. Its use in

the food and drugs for human being are restricted due to the severe side effects.

The administration of Xylazine is only allowed in animals such as dogs, horses, cats, deers etc. It can be used as a Central nervous system relaxant, painkiller and also as a sedative.

Xylazine is commercially known as tranq, tranq dope or sleep cut.Illicit usage of Xylazine is increasing tremendously. Apart from that the death due to overdose is more reported that is mainly with heroin and or fentanyl. Most commonly found drug along with Xylazine are cocaine and fentanyl. Because of the insufficient source for analyzing the drugs, the cases related to the various forensic instrumentation were carried out for the detection of presence of Xylazine such as gas chromatography-mass spectrometry. Appropriate antidote is not present for the intoxication of Xylazine poisoning, but some reports pointing towards the use of naloxone as antidote, but the efficiency of naloxone for reversing the effects of Xylazine is not accurate .Some antidote for reversing the toxic effects on animals are Yohimbine, Atipamezole. When a person was intoxicated with Xylazine poisoning gave support for the respiratory function and also for stable blood pressure

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FABRICATION OF PHOTOCATALYTICALLY EFFICIENT ZNO FILM DEPOSITED ON STAINLESS STEEL MESHES FOR EFFECTIVE DYE DEGRADATION

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Abstract

Photocatalytically efficient ZnO thin film were deposited on stainless steel mesh (SSM) substrates using nebulizer spray technique for effective decomposition of toxic organic dyes discharged as textile effluents. Structure, morphology and composition of the coated material were analyzed using XRD, SEM and EDAX. Dye decomposition studies show that the efficiency increases remarkably with ZnO results in moderate enhancement in efficiency. The reasons for this efficiency improvement and the underlying mechanism have been addressed in detail with the support of trapping test, structure and compositional studies.

Keywords: photocatalysis; ZnO thin film; stainless steel mesh substrates; nebulizer spray pyrolysis; XRD analysis.

Introduction

In recent decade, human beings are tremendously affected by various health issues due to heavy contamination of water caused by the number of growing industries in all over the world. Around 1800 children under the age of five years are severely affected by diarrhoeaper day due to the contamination of water. It is confirmed by the report submitted by the united nation [1].

Textile industry is one of the major industry which consume large quantity of water, chemicals and fuel for the production of textile products. Discharging of huge amount of waste water from the industry is the main source of causing water pollution which is drastically affecting the human health and the environment. Amaral et al. reported that 3.7 million litres of waste water are released each day from textile industry worldwide as 100 litres of waste water are produced for every kilogram of textile product [2]. Generally, all the textile industries are using synthetic dyes for dyeing and printing purpose. More than 7×10^5 metric tonnes of dyes are annually produced and commercially available worldwide. A significant fraction of dyes is lost in industrial effluents during manufacturing process. Hence, effluents from these industries contains a high concentration of dyes and a variety of non-biodegradable organic compounds [3].

Recently, various research activities are going on for the removal of hazardous dyes present in the textile effluents. For which, much attention has been devoted to develop effective technologies. Among them, photocatalysis is a promising technique which can decompose the dye molecules efficiently [4-6].

Titanium oxide (TiO_2) [7] and zinc oxide (ZnO) [8] are potential semiconductor oxide photocatalysts [9].

The holes and electrons created by photons can migrate and react with oxygen and water to initiate redox reactions. As a result, reactive oxygen species (ROS) are generated which react with organic dye molecules to produce CO_2 and H_2O [10].

ZnO is a promising photocatalyst because its distinct properties: high ultra violet absorption, low cost, non-creation by-products, high chemical stability and non-toxicity. However, the wider band gap and fast charge carriers recombination are the major disadvantages of the ZnO. In order to overcome these disadvantages and improve the catalytic property of ZnO, effective and practical approaches such as adding some hetroelements and carbonaceous elementsare adopted [11,12].

However, the disadvantage of the catalyst is that catalytic activity is still not high enough for the commercial application [13].

ZnO is one of the compatible material for photocatalytic studies [14] the ionic radius of Zn^{2+} (0.074 nm). It is reported that ZnO is the best photocatalytic ability of when compared to the other Semiconducting Materials [15]. Keeping these points in mind, ZnO film are prepared to find how they act as photocatalyts for degrading dye molecules.

Experimental Methods
Materials & Methods

Zinc acetate dihydrate (Zn (CH3COO)2·2H2O; Merck- 99%) was used as precursor for ZnO. Methylene blue (C16H18ClN3S, Merck) and malachite green (C23H25N2, Merck). All the reagents used in this research work were analytical grade.

The ZnO film were coated on stainless steel meshes (2.5 x 7.5 cm2) using the Homemade automated tubular nebulizer spray unit. The process conditions adopted in this study are: substrate temperature - 350 ± 5°C, volume of the sprayed solution - 30 mL and nozzle to substrate distance - 10 cm. For the deposition of ZnO film, zinc acetate dihydrate (0.2 M) were dissolved in solvent consists of deionized water, methanol and acetic acid (ratio - 7:2:1). The thin film samples were prepared by employing nebulizer spray method. Photocatalytic performance has been carried-out annular type photo-reactor. The MB dye was taken as a model pollutant.

1. Tubular furnace 2. Heating coil 3. Glass tube 4. SS Mesh 5. Fumes 6. fumes flow Glass tube
7. Alumol thermocouple 8. Nebulizer 9. Stand 10. Temperature controller 11. Compressor
12. Air flow tube
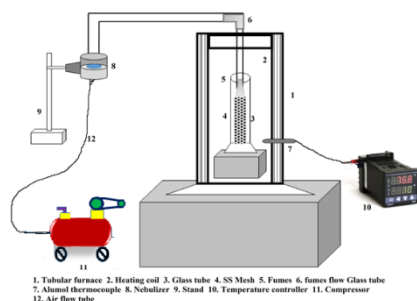
Figure 1 The schematic diagram of tubular furnace nebulizer spray unit

Photocatalytic Activity Analysis
Table 1 Photocatalytic experimental parameters

Photocatalytic experiment parameters	
Tested dye	MB
Light source	Tungsten lamp (500W)
Distance between light source and sample holder	9 cm
Concentration of tested dye	1×10^{-5} mol/L
Volume of test dye	60 ml
Area of the sample	2.5 cm × 7.5 cm
Time interval	15 min
Absorption wavelength of test dye	664 nm

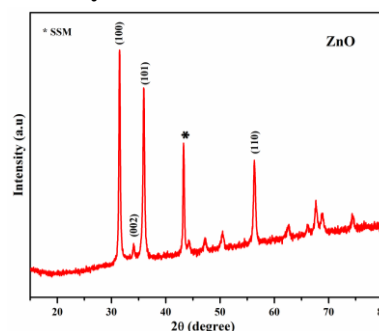## Result and Discussion
Structural Analysis

Figure 2 X-ray diffraction spectra of ZnO films

The structural properties of undoped ZnO coating deposited on flexible SSM were studied using XRD. The corresponding XRD patterns are shown in Fig. 2. the recorded diffraction patterns are indexed to hexagonal wurtzite structure of ZnO phase, which matched with (JCPDS - 36 -1451) [16]. The peaks are found at Bragg's angles 31°, 36°, 56° and 67° which corresponds to the (hkl) planes (100), (002), (101), (110) and (112), respectively [17-19]. The average crystallites size was calculated using Scherer's formula,[20]

$$D = \frac{0.9\lambda}{\beta \cos\theta} \tag{1}$$

As the ZnO films have hexagonal structure, the lattice constants were calculated from

$$\frac{1}{d^2} = \frac{4}{3}\frac{(h^2+k^2+hk)}{a^2} + \frac{l^2}{c^2} \qquad (2)$$

The calculated crystallite size and lattice parameters are given in Table 1 for ZnO thin films.

Table 1. Results of structural calculations

Sample	Lattice parameters (Å)		Crystallite size (D) nm
	a*	c*	
ZnO	3.266	5.275	20

FT-IR Analysis

Fig.3 shows the FTIR spectra of Undoped ZnO on deposited thin films. The absorption bands within the range $440 - 690$ cm^{-1} are appeared in Undoped ZnO films, which are related to stretching vibrations of Zn-O bond [21]. In addition to the stretching bond of ZnO, another absorption band is appeared at 2350 cm^{-1} in the ZnO films. This result confirms the successful incorporation of the ZnO matrix.
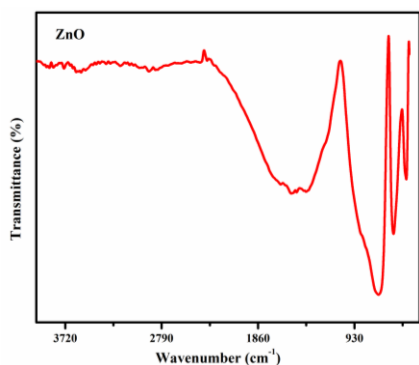
Figure 3 FTIR spectra of ZnO

Morphological and Elemental Analysis

The SEM images in Fig.4 (a, b and c) shows the surface morphology of deposited thin films. Undoped ZnO film has agglomerated granules [22]. The grain size slightly reduced and granules are in the form of cluster. Fig. 5 show the presence of excepted elements Zn, O, N and C in the deposited ZnO thin films is confirmed by EDX.
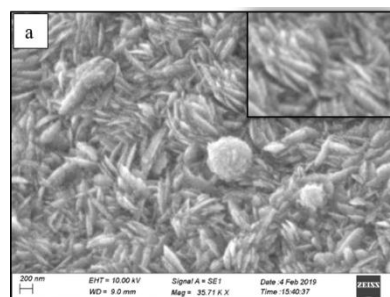
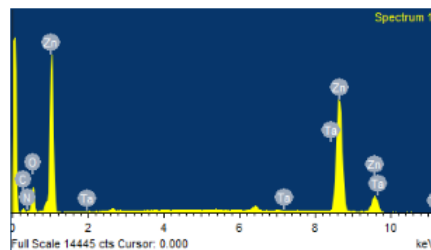**Fig. 4 SEM micrograph images of (a) Pristine ZnO**

Fig. 5 EDX spectra of ZnO deposited film

Photocatalytic Activity

The photocatalytic activity was tested for degrading an organic dye - methylene blue - under UV-visible light irradiation. Absorption spectra of MB dye is shown in Figure 6.
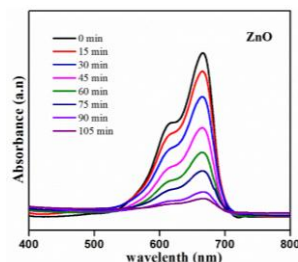

Fig.6 Absorption spectra of MB dye under UV-visible light irradiation with ZnO photocatalyst.
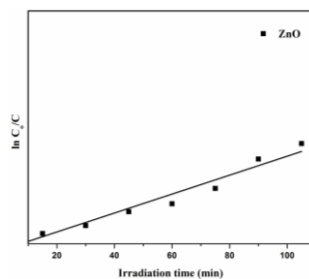

Fig. 7 Photocatalytic activities of MB under visible light irradiation with the presence of photocatalysts

The apparent rate constant (k$_{app}$) and degradation efficiency (η) are calculated from the formulae [4]

$$k_{app} = \frac{1}{t} \ln\left(\frac{C_0}{C}\right) \qquad (4)$$

$$\eta = \frac{(C_0 - C)}{C_0} \times 100\% = \frac{(A_0 - A)}{A_0} \times 100\% \qquad (5)$$

The calculated values are given in Table 2.

Table 2. Rate constant and efficiency of ZnO thin films

Catalysts	MB	
	K (min^{-1})	η %
ZnO	0.014	78

It is observed that the composite thin films show better photocatalytic efficiency, whereas in pristine ZnO have only 78% degradation within an irradiation of time of 105 min. It may be due to the very larger band gap compare to other composite thin films [23]. The higher degradation efficiency of 78% was observed for ZnO film due to the formation of hetrojunction between ZnO which creates a more number of electron–hole pairs and at same time, ions acts as a trap to delay the recombination rate of charge carriers this synergistic effect makes it a superior material for degrading MB dye [24]. The evaluated degradation efficiency were represented as a bar chart as shown in Fig. 13.

Proposed Mechanism for ZnO Thin Film

The schematic representation of the proposed mechanism of ZnO thin film was shown in the Fig.12. The band edge potential values of ZnO is calculated using Butler and Ginley relation

$E_{VB} = \Box - E^e - 0.5\ E_g$

$E_{CB} = E_{VB} - E_g$

When ZnO thin film is illuminated by UV-vis irradiation, separation of photo generated charge carriers takes place between the VB and CB edge potential of ZnO semiconductor. The photo generated electrons in the conduction band of ZnO due to the band edge potential of ZnO (+1.53 eV). The photo generated electrons in the conduction band of ZnO readily reacts with the oxygen (O_2) molecules to form super oxide anion radicles (O_2^-), while holes in the VB of ZnO react with the OH ions to form hydroxyl radicles ($\cdot$H). These generated reactive oxygen species strongly react with the MB dye molecules to form H_2O, CO_2 and other mineralization products. However, the presence of ZnO thin film, acts as a trap for electron in the CB of ZnO thereby delaying the recombination rate of charge carriers to promotes the higher degradation efficiency. This increase in number of charge carriers and delay of recombination of charge carries which cause the ZnO thin film shows the efficient photocatalytic material for MB dye degradation.
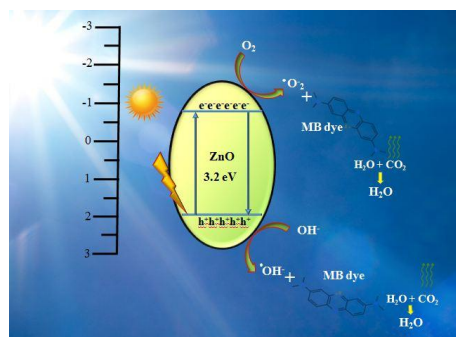

Fig.14 Photocatalytic mechanism of ZnO

Conclusion

The activated ZnO film deposited on stainless steel wire meshes show efficient dye decomposing activity when MB is used as a test dye. The efficiency of ZnO is 78 % dye degradation. This synergistic effect help to improve the efficiency. The results reveal that the combined effects of ZnO film a promising material for visible light responsive photocatalysis.

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ISOLATION AND IDENTIFICATION OF INDUSTRIAL ENZYMES PRODUCING MICROBES FROM ENVIRONMENTAL SAMPLE

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Abstract

Microbial cells are selected from different groups of microorganisms for the production of amylase Industrial enzyme on a wide-scale basis. This paper aims to isolate and identify industrial valuable enzyme producing microbes from algae, eel fish and soil sample. In this study, the bacterial colonies were isolated by enumeration of microbes followed by colonies selection using the nutrient agar medium. The identified colonies were screened for amylase enzyme production using milk and starch agar selection medium. Furthermore, IMViC test helps in the identification research of organisms in the coliform group followed by the protein confirmation using SDS-PAGE analysis. Upon investigation, the enzymatic activity was observed only on starch agar selection medium. Therefore, the identified bacteria can be an amylase enzyme producing bacteria. Methyl red test showed positive reaction based on all the IMViC reactions performed. Moreover, the dark protein bands were observed by SDS-PAGE analysis. Taken together these results showed that, the identified microbes were able to produce significant amounts of intracellular amylase enzyme. The bacteria were isolated from the extracts which had the ability to produce industrially amylase enzyme in an efficient manner.
Keywords: microbial-enzymes, amylase, bacteria, imvic, sds-page.

Introduction

Enzymes are biological macromolecules produced by a living organism that acts as a catalyst to bring about a specific biochemical reaction either through intracellular or extracellular process which is eventually termed as "Biocatalyst." As enzyme mediated processes are eco-friendly and non-toxic they are expeditiously gaining interest. As per the need for industrial applications, enzymes of microbial origin are cultured largely by genetic manipulations. The microbial enzymes are used for the treatment of industrial effluents containing aromatic compounds by bioconversion of toxic chemical compounds to innocuous products which have gained recognition worldwide for their widespread use in various sectors of industries. (Klibanov et al. 1982).

Amylases are the second type of enzymes used in the formulation of enzymatic detergent, and 90% of all liquid detergents contain these enzymes (29). Detergent industries are the primary consumers of enzymes, in terms of both volume and value. The use of enzymes in detergents formulations enhances the detergents ability to remove tough stains and making the detergent environmentally safe. Nattokinase (EC 3.4.21.62), a potent fibrinolytic enzyme, is a promising agent for thrombosis therapy which is the most prominent medical use of microbial enzymes for the removal of dead skin and burns by proteolytic enzymes, and clot-busting by fibrinolytic enzymes. (Sumi et al. 1987; Cho et al. 2010).

The α-Amylase production can be obtained from different microorganisms species especially from fungal and bacterial sources as they have dominated applications in several industrial sectors. But for commercial applications they are mainly derived from the genus *Bacillus* such as *Bacillus licheniformis*, *Bacillus stearothermophilus*, and *Bacillus amyloliquefaciens* which find a greater potential in a number of industrial processes. Among bacteria, α-amylase obtained from thermoresistant bacteria like *Bacillus licheniformis* or from engineered strains of *Escherichia coli* or *Bacillus subtilis* is used during the first step of hydrolysis of

starch suspensions as they have the ability to survive in all sorts of inhospitable environments above 70°C. The thermophilic fungus *Thermomyceslanuginosus* is also an excellent producer of amylase and its thermostability was proven by Jensen.

Feed enzymes are used in animal diet formulation as it can increase the digestibility of nutrients leading to greater efficiency in feed utilization. They are added to degrade specific feed components that have no nutritional value. Commercially available feed enzymes used for poultry includes phytases, proteases, α-galactosidases, glucanases, xylanases, α-amylases, and polygalacturonases (Walsh et al. 1993; Chesson 1993).

Thus, the applications of microbial enzymes in food, pharmaceutical, textile, paper, leather, and other industries are increasing rapidly over conventional methods due to less harm to the environment.(Jordon 1929; Kamini et al. 1999; Gurung et al. 2013).

Consequently, the present study was to isolate industrial enzyme producing microbes from environmental samples.

Materials and Methods
Sample Collection
The algal, eel fish and soil samples were collected from Vayalur, Trichy.

Chemical Reagents
The composition of nutrient broth for 100ml is 0.5 gm of peptone, SRL (India), 0.5 gm of NaCl SRL (India), 0.1 gm of Beef Extract, SRL (India),0.2 gm of Yeast Extract, SRL (India). The composition of nutrient medium for the inoculation of taken sample in Petri plates of 0.5 gm of peptone, SRL(India),0.1 gm of Beef Extract, SRL (India),0.2 gm of Yeast Extract, SRL (India),0.5 gm of NaCl, SRL (India), 1.75 gm of Agar powder, SRL (India) for 100 ml.

Identification of amylase enzyme in starch Agar medium was prepared by the composition of 0.2gm of Yeast extract, SRL (India), 0.1 gm of beef extract, 1.75gm of Agar powder, SRL (India),0.1 of milk solids, SRL (India).

Isolation of Microbes
The extract of the sample was taken and dissolved into 10 ml of nutrition broth. After inoculation, to sterile tube was kept into the incubator at 37 degree Celsius for 24 hr in control incremental condition. The nutrient agar was prepared and then the sample was pour into the plate. The L-rod was used to spread the sample in the plate. After incubation of plate at 37 °C at 24 hr. The plate was observed and the colony was viewed in the plate.

Characterization of Microorganism
Gram Staining
A loop full of sample was spread in the slide, which was taken from plate. The slide was smeared in the flame. The crystal violet dye was added kept it for 1 min and wash the slide in the water. Gram iodine was added and kept it for 1 minute then it washed out. The decolorizing agent was added kept it 1 min and then it was out finally the saffron strain was added after a minute it was washed in the water. It was observed under microscope the purple colours indicate gram positive and the pink colour was indicated gram negative.

Motility
The motility test was performed by hanging drop method. The cover slip was taken also then its edge was coated with Vaseline. The loop full of sample was transferred into the cover slip and placed it over the cavity slide. The slide was viewed under microscope and observed the organism, whether it was motile or non- motile.

Screening and Selection of Industrially Important Microbes
Milk agar medium and potato dextrose agar medium was prepared and screened for industrial enzyme producing microbes. Petri plates divided into the different small boxes, a loop full of culture was taken and placed a single streak on the Milk Agar Plates and PDA agar plates. After Incubation, the zone of

clearance was examined in both milk and PDA agar medium.

a. Potato Dextrose Agar Medium

The potato dextrose agar medium was prepared by dissolving 20 gm of potato infusion, 2 gm of dextrose and 1.5 gm of agar in 100ml of distilled water. The dissolved medium was autoclaved at 15 lbs pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm petri plates (25-30 ml/plate) while still molten.

b. Milk Agar Medium

The milk agar medium was prepared with the composition of 0.3 gm of Yeast extract, 0.5 gm of beef extract, 1.5 gm of Agar powder, 0.1 of milk solids in 100 ml of distilled water. The dissolved medium was autoclaved at 15 lbs pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm petri plates (25-30 ml/plate) while still molten.

Selection of Mutation Colony

The isolated pure culture was spread over the nutrient agar medium in the plate. The plate was separated into two sections; the half of the petri plate portion was covered with aluminium foils which protect the sample from the UV exposure. The remaining half portion was exposed under UV for different time period (10, 20, 30 minutes). After exposure, the plate was incubated at 37 degree Celsius for 24 hours in bacteriological incubator. The plate was observed, the mutant colonies were isolated from the UV exposed area after 24 hours.

SDS-PAGE Analysis

The determination of molecular weight of the enzyme was analyzed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) according to the Laemmli method. The protein bands were determined through the Coomassie Brilliant blue staining method.

Statistical Analysis

The difference in estimated parameters between the groups was analyzed using one-way ANOVAwithBonferroni's test. Data expressed as mean ± SD. All parameters were analyzed at 95% confidence intervals and a P-value of <0.05 was considered to be statistically significant. Statistical analysis of the data was performed using Graphpad Prism version 6.00 for Windows, GraphPad Software, San Diego California USA.

Results

Screening, Isolation and Identification of Industrial Important Enzyme producing Microorganism from the Algal Sample

From the algal samples, ten different bacterial colonies were isolated which produced very minimum enzyme activity.Those colonies were isolated and stained with gram staining method. The shape of the bacterial isolate was rod shaped.
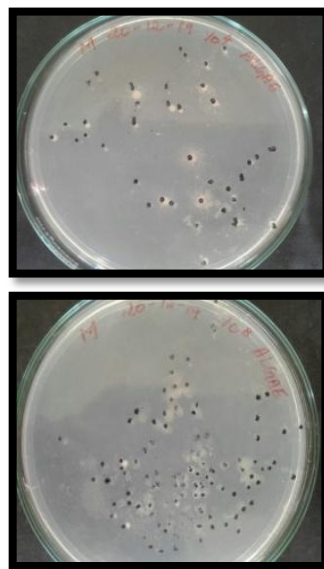

Fig 1: Colony formation of 10^4 and 10^8 algal samples

Fig 2: Isolation of individual colonies from 10^4 and 10^8 plates
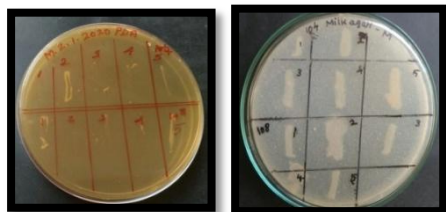

Fig 3: Screening of protease and amylase enzyme producing bacterial isolates by PDA and milk agar

Screening, Isolation and Identification of Industrial Important Enzyme producing Microorganism from the Eel Fish Sample

In the Eel fish samples, several colonies were isolated by spread plate technique. Those colonies were isolated and stained with gram staining method in which the isolate shape was cocci as well as rod shaped.
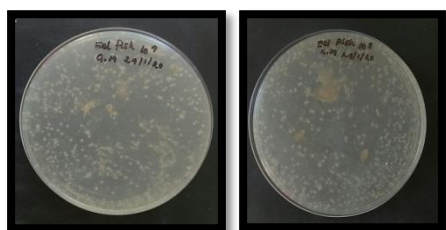
Fig 4: Colonies formationof 10^4 and 10^8 dilution of eel fish samples
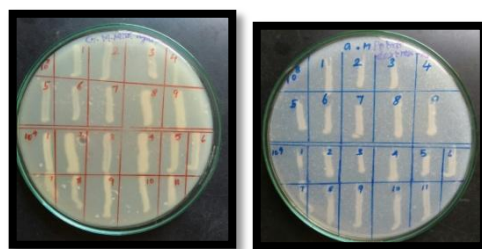
Fig 5: Screening of enzyme producing microbes by PDA and milk agar medium

Screening, Isolation and Identification of Industrial Important Enzyme producing Microorganism from Soil Sample

The bacteria isolated from the soil were capable of producing amylase enzyme as the zone of clearance was observed around colonies on the starch agar plate. Those colonies positive were isolated and stained with gram staining method. The shape of the bacterial isolate was rod shaped gram-positive bacteria.
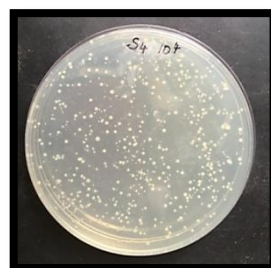

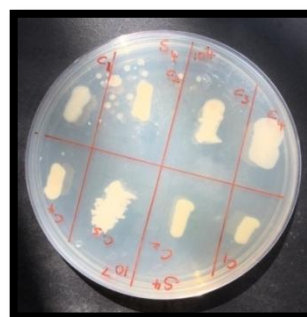**Fig 6: Colonies observed atserial dilution of 10^4in soil sample**

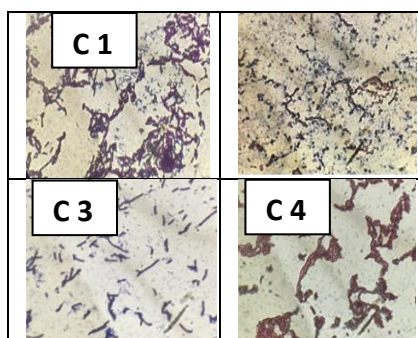**Fig 7: Isolation of colonies from the 10^4and10^7 dilution plate**

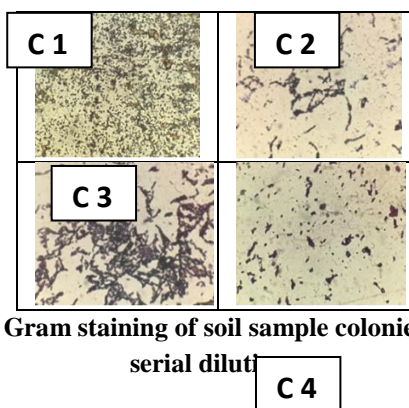**Fig 8: Gram staining of soil sample colonies at 10^4 serial dilutions**

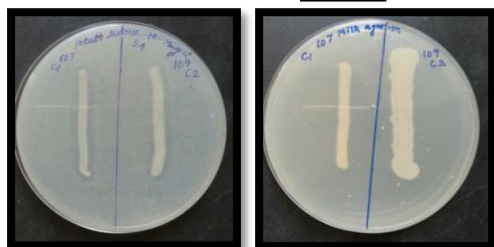**Fig 9: Gram staining of soil sample colonies at 10^7 serial dilut**

Fig 10: Enzymatic activity of 10^7 and 10^4 dilution soil sample colonies in PDA and milk agar

Table 1. Identification of unique bacterial colonies from the three different samples

S NO.	Test Sample & Serial Dilution	Shape	Gram Staining
1	S 1 10^4 C 1	Long chain rods	Positive
2	S 1 10^4 C 2	Rods	Positive
3	S 1 10^4 C 3	Long chain rods	Positive
4	S 1 10^4 C 4	Long chain rods	Negative
5	S 1 10^7 C 1	Short rods	-
6	S 1 10^7 C 2	Long chain rods	Positive
7	S 1 10^7 C 3	Long chain rods	Positive
8	S 1 10^7 C 4	Short rods	Positive
9	S 2 10^8 C 1	Short rods	Positive
10	S 2 10^8 C 2	Rods	Negative
11	S 2 10^8 C 3	Rods	Negative
12	S 2 10^8 C 4	Rods	Negative

Table 2. Biochemical assays for amylase enzyme producing microbes

S.NO	Bio Chemical Test	Sample	Result
1.	Indole test	10^7	-
		10^4	-
2.	Methyl red test	10^7	+
		10^4	+
3.	Vogesproskauer test	10^7	-
		10^4	-

Biochemical Screening and Identification of Industrial Enzyme Producing Microbes

There are 38 bacterial colonies were isolated from the three different environmental samples. All the bacterial colonies were subjected to gram staining and unique colonies were shortlisted. There colonies were further identified by IMViC biochemical assays.IMVIC tests showed the colonies were methyl red positive result. The methyl red positive bacteria producing sufficient amount of acid during fermentation of glucose.

Amylase Enzymatic Activity of Bacterial Isolate from the Soil Sample

The amylase enzymatic activity was performed using bacterial lysate and their supernatant. The results showed that the bacterial isolate produces intracellular amylase enzyme production as shown in fig 15.
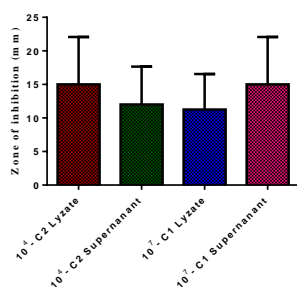
Fig 15: Amylase enzymatic activity of 10^4 C2 colonies of soil sample in PDA agar medium

SDS PAGE Analysis of Amylase Enzyme

The SDS-PAGE analysis was performed for amylase enzyme producing bacterial lysate. The results showed the presence of amylase enzyme band at 68 kDa.

Fig 16.SDS-PAGE analysis of amylase enzyme

Discussion

Amylase is one of those enzymes that has high specificity and catalytic characteristics which have enabled them to be used in various industrial sectors for the production of a wide range of products.In the present study we isolated an industrial enzyme producing microbes from the environmental sample and their biochemical characterization by IMViC tests and their enzymatic activity. Isolation of bacteria was carried out using algal, eel fish and soil samples. From the algal samples, ten different bacterial colonies were isolated which produced very minimum enzyme activity.Those colonies were isolated and stained with gram staining method. The shape of the bacterial isolate was rod shaped. In the Eel fish samples, several colonies were isolated by spread plate technique. Those colonies were isolated and stained with gram staining method in which the isolate shape was cocci as well as rod shaped.The bacteria isolated from the soil was capable of producing amylase enzyme as the zone of clearance was observed around colonies on the starch agar plate. Those colonies positive were isolated and stained with gram staining method. The shape of the bacterial isolate was rod shaped gram-positive bacteria.

There are 38 bacterial colonies were isolated from the three different environmental samples. All the bacterial colonies were subjected to gram staining and unique colonies were shortlisted. There colonies were further identified by IMViC biochemical assays.IMVIC tests showed the colonies were methyl red positive result. The methyl red positive bacteria producing sufficient amount of acid during fermentation of glucose.

The amylase enzymatic activity was performed using bacterial lysate and their supernatant. The results showed that the bacterial isolate produces intracellular amylase enzyme production as shown in fig 15.The SDS-PAGE analysis was performed for amylase enzyme producing bacterial lysate. The results showed the presence of amylase enzyme band at 68 kDa.

The important steps of enzyme production are isolation and screening of the bacterial strains. On primary screening, the bacterial strains showed amylase positive with a maximum zone formation. The mechanism of a clear zone observed was due to the fact that the amylase produced during the growth of the organisms has hydrolyzed the starch around the colony. Selection of suitable fermentation medium is very essential for the growth of microorganisms as well as for the production of amylase.

The composition and concentration of media greatly affect the growth and production of extracellular amylase by bacteria. Alpha amylase production is induced by the presence of starch in the production medium.

The results in this investigation suggest that the zone of clearance with the amylase activity was observed clearly in the soil sample. The isolate displaying maximum amylase activity on

quantization was selected and confirmed the protein band by SDS PAGE analysis.

Conclusion

Amylases are significant enzymes for their specific use in the industrial starch conversion process. The present study attempts to explore the potential of indigenously isolated bacterial strains to produce amylases efficiently. The strains isolated from algal, eel fish and soil samples found to be amylase positive. Among all the three samples, the soil sample showed a clearer and sharp zone of clearance. The results are significant as they indicate that the enzyme will be active even under the presence of high temperatures and could be used under harsh conditions of textile wet processing.

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TIME LAPSE STUDY OF DEVELOPED LATENT FINGERPRINTS USING TURMERIC METHOD – SPR BASED

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Abstract

Usually, at the crime scene three types of fingerprints are encountered namely, patent prints, latent prints and plastic prints. Patent prints and plastic prints are the two dimensional and three-dimensional visible prints whereas latent prints are the invisible prints. For their enhancement, certain development methods should be carried out.This study focuses on timelapse of development of fingerprints using the Smal particle reagent-based turmeric on non-porous surface which have been intentionally or fortuitously wetted. The small particle reagent method used to develop latent prints on the wet non-porous surfaces. For this experimental purpose, the fingerprint impinged on the seven glass slides and immersed into the clean water for 5, 7, 9, 11, 13, and 15 days respectively.The SPR suspension based on turmeric powder was used to develop the print on each glass slides. The result concluded that it is possible to develop the print using non-conventional powder (turmeric) on wet glass slide, but the clarity of prints was decreased with increase in number of days of submersion.

Keywords: small particle reagent; fingerprint; turmeric powder; latent prints; non-porous surfaces.

Introduction

Fingerprint is an impression or mark made on the surface by a person's fingertip, which can be used for the purpose of identification because of their unique patterns.Fingerprint is one of the significant pieces of evidence found at crime scene. It is a source of individualization due to its unique pattern. The prints left at scene of crime are collected and compared with the suspect sample.Usually, three types of fingerprints are found at crime scene namely latent, patent and plastic prints. Sometimes prints bearing surfaces are intentionally or accidentally wetted. Oil red O, Cyanoacrylate, Small particle reagent etc. are the methods which are used to develop fingerprints on wet surfaces where the suspension reacts with fatty components of fingerprints.

The present study was focused on small particle reagent, but the conventional powders were replaced by turmeric powder on glass slide which were immersed in water for five to fifteen days to study the time lapse. The curcumin is the major chemical component present in the turmeric powder which react with the non-soluble water residue present on the fingerprint and makes them visible. The turmeric powder is cost effective and easily available in the household[15]. Conventional powders cause occupational health hazards. To overcome this, a natural powder (turmeric) which is mainly used in food and as a medicine in India was used to develop the print [15].

Materials and Methodology

The turmeric roots were collected from cultivated land, Karnataka. The liquid detergent was used to reduce the surface tension of the water and act as a surface-active agent as well as it enhances the quality of developed fingerprint. Sony IMX 586 sensor with 48MP resolution camera used for photography. Bandey fingerprint grading systemwas used to assess the quality of developed fingerprint.[4]

Table 2.1 Bandey fingerprint grading system[4]

GRADE	DESCRIPTION
0	No visible prints.
1	No continuous ridges.
2	One-third of the mark comprised continuous ridges; the remainder either no development.

3	Two-thirds of the mark comprised of continuous ridges; the remaindershow no development.
4	Full development: whole mark comprised of continuous ridges.

A. Preparation of surfaces

The seven glass slides were collected and impinged with the prints, which were then immersed in water for five to fifteen days (5, 7, 9, 11, 13, and 15 days). The experiment was conducted during the summer season (Mid-March to April) in Mandi Gobindgarh, Punjab, India. The temperature was around **25℃ - 40℃** and the humidity level was around **40 - 50%.**

B. Preparation of powders

Turmeric powder: Firstly, the roots from the turmeric plant were collected and dried for 7 days under sunlight, and then the fine powder was prepared. Lastly, the fine particles were separated by a sieve plate. Before preparing suspension, the separated powder was placed in the hot air oven for 15 minutes at $30^{o}C$ to remove the moisture.

Figure 2.1: Turmeric (*Curcuma longa*)

Figure 2.2: Turmeric powder

C. Preparation of small particle reagent suspension

The small particle reagent suspension was prepared using the turmeric powder, distilled water and commercially laboratory detergent.

Firstly, turmeric powder must be placed in an oven for 15 minutes at 30℃ to remove the moisture.

Add 3g of Turmeric powder to 70ml of distilled water followed by 2 drops of laboratory detergent and mix it well and stored in a glass beaker.

Results

Small particle reagent technique has proved its advantage of developing latent fingerprint on wet or moist nonporous surfaces. To study the time lapse, the fingerprints were impinged on seven different glass slides and immersed in clean water for the interval of 5, 7, 9, 11, 13, and 15 days respectively. Later, the glass slides were dipped in SPR suspension (3g turmeric powder + 70ml distilled water + 2 drops of labdet) for two minutes and the slides were gently washed under stream of water for thirty seconds. The same process was repeated after respective intervals. The obtained results are presented below.
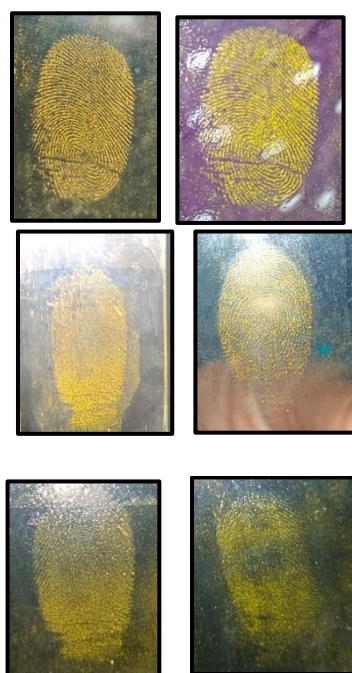

Fig 4.1: Developed fingerprints on glass slide using SPR based turmeric, after immersion for 5 days (A), 7 days (B), 9 days (C), 11 days (D), 13 days (E), and 15 days (F).

Small particle reagent-based turmeric developed latent prints observed very clear friction ridges and

the minutiae were identifiable after submersion in water for 5 and 7 days.

The minutiae visibility of developed prints showed significant decrease in quality after 9, 11 and 13 days.

The pattern developed after 15 days observed poor quality prints even the fingerprint patterns were not recognizable.

Based on the obtained result, it was concluded that the number of days of immersion is inversely proportion to the quality of prints.[19]

Table 4.2 Quality estimation of developed fingerprints on wet glass slide using SPR based turmeric (Refer TABLE 2.1)

DAYS	GRADES
5	4
7	4
9	3
11	2
13	2
15	0

Discussions

The main objective of this study based upon time interval lapse considering the interaction of turmeric powder with the latent prints on glass slides. The materials which were used for the preparation of SPR suspension are cost effective and easily available in household. In the study of time lapse, small particle reagent-based turmeric developed latent prints observed very clear friction ridges and the minutiae were identifiable after submersion in water for 5 and 7 days. After 9, 11, and 13 days, the quality of the prints were declined where the minutiae were not identifiable. After 15 days, the poor-quality prints were developed where the fingerprint pattern was not noticeable.

Earlier studies in 2018, Kallumpurat and kudtarkar used small particle reagent for the development of fingerprints using SPR black and SPR white suspension on wet non-porous surfaces to study the time lapse. This study concluded that the number of days of immersion is inversely proportional to the clarity of enhanced prints[19]. Likewise in current study to determine the time lapse, instead of SPR black and SPR white, the turmeric powder was used to prepare the small particle reagent suspension and the prints were developed. The study was concluded that the number of days of immersion is inversely proportion to the quality of prints.

Conclusion

The study concluded that the turmeric based SPR can substitute conventional powders based SPR effectively. This study was conducted to develop the latent fingerprint on nonporous surfaces which were immersed in water for five to fifteen days using Turmeric powder based SPR Suspension. The objective was to develop the print on wet glass slide and compare the quality of print with respect to time. The turmeric powder was used to make SPR suspension to develop fingerprint on wet glass slide. It gave better contrast due to its coloring component and developed high quality print. Therefore, it has been concluded that this can be used on wet surfaces effectively and it achieve the characteristics criteria of fingerprint powders such as good contrast and adherence. The powder don't cause any occupational health hazards, and these were eco-friendly, cost effective and non-toxic in nature[1].The time-lapse was determined using turmeric powder suspension on wet glass slide. From the study it was concluded that the greater number of days of immersion, the lesser quality of the prints.

The obtained results were encouraging as well as presented a most advisable method is 'Small particle reagent' in terms of developing fingerprint under wet condition and suggest a way to utilize theorganic powders to develop fingerprint on wet nonporous surfaces.

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DEVELOPMENT OF ALCOHOL-FREE HERBAL MOUTHWASH

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Abstract

Despite substantial progress in global oral health, many communities continue to face significant challenges. Oral infections, like tooth decay and periodontal diseases, remain among the most common bacterial infections affecting humans. While mouthwash is a widely used product for maintaining oral hygiene, many commercial varieties contain potentially harmful chemicals, including sodium lauryl sulfate, thymol, methyl salicylate, benzalkonium chloride, hydrogen peroxide, and alcohol. To address this issue, we have developed a more economical and natural mouthwash alternative, utilizing common food ingredients and herbs instead of costly chemicals. Our herbal mouthwash incorporates extracts from peppermint oil, tea tree oil, rosemary oil, betel leaf, ajwain, mint leaves, rose water, apple cider vinegar, baking soda, lemon, cinnamon, and clove. These components are selected for their beneficial properties, including preservation, antimicrobial effects, anti-cancer properties, and anti-fungal activity. Ajwain is particularly noted for aiding digestion and neutralizing bad breath. We conducted sensory, physicochemical, and microbial evaluations of the mouthwash both on the day of preparation and on the seventh day, assessing its stability and effectiveness under ambient and refrigerated conditions. This analysis aimed to determine the mouthwash's shelf life and overall efficacy.

Keywords: Oral health, tooth decay, buccal cavity, alcohol, herbs, shelf life.

Introduction

Oral health is integral to overall well-being, yet despite significant advancements in dental care, many communities globally continue to face substantial challenges. Among these challenges, dental infections caused by the formation of dental biofilms are notably prevalent. Conditions like oral caries and periodontal diseases are major concerns, exacerbated by modern lifestyle changes, including diets high in sugar, widespread tobacco use, and increased alcohol consumption. These factors contribute to an imbalanced oral microbiome, which is various community of microorganisms stay in the dental cavity.

The oral microbiome comprises over 500 bacterial species, although standard culture methods have isolated only about 280 of them. This complex microbial community inhabits various oral surfaces, including teeth, tongue, cheeks, gingiva, and lips. The bacteria within this biofilm can play a significant role in oral health problems. Notably, *Streptococcus mutans* is a significant contributor to these issues. This facultative anaerobic bacterium metabolizes sucrose to produce sticky plaque, which contributes to enamel demineralization and cavity formation. The presence of sucrose acts as a matrix for extracellular polysaccharides, enhancing bacterial adhesion and increasing the acid concentration at the tooth biofilm interface, which further aggravates the risk of dental caries and periodontal disease.

To combat these issues, mouthwash has been an essential component of oral hygiene for centuries. Historical practices included using mixtures derived from milk, oil, plants, and vinegar, which laid the foundation for modern mouthwash formulations. However, many current commercial mouthwashes contain potentially harmful chemical compounds such as sodium lauryl sulfate, thymol, and alcohol. These ingredients, while effective in some respects, may pose dangerous s to dental health and overall well-being.

In response to these concerns, we have developed an alternative herbal mouthwash formulated with natural ingredients. Our mouthwash incorporates extracts of peppermint oil, tea tree oil, rosemary oil, betel leaf, ajwain, mint leaves, rose water, apple cider vinegar, baking soda, lemon, cinnamon, and clove. Each of these components was

selected for their beneficial properties: antimicrobial, anti-cancer, and anti-fungal activities, as well as their roles in aiding digestion and combating bad breath. For instance, ajwain is known for its digestive benefits and its ability to neutralize malodorous compounds in the mouth.

This herbal mouthwash not only offers a safer and more cost-effective alternative to commercial products but also aligns with the growing demand for natural and non-toxic dental care solutions. To ensure the effectiveness and stability of our formulation, we conducted thorough sensory, physicochemical, and microbial analyses. These evaluations were performed immediately after preparation and again on the seventh day, under both ambient and refrigerated conditions. The goal was to assess the mouthwash's stability, shelf life, and overall efficacy as an alternative to conventional mouthwashes.

Our research aims to provide a viable and natural solution for maintaining oral hygiene, addressing the limitations of commercial mouthwashes while promoting safer and more sustainable oral health practices.

Significance of Ingredients Used

Mint Leaves: Mint leaves provide a fresh flavor and have antimicrobial properties that help reduce oral bacteria and enhance breath freshness.

Betel Leaves: Betel leaves contribute antibacterial and anti-inflammatory effects, which help in combating oral pathogens and soothing gum irritation.

Guava Leaves: Guava leaves offer strong antimicrobial benefits that help control bacteria in the mouth and promote overall gum health.

Clove: Clove's eugenol acts as a powerful antibacterial agent, providing relief from toothache and fighting harmful oral bacteria.

Cinnamon: Cinnamon's antimicrobial properties help reduce bacteria in the mouth while adding a pleasant taste and freshening breath.

Rose Water: Rose water soothes the oral mucosa and has mild antimicrobial properties, contributing to a calming and refreshing mouthwash experience.

Apple Cider Vinegar: Apple cider vinegar helps to maintain the mouth's pH and provides antibacterial effects, which support the reduction of oral bacteria and prevent bad breath.

Peppermint Oil: Peppermint oil imparts a cooling sensation and freshens breath, while its antimicrobial properties help eliminate oral bacteria.

Tea Tree Oil: Tea tree oil offers strong antimicrobial and antiseptic benefits, effectively targeting a wide range of oral pathogens and supporting overall oral hygiene.

Rosemary Oil: Rosemary oil's antibacterial and anti-inflammatory properties help reduce oral infections and soothe gum tissues, enhancing mouthwash effectiveness.

Methodology

Clove and Cinnamon (5g) were boiled, filtered, and 10 ml was used for the preparation (Jadhav et al., 2005); Dried Mint, Beetle leaves, and Guava (50g) were shade dried for 5 days, powdered, then boiled in 250 ml distilled water, filtered, and 50 ml was used (Singgih et al., 2008); Rose petals were boiled in 250 ml distilled water until their color changed from pink to white, then 50 ml of this was diluted with 5 ml distilled water to make 30 ml, and 20 ml was filtered for use; Apple cider vinegar (5 ml) was adulterated to 100 ml with distilled water, and 10 ml was used (Paul et al., 2015). Two drops each of Tea Tree, Rosemary, and Peppermint oil were added to the final prepared solution.

Swabbing: Samples were collected before and after using mouthwash with a cotton swab, then streaked onto agar plates, which were incubated at 37° C for 24 hours.

Result and Discussion

In this study, a herbal mouthwash was formulated using extracts with the highest antimicrobial activity, including betel leaves, mint leaves, and guava leaves. Additional components were incorporated to enhance the mouthwash's efficacy and sensory appeal: flavor agents such as cinnamon, clove, and rose water, and preservatives including lemon and essential oils.

The mouthwash was tested on various individuals, with samples collected at specific intervals to assess its impact. The results indicated a significant reduction in microbial growth in the oral cavity following the use of the herbal mouthwash. This reduction suggests that the herbal extracts effectively inhibited bacterial activity, aligning with their known antimicrobial properties.

Moreover, the mouthwash maintained a sense of freshness in the mouth for up to six hours, demonstrating its effectiveness not only in reducing oral microorganisms but also in providing long-lasting breath freshness. These findings support the use of the selected herbal ingredients in oral hygiene products, highlighting their potential as a natural and effective alternative to conventional mouthwashes. The combination of antimicrobial extracts and flavoring agents contributed to both the functional and sensory attributes of the mouthwash, making it a viable option for maintaining oral health.

1st week
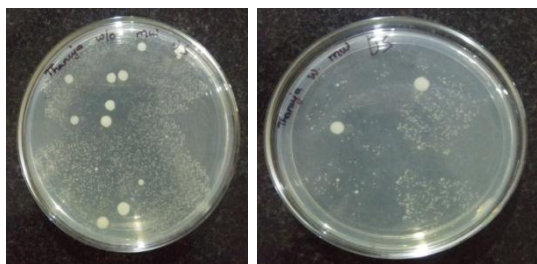
Before swabbing

2nd week:
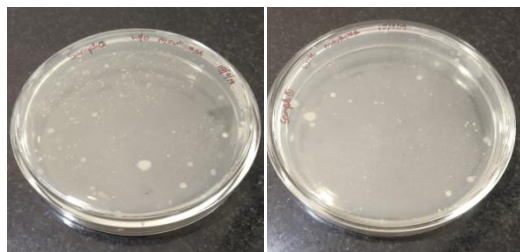
After swabbing

Conclusion

The increasing prevalence of oral diseases has prompted extensive research into oral disinfectants and remedies. Traditional antibiotics have proven less effective against resistant bacterial strains, leading to the exploration of herbal alternatives, which have shown greater efficacy. Herbal extracts with strong antimicrobial properties were selected to create an effective herbal mouthwash. This mouthwash demonstrated superior activity against oral microorganisms compared to conventional antibiotics. The formulation maintained its effectiveness for five to seven days before the flavor began to alter. The mouthwash was tested for microbial efficacy in both the first and second weeks. Compared to commercial mouthwashes, the herbal formulation exhibited enhanced antibacterial action. Thus, we conclude that the alcohol-free herbal mouthwash is a safe and effective option for oral hygiene. Future research will focus on extending the shelf life of the mouthwash to enhance its suitability for commercial use.

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STUDY ON THE ANTIFUNGAL EFFICACY OF PIPER NIGRUM AND CUMINIUM CYMINIUM AGAINST FUNGAL PATHOGEN

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Abstract

Traditionally used Indian spices produce a variety of compounds of known therapeutic properties. The substances that can either inhibit the growth of pathogens or kill them and have no or least toxicity to host cells are considered candidates for developing new antifungal drugs. In recent years, antifungal properties of medicinal plants are being increasingly reported from different parts of the world. It is expected that spices extracts showing target sites other than those used by antibiotics will be active against drug resistant microbial pathogens. However, very little information is available on such activity of medicinal plants. Hence, the present study, aimed at screening selected spices for their anti-fungal activity and evaluating their potential use in treating infections caused by black mould A.niger and green mould A.flavus.

Introduction

Fungal infections pose serious medical issues. Up to now, more than a hundred thousand fungal species are considered as natural contaminants. There is a general consensus among researchers, clinicians and pharmaceutical companies that new, potent, effective and safe antifungal drugs are needed. Historically, most of the substances have been part of natural products (Thyaga Raju K etal 2014). Therefore, it is quite logical that any recent search for new prototype antifungal products should also include a variety of plant extracts. In designing a search for novel prototype antifungal agent, it seems reasonable to assume that if new agents are to be found that have different structures and different activities from those in current use, higher plants are a logical choice. It is chiefly because of their seemingly infinite variety of novel molecules, which are often referred to as secondary metabolite (Saha D etal 2005).

Piper Nigrum

Black pepper (*Piper nigrum*) is a flowering vine in the family Piperaceae, cultivated for its fruit (the pepper corn), which is usually dried and used as a spice and seasoning. The fruit is a drupe (stone fruit) which is about 5 mm (0.20 in) in diameter (fresh and fully mature), dark red, and contains a stone which encloses a single pepper seed. Pepper corns and the ground pepper derived from them may be described simply as *pepper*, or more precisely as *black pepper* (cooked and dried unripe fruit), *green pepper* (dried unripe fruit), or *white pepper* (ripe fruit seeds) (Raper and Fennell, 1965). Black pepper is native to the Malabar Coast of India and the Malabar pepper is extensively cultivated there and in other tropical regions. Ground, dried, and cooked peppercorns have been used since antiquity, both for flavour and as a traditional medicine. Black pepper is the world's most traded spice,[5] and is one of the most common spices added to cuisines around

the world. Its spiciness is due to the chemical compound piperine, which is a different kind of spiciness from that of capsaicin characteristic of chili peppers. It is ubiquitous in the Western world as a seasoning, and is often paired with salt and available on dining tables in shakers or mills (Bennett, 1980).

Cuminium Cyminium

In traditional medicine, cumin was used to treat hoarseness, jaundice, dyspepsia and diarrhoea. Its seeds were used for stomachic, diuretic, carminative, stimulant, astringent and abortifacient properties. The oil of cumin was used in perfumery and as a seasoning in curry powders, soups, stews, sausages, cheeses, pickles, meats and chutneys (Vogel, H.G., 1991). In America, Africa and India the drug is used as an abortive and as an emmenagogue. In Indonesia, it was used in cases of bloody diarrhea and headache (paste is applied to the forehead). It was also taken orally for rheumatic ailments. In India, cumin was used as an abortifacient, for kidney and bladder stones, chronic diarrhea, leprosy and eye disease. In Unani system of medicine, the fruits of Cuminum cyminum were used as an astringent, carminative, emmenagogue, for the treatment of corneal opacities, ulcers, boils, styes and to relieve cough and inflammation (Wani, M.C etal 1971).

Materials and Methods
Sample Collection
The spoiled vegetable was collected from a local market at Perambalur. Collected sample was normally cut at the depth of 15 cm and transferred to clean containers.

Preparation of Extract
Sample of spices were extracted twice in Aqueous, Acetone, Ethanol (1:10 w/v) at room temperature for 48 hours and filtered. The filtrates were concentrated to dryness under reduced conditions at room temperature.

Determination of Anti Fungal Activity using Disc-Diffusion Method (Bauer *et al.*, 1959).
Various solvent fractions of *Piper nigrum* and *Cuminium* cyminium extract were checked for antifungal activity using disc-diffusion method. A.flavus and A.niger was swabbed on the surface of the potato dextrose agar plates. The disc (Whatman No.1 filter paper with 9 mm diameter) was impregnated with the 50 μl of each test sample and it was placed on the surface of potato dextrose agar plates. The plates (triplicates) were incubated 28°C for 72 h. The antimicrobial potency of the test samples was measured by determining the diameter of the zones of inhibition in millimeter.

Results and Discussion
Test Organism
The test organism were collected from infected spoiled vegetables and the morphology ,microscopic structure were observed under light microscope.

Morphological Study of *Pathogens*
Microscopically, *A. flavus* colony appear as a velvety, yellow to green or brown mold with colorless or sandy beige reverse. Old colony appears as dark green. The shape is smooth and some have radial wrinkles

Disc Diffusion Method
In the present study from the spices such as *Piper nigrum and Cuminium cyminium* extracts showed antifungal activity against *A.flavus*. The individual extracts (Aqueous, acetone and ethanol) of *Piper nigrum and Cuminium cyminium* showed moderate antifungal activity. The average zone of inhibition of 0.2, 0.1 and 0.4 mm was observed in *Piper nigrum* and the average zone of inhibition of 0.1, 0.3 and 0.1 mm was observed in *Cuminium cyminium* in disc diffusion method.Among all the extracts, only acetone and ethanol showed maximum activity against *A.flavus*.
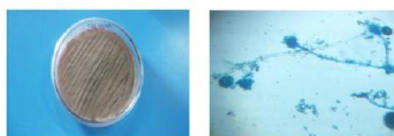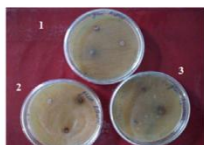
Fig 1   1. *Piper nigrum*   3. *Cuminum cyminum*

Fig 2   *A.flavus* Plate view   *A.flavus* Microscopic view

Fig 3 Antifungal activity of Indian spices against *A.Favus*

Table: 2 Antifungal activities of Indian spices (*Piper nigrum and Cuminiumcyminium*) tested against *A.flavus* and *A.niger* by Disc diffusion method

Sample	Indian Spices activity against *A.flavus*		
	Aqueous extract	Acetone extract	Ethanol extract
Piper nigrum,	0.2mm	0.1mm	0.4mm
Cuminiumcyminium	0.1mm	0.3mm	0.1mm

Conclusion

Traditionally used Indian spices produce a variety of compounds of known therapeutic properties. The substances that can either inhibit the growth of pathogens or kill them and have no or least toxicity to host cells are considered candidates for developing new antifungal drugs. In recent years, antifungal properties of medicinal plants are being increasingly reported from different parts of the world. It is expected that spices extracts showing target sites other than those used by antibiotics will be active against drug resistant microbial pathogens. However, very little information is available on such activity of medicinal plants. Hence, the present study, aimed at screening selected spices for their anti-fungal activity andevaluating their potential use in treating infections caused by green mould *A.flavus.* From the present investigation, following observation were made.

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STUDY ON THE ANTIFUNGAL EFFICACY OF PIPER NIGRUM AND CUMINIUM CYMINIUM AGAINST ASPERGILLUS NIGER

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Keywords: antifungal activity, black mould, toxicity

Introduction

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The test organism were collected from infected spoiled vegetables and the morphology ,microscopic structure were observed under light microscope.

Morphological Study of *Pathogens*

Microscopically, *A. flavus* colony appear as a velvety, yellow to green or brown mold with colorless or sandy beige reverse. Old colony appears as dark green. The shape is smooth and some have radial wrinkles. Microscopically, *A. niger* can be identified by its hyaline, septate hyphae. Asexual conidiophores can be identified by being long and globose at the tip, with what appears to be a hymenial layer of structures, each "ejecting" its own spore.

Anti-fungal activity of Indian spices Disc diffusion method

Disc Diffusion Method

In the present study from the spices such as *Piper nigrum and Cuminium cyminium* extracts showed antifungal activity against *A.niger.* The individual extracts (Aqueous, acetone and ethanol) of *Piper nigrum and Cuminium cyminium* showed moderate antifungal activity. The average zone of inhibition of

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Table: 1 Antifungal activities of Indian spices (*Piper nigrum and Cuminiumcyminium*) tested against *A.niger* by Disc diffusion method

Sample	Indian Spices activity against *A.niger*		
	Aqueous extract	Acetone extract	Ethanol extract
Piper nigrum,	0.1mm	0.2mm	0.7mm
Cuminiumcyminium	0.1mm	0.4mm	0.2mm

Conclusion

Traditionally used Indian spices produce a variety of compounds of known therapeutic properties. The substances that can either inhibit the growth of pathogens or kill them and have no or least toxicity to host cells are considered candidates for developing new antifungal drugs. In recent years, antifungal properties of medicinal plants are being increasingly reported from different parts of the world. It is expected that spices extracts showing target sites other than those used by antibiotics will be active against drug resistant microbial pathogens. However, very little information is available on such activity of medicinal plants. Hence, the present study, aimed at screening selected spices for their anti-fungal activity andevaluating their potential use in treating infections caused by black mould *A.niger*

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EFFECT OF CYANOBACTERIA ON BIODEGRADATION OF SUGARCANE INDUSTRIAL WASTEWATER

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Abstract

The disposal of sugar cane waste into the environment creates serious adverse effects by altering the normal physiochemical properties of soil and water. The wastewater from sugar can industries readily provides a source of soluble food which is an ideal substrate for the microbial growth and rich in carbohydrates, they disturb the normal microbial growth thereby causing oxygen depletion. The rich organic matter favours the growth of various microorganisms and depletes oxygen by rapid respiration and oxidation which is recognized to degrade the pollutants. In this study, the effectiveness of cyanobacterial treatment system for bioremediation of sugar can industrial waste was investigated. In the treatment system, Cyanobacteria (osillatoria) was employed for the biodegradation of sugar cane waste. The effluents were analysed for their physiochemical and elemental parametersThe results revealed a chemical parameters results showed that the water quality was improved in parameters such as chloride, magnesium, dissolved O_2, potassium, TDS, pH, phosphate, and sulfate etc.

Keywords: algae, biodegradation, cyanobacteria, waste water, tds

Introduction

Polls frequently rank hazardous waste as the most significant environmental issue, and it has been one of the fastest-growing components of environmental compliance expenses in the United States The rate at which hazardous waste disposal is taxed has increased significantly in several jurisdictions in recent years, and some have raised the rates on waste that is imported from other states (Levinson, A. 1999). The impact of these state taxes on interstate hazardous waste shipments is measured by this study. For several reasons, the subject merits more attention .India's sugarcane industries are ancient industrial processes that produce a large amount of waste and byproducts. Because these by-products need a lot of storage space, handling and managing them is a major task. Nonetheless, it offers a chance to use these agricultural crop by-products as a source of organic nutrients. As a result, an assessment of the potential, accessibility, and application of sugar industry byproducts in agricultural production is made (Dotaniya2016).

The biological regulation of cyanobacteria can be achieved by a variety of naturally existing species, including as actinomycetes, bacteria, fungus, viruses, and protozoa. These organisms must first be isolated from environmental samples, their anti-cyanobacterial activity must be evaluated, large-scale field and microcosm tests must be conducted, and finally a biological control lake management plan must be developed (Taib etal 2008). M. Actinomycetes (such as Streptomyces exfoliatus,

which works by producing a lytic agent) and protozoa (such as Nuclearia delicatula and Nassulatumida, which work by predation) are the two opponent categories that are thoroughly examined. Many biological and physico-chemical variables affect how effective biological control agents are in the lake environment. To maximise their activity, a variety of tactics might be used(Palmer, J. T. 1998).

Materials and Methods
Collection of Fresh Water from Pond and Sugarcane Industrial Waste Water
The sugarcane waste is collected from Udumbiam Perambalur (Latitude 11.4313° N and Longitude78.7569° E).

Isolation and Microscopic Identification of Cyanobacteria Culture
Isolation and microscopic identification of cyanobacteria culture under the microscope in 40X.

Physical Parameters (Lima, S. A etal 2012) pH
The pH of the sample was measured by an electronic portable pH meter.

Colour
The term colour means true colour that is the colour of sample from which turbidity has been removed. True colour of the water is due to dissolved material. Colour of the sample is determined by visual comparison of waste waters with fresh water.

TDS (Total Dissolved Solids)
Total dissolved solid levels of samples were analyzed using digital TDS meter. The results were noted in triplicates.

EC (Electrical Conductivity)
The electrical conductive ability of water was assessed using a digital conductivity meter. The results were tabulated.

Turbidity
Similarly, the turbidity of water were tested using turbidity meter.

Odour
As soon as possible after collection of sample, fill a bottle (cleaned as in 2.1) half-full a sample, insert the stopper, shake vigorously for 2 to 3 seconds and then quickly observe the odour. The sample-taken for observation of odour shall bottle at room temperature.

Chemical Parameters procedure-Before and After
(APHA, AWWA, WEF, Standard Methods Washington, DC, 2005).

Calcium Hardness
It is measured by EDTA titrimetric method. Small concentration of calcium carbonate prevents corrosion of metal pipes by laying down a protective coating. But increased amount of calcium precipitates on heating to form harmful scales in boilers, pipes and utensils.

Calculation

$$\text{Calcium as Ca (mg/L)} = \frac{T \times 400.5 \times 1.05}{\text{Sample taken, ml}}$$

Where, T= volume of titrant, ml

$$\text{Calcium hardness (mg/L as CaCO}_3) = \frac{T \times 1000 \times 1.05}{\text{Sample taken, ml}}$$

Total Hardness
In alkaline conditions EDTA (Ethylene-diamine tetra acetic acid) and its sodium salts react with cations forming a soluble chelated complex when added to a solution.Exactly 5 ml of the well-mixed sample is pipetted into a conical flask, to which 1ml of ammonium buffer and 2-3 drops of Eriochrome black -T indicator is added. The mixture is titrated against standard 0.01M EDTA until the wine red colour of the solution turns pale blue at the end point.

Calculation

$$\text{Total hardness} = \frac{(T)\,(1000)}{V} \text{ (mg/L)}$$

Where, T = Volume of titrant

V = Volume of sample

Magnesium Hardness

Magnesium hardness can be calculated from the determined total hardness and calcium hardness.

Calculation

Magnesium = (T - C) x 0.243

(as mg/L)

where, T = Total hardness mg\L (as $CaCO_3$)

C = Calcium hardness mg\L (as $CaCO_3$)

Nitrates

Nitrates can be measured by the phenoldisulphonic method. A known volume (5ml) of the sample is pipetted into a porcelain dish and evaporated to dryness on a hot water bath. 2ml of phenol disulphonic acid is added to dissolve the residue by constant stirring with a glass rod. Concentrated solution of sodium hydroxide or conc. ammonium hydroxide and distilled water is added with stirring to make it alkaline. This is filtered into a Nessler's tube and made up to 50ml with distilled water. The absorbance is read at 410nm using a spectrophotometer after the development of colour. The standard graph is plotted by taking concentration along X-axis and the spectrophotometric readings (absorbance) along Y-axis. The value of nitrate is found by comparing absorbance of sample with the standard curve and expressed in mg/L.

Calculation:

$$\text{Nitrates} = \frac{\text{Absorbance of sample } \mathbf{X} \text{ Conc. of Std } \mathbf{X} \text{ 1000}}{\text{Absorbance of Std. } \mathbf{X} \text{ Sample taken}}$$

(as mg/L)

The high concentration of nitrate in water is indicative of pollution.

Sulphates

Sulphates can be calculated by turbidometric method. Sulphate ions are precipitated in acetic acid medium with barium chloride to form barium sulphate crystals of uniform size. The scattering of light by the precipitated suspension (barium sulphate) is measured by a Nephelometer and the concentration is recorded.**5** ml of the sample is filtered into a Nessler's tube containing 5ml of conditioning reagent. About 0.2g of barium chloride crystals is added with continued stirring. A working standard is prepared by taking 1ml of the standard, 5ml of conditioning reagent and made up to 100ml, to give 100 NTU. The turbidity developed by the sample and the standards are measured using a Nephelometer and the results are tabulated.

Calculation:

Sulphate = (Nephlometric reading) (0.4) (Dilution Factor)

(as mg/L)

Chlorides

Chlorides are calculated by Argentometric method. In alkaline or neutral solution, potassium chromate indicates the endpoint of the silver nitrate titration of chlorides. Silver chloride is quantitatively precipitated before the red silver chromate is formed.50g of potassium chromate is dissolved in minimum amount of distilled water and silver nitrate is added drop wise till a red precipitate is formed. The mixture is allowed to stand for about 12 hours and diluted to 1000ml with distilled water.A known volume of filtered sample (5ml) is taken in a conical flask, to which about 0.5ml of potassium chromate indicator is added and titrated against standard silver nitrate till silver dichromate ($AgCrO_4$) starts precipitating.

Calculation

$$\text{Chlorides (Cl}^-\text{)} = \frac{(A-B)\,(N)\,(35.45)}{\text{Sample taken in ml}}$$

Where,

A - Volume of silver nitrate consumed by the sample

B - Volume of silver nitrate consumed by the blank
N - Normality of silver nitrate (Standard methods, APHA, 16th edn, pp 286-88)

Dissolved Oxygen

Dissolved oxygen is calculated by Winkler's method**.** The samples are collected in BOD bottles, to which 2ml of manganous sulphate and 2ml of potassium iodide are added and sealed. This is mixed well and the precipitate allowed to settle down. At this stage 2ml of conc. sulphuric acid is added, and mixed well until all the precipitate dissolves. 203ml of the sample is measured into the conical flask and titrated against 0.025N sodium thiosulphate using starch as an indicator. The end point is the change of colour from blue to colourless.

Calculations:

203ml because (200) (300)/ (200-4) = 203ml.
1ml of 0.025N Sodium thiosulphate = 0.2mg of Oxygen

$$\text{Dissolved Oxygen (as mg/L)} = \frac{(0.2)(1000 \text{ ml of Sodium thiosulphate})}{200}$$

(Water analysis, APHA, 16th edn., pp 423-17)

Potassium

Trace amount of potassium can be determined by direct reading of flame photometer at a specific wavelength of 766.5nm by spraying the sample into the flame. The desired spectral lines are then isolated by the use of interference filters or suitable slit arrangements. The intensity of light is measured by the phototube.The concentration is found from the standard curve or as direct reading.

Phosphates

Phosphates are calculated by the stannous chloride method.To 50ml of the filtered sample, 4ml of ammonium molybdate reagent and about 4-5 drops of stannous chloride reagent is added. After about 10 min but before 12 min, the colour developed is measured photometrically at 690nm and calibration curve is prepared. A reagent blank is always run with same treatment with distilled water as sample. The value of phosphate is obtained by comparing absorbance of sample with the standard curve and expressed as mg/L.

Calculation:

$$\text{Phosphates} = \frac{\text{Absorbance of sample X Conc. of Std X } 1000}{\text{Absorbance of Std. X Sample taken}} \text{ (as mg/L)}$$

Sodium

Sodium calculated by flame photometric method. The filter of the flame photometer is set to 589nm (marked for Sodium, Na). By feeding distilled water the scale is set to zero and maximum using the standard of highest value. A standard curve between concentration and emission is prepared by feeding the standard solutions. The sample is filtered through filter paper and fed into the flame photometer and the concentration is found from graph or by direct readings.

Results and Discussion

The wastewater collected from the sugarcane industry was treated with cyanobacteria and the physical and chemical parameters of the raw wastewater and treated wastewater was studied and changes were observed. In physical parameters, pH, TDS (Total dissolved solids), EC (Electrical conductivity), Turbidly, Color, and odor was studied and in chemical parameters, the amount of Nitrate, Chloride, Magnesium, Dissolved oxygen, Calcium, Sodium, Potassium, Phosphate, Sulphate and salinity were studied and results were recorded. In physical parameters, while comparing with before and after treatments, TDS was reduced to the maximum limit of 1840 to 1229, and EC was reduced from 3826 to 2903, Turbidity was reduced from 0.50 to 0.28. The results are shown in Table. Primary-treated wastewater produced by the two plants was characterized. BOD_5, COD, TSS, TDS, FOG, Zn and Cu recorded averages of 155, 380, 184, 1250, 22, 0.1779 and 0.0577 mg/l, respectively, in the primary-treated wastewater of the EWTP (El-Bestawy, E. (2008). In chemical parameters, while comparing

with before and after treatments, the Chloride level was increased from 0.099 mg/L to 0.129mg/L, the Presence of magnesium was reduced from 1.09 mg/L to 0.607 mg/L, 94.08 mg/L of dissolved O2 was increase to 110.83 mg/L. The sodium level was increased from 0 to 6.87 mg/L. Potassium was increased from 0.56 mg/L to 7.43 and phosphate was reduced to the maximum level of 0.46 mg/L to 0.01 mg/L. Apart from these, there is an increase in sulfate level from 1.36 to 1.72 mg/L. Phosphorous was increased from 0 to 0.05 mg/L and salinity was reduced to the maximum level of 20.0 to 0 ppt. The results of chemical parameters are shown in Table.
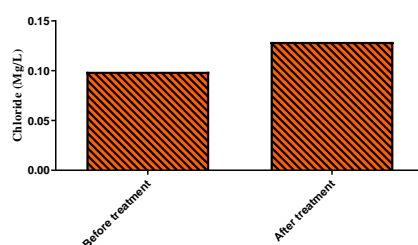
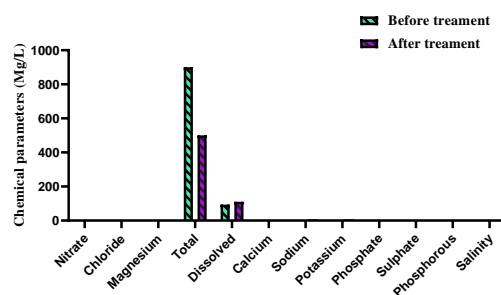## Physical Parameters of Industrial Wastewater Before and After Treatment

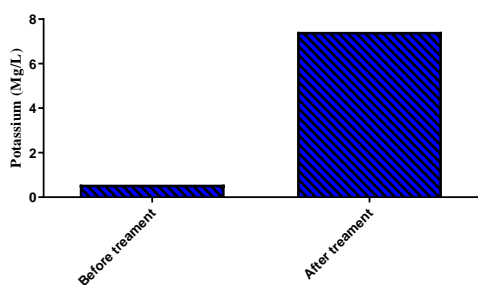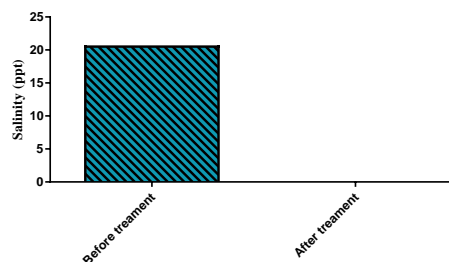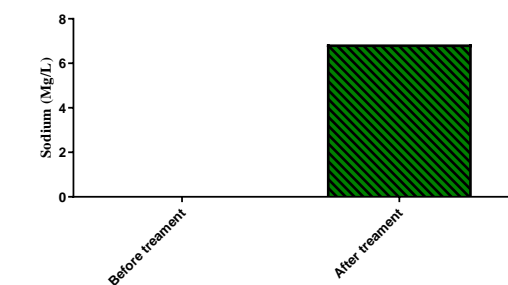**Table 1 Physical parameters of industrial wastewater before and after being treated with cyanobacteria**

S.NO	Name of the sample	Name of the parameters	Results Before treatments	After treatments
1.	Sugarcane industry waste water and cyanobacteria	P^H	2	8
2.		TDS	1840	1229
3.		EC	3826	2903
4.		Turbidity	0.50	0.28
5.		Colour	Brown	Light brown
6		Odour	Yes	Mild

Showing that Graph for Physical Parameters of Industrial Wastewater Before being Treated with Cyanobacteria
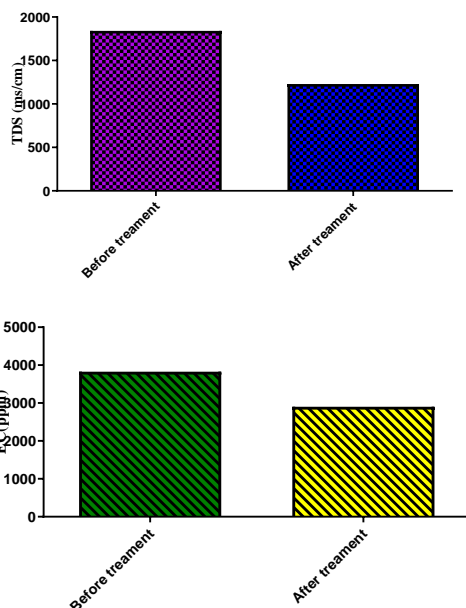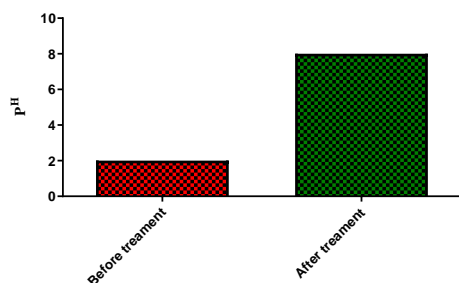
Showing that graph for physical parameters of industrial wastewater before being treated with cyanobacteria
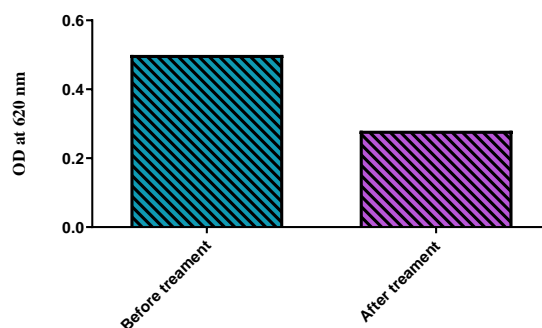
Images 1 Physical parameters of industrial wastewater before being treated with cyanobacteria

	oxygen	cane		
6	Calcium	Industrial	0	0
7	Sodium	Wastewater	0	6.87
8	Potassium	treatment	0.56	7.43
9	Phosphate		0.46	0.01
10	Sulphate		1.36	1.72
11	Phosphorous		0	0.05
12	Salinity		20.7	0

Showing that graph for Chemical parameters of industrial wastewater before being treated with cyanobacteria

Chemical parameters of Industrial wastewater before and after treatment

Table 2: Chemical parameters of industrial wastewater before and after being treated with cyanobacteria

S.NO	Chemical parameters	Name of the sample	Results of Test sample Mg/L	
			Before treatment	After treatment
1	Nitrate		0	0
2	Chloride		0.099	0.129
3	Magnesium		1.09	0.607
4	Total hardness		900	500
5	Dissolved	Cyanobacteria and Sugar	94.08	110.83
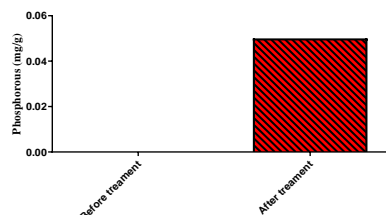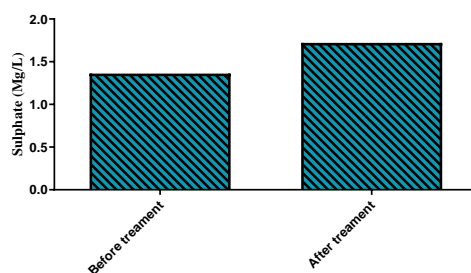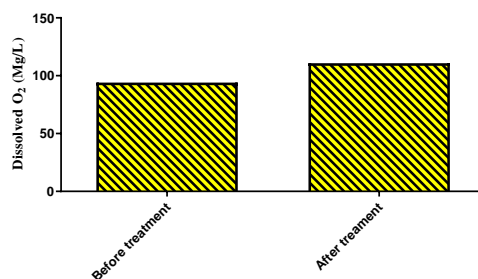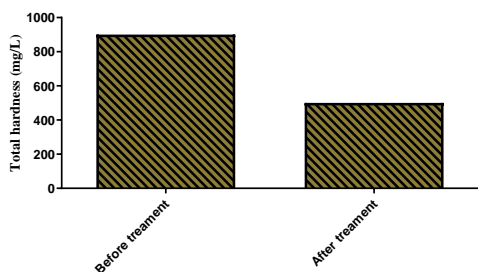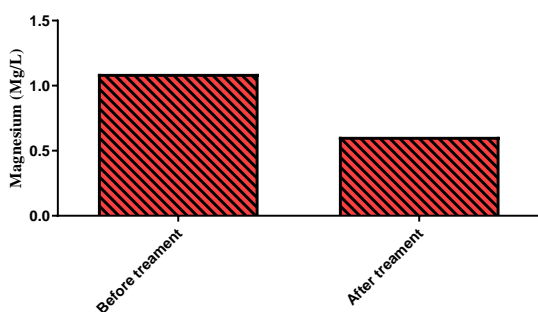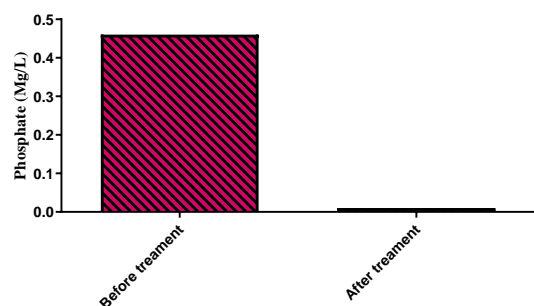
Conclusions

As the wastewater generated by the cane sugar mills is easily biodegradable, in principle it should be amenable to any kind of biological (cyanobacteria) treatment. The high content of organic matter in these effluents suggests however that an anaerobic pre-treatment followed by aerobic polishing should be the most effective option from an economic point of view to produce water of sufficient quality that can be safely discharged to the environment. The chemical parameters results showed that the water quality was improved in parameters such as chloride, magnesium, dissolved O_2, potassium, TDS, pH, phosphate, and sulfate etc.

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CRYPTO CURRENCY PREDICTION USING MEACHINING LEARNING

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Abstract
The decentralized structure of crypto currency and its potential for large profits have made it a popular choice for investors. However, buyers looking to anticipate fee swings and make profitable investments have a task due to the volatile and dangerous nature of the crypto currency market. One of the unique and effective methods for charge prediction is time collection analysis, which takes into account trends and advancements in historical charge data to generate predictions about future charge movements. Prediction accuracy can be greatly increased by combining technical indicators and machine learning (ML) techniques with time collecting analysis.

Introduction
A virtual or digital currency utilized in financial systems is called a crypto currency. It is protected by encryption, which prevents counterfeiting and duplicate spending. It differs from other currencies in that it is a decentralized virtual currency that can be converted using cryptographic processes and is not issued by central banks or authorities. The other characteristic is that it was made using a very sophisticated technology known as block chain, which stores data that makes it difficult or impossible to change, hack, or cheat the system. Bit coin has started to carve out a niche for itself, which could either contribute to the broader adoption of crypto currencies or be the primary factor in their downfall.

Machine Learning for Predicting Bit Coin Prices
The price of Bit coin was predicted by the authors of this study using a variety of machine learning algorithms, including as neural networks, decision trees, and linear regression. They experimented with various feature sets and assessed how well the algorithms worked with various sample sizes. The findings demonstrated that a blend of technical indicators, social media, and historical price data With great accuracy, sentiment may be used to forecast Bit coin values.

Neural networks and random forests are used to predict the price of bitcoin. A range of features were employed, such as market capitalization, trade volume, and historical price data. The outcomes demonstrated that neural networks and random forests performed better in predicting Bitcoin prices than the other methods.

Problem Statement
Creating precise and dependable models that can anticipate future crypto currency prices based on past price data, technical indications, market sentiment, and other pertinent factors is the problem statement for machine learning-based crypto currency price prediction. This statement of the problem is driven by the extreme volatility and unpredictable nature of crypto currency markets, which can make it difficult for investors and traders to make wise choices. Creating these prediction models with the intention of to give investors and traders insightful information about how the price of crypto currencies will change in the future, enabling them to make better educated investment choices. Additionally, regulators and other stakeholders can utilize precise bit coin price prediction models. Regulators should keep an eye on and control the crypto currency markets false news can differ greatly, making it challenging .

Model Selection

Numerous machine learning methods, such as Support Vector Machine and Linear Regression, can be utilized to forecast bitcoin prices.

Neural networks, Random Forest, and SVM machines. The quantity of the dataset, the difficulty of the task, and the performance indicators all influence the choice of model.

Model Training and Validation

To evaluate the chosen model's performance, it is verified on a holdout dataset after being trained on the preprocessed data. The model's performance measures were employed for assessment can take the form of root mean square error (RMSE), mean square error (MSE), mean absolute error (MAE), etc.

Hyperparameter Tuning

The parameters known as hyper parameters are those that are pre-set and not learned by the model during training. Finding the best values for these parameters is known as hyper parameter tuning, and it helps the model work better.
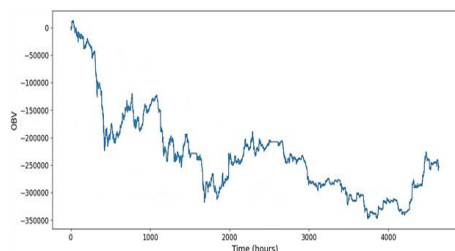

Deployment

The model can be used to forecast real-time bit coin values after it has been trained and verified. A web application, an API, or any other platform that gives access to the model's predictions can be used for the deployment.
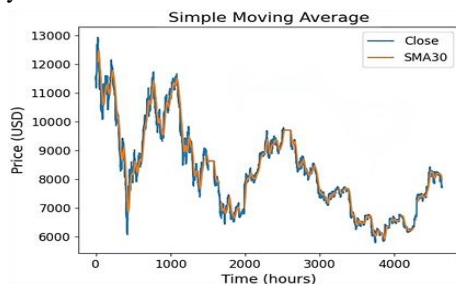
Data Collection

Gathering a sizable dataset of news stories—both authentic and fraudulent—from a variety of sources is the initial stage. We gather a lot of information by using social media sites, internet news portals, and other publicly accessible sources. The gathered data is pre-processed to eliminate extraneous elements like HTML tags, advertisements, and graphics.
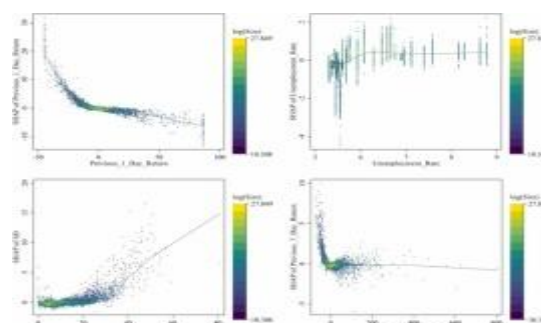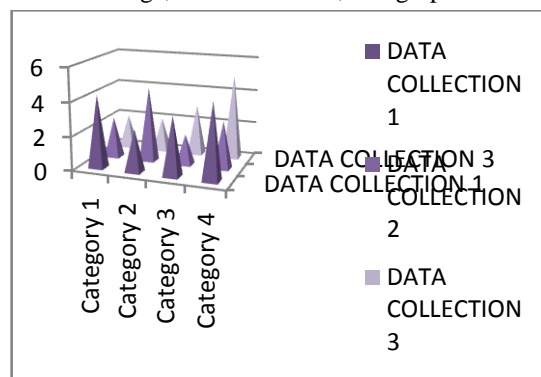
Feature Extraction

Gathering pertinent features from the pre-processed news articles is the second phase. We use multiple text-based features, including word embeddings, term frequency-inverse document frequency (TF-IDF), and bag-of-words. Additionally, we extract meta-data attributes like the source website, author name, and publication date.

Feature Selection

Finding the most discriminative and instructive features from the extracted feature set is the third phase in the process. We employ several feature selection methods, including mutual information, chi-square. Machine learning-based crypto currency

price prediction is a difficult task since the bit coin market is so complex and has great volatility. Nonetheless, the following general procedures and approaches can be utilized to forecast crypto currency prices with machine learning.

Feature Extraction

Data Gathering: Compile past information on trading volumes, bit coin values, and other pertinent variables. Numerous websites, such as Coin Market Cap and Coin Gecko, offer crypto currency data. Feature extraction transforms uncooked data, with picture documents being a standard use case, into numerical functions which can be like minded with device getting to know algorithms. Data scientists can create new functions appropriate for system gaining knowledge of programs with the aid of using extracting the form of an item or the redness cost in images.
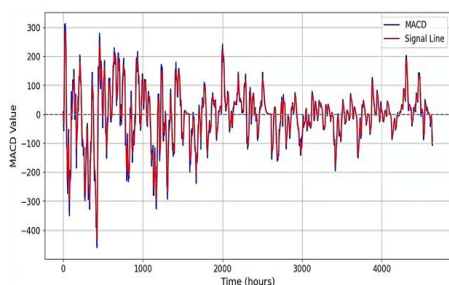
Results and Discussion

Among the models mentioned above, log it model is likely to be the best choice for predicting crypto currency prices. It continually demonstrates awesome overall performance throughout all prediction horizons, with excessive accuracy and coffee MSE. Its binary class cap potential is in particular strong, as evidenced via way of means of the excessive AUC cost for the 14-hour look ahead predictions. Additionally, the version well-known shows notable generaliz ability, as indicated through the excessive cross-validation scores. Predicting crypto currency costs entails binary class tasks (e.g., predicting rate actions as "up" or "down"). Log it model's capacity to deal with category responsibilities correctly makes it a appropriate

desire for crypto currency charge prediction. However, it's far essential to notice that the selection of the pleasant version in the long run relies upon at the unique dataset, functions generated and the complexity of the crypto currency charge prediction problem. Careful experimentation and tuning of hyper parameters can help obtain the optimal performance for a given dataset. The findings of this look at are in step with numerous preceding studies works. Similar to preceding studies, technical signs including SMA, RSI, MACD and OBV are used as features for the predictive models, that have been taken into consideration influential in capturing market trends and price movements. This research confirms the importance of feature engineering in crypto currency price prediction as running a model without feature engineering caused key performance metrics like accuracy and AUC to plummet.

The use of interpolation to address lacking facts is likewise a broadly followed exercise in crypto currency charge prediction studies .The findings of this study, however, display that greater correct outcomes have been received whilst the lacking values are ignored as opposed to interpolating the dataset. This may have occurred as the missing values contribute to less than 1.5% of the entire data set used in this research. Moreover, the comparison of different machine learning algorithms' performance corroborates earlier studies' insights into the performance of various models in crypto currency price prediction. Log it model demonstrates outstanding performance with high accuracy and excellent classification capabilities, consistent with its widespread application in financial prediction tasks.

The neural network model's varying performance across different prediction horizons highlights the need for further exploration of complex architectures and hyper parameter tuning. However, its accuracy for longer forecasting durations within reason high, making it a appropriate predictor in lots of cases The study's results reinforce the notion that the choice of machine learning algorithm plays a critical role in achieving accurate

and reliable crypto currency price predictions . The use of open source data, technical indicators, and interpolation techniques, along with the comparison of machine learning algorithms, adds to the growing understanding of effective methodologies in this rapidly evolving field.

This observe has a few boundaries and capacity re assets of bias that have to be acknowledged. Firstly, using ancient crypto currency charge statistics may not completely constitute the incredibly risky and dynamic nature of the crypto currency market. Market sentiment, regulatory changes, and other external factors that can significantly impact crypto currency prices are not possible to capture solely through historical price data (external data sources are required). The choice of machine learning algorithms and hyper parameter tuning could introduce bias towards specific models and settings, potentially influencing the performance results. Moreover, the feature engineering techniques employed in the study may not capture all relevant information, and other meaningful features could be overlooked, affecting the predictive accuracy. Additionally, there can be over fitting troubles because the identical information become used for version choice and hyper parameter tuning.

The evaluation metrics chosen might not fully capture all aspects of model performance, and using only a few metrics may not provide a comprehensive view of the models' strengths and weaknesses. Ensemble gaining knowledge of techniques might have been used to mix the predictions of more than one system gaining knowledge of fashions and upload to the prediction accuracy and robustness. Applying regularization techniques such as lasso and ridge could have helped combat over fitting issues.

Experimentation with one-of-a-kind regularization strengths should have helped discover the choicest stability among version complexity and generalization. Furthermore, subjecting the fashions to strain tests consisting of excessive marketplace situations or statistics anomalies should have helped examine their overall performance below negative situations. All of those elements have an impact at the predictive accuracy of the fashions so incorporating them may want to have caused a extra complete interpretation of the fashions' capability to predict future crypto currency prices. Despite the limitations, this research provides valuable insights into predicting crypto currency prices using machine learning algorithms. To deal with the recognized obstacles and capability re assets of bias, destiny studies must consciousness on increasing the dataset to encompass statistics from a couple of exchanges and time Periods, that allows you to boom the pattern length and offer numerous marketplace insights, in addition to incorporating different applicable capabilities together with relative vigour index (RVI) and commodity channel index (CCI). Employing greater state-of-the-art techniques, including sentiment evaluation or incorporating outside data, can decorate the model's overall performance and enhance its generalizability. Exploring ensemble methods, along with combining the predictions of more than one models, can also additionally in addition decorate the predictive accuracy and robustness. By addressing those areas, destiny research can make a contribution to the improvement of greater dependable and correct fashions for predicting cryptocurrency prices, imparting treasured insights to cryptocurrency buyers and the economic market.
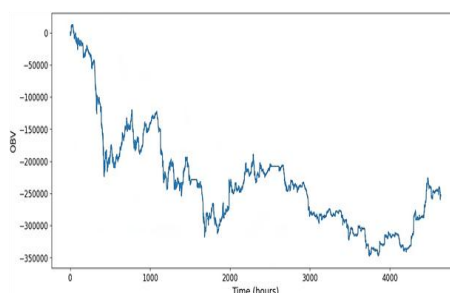
Conclusions

This observe aimed to are expecting destiny crypto currency costs the usage of gadget getting to know algorithms. Historical crypto currency charge information changed into acquired and information preprocessing strategies to put together the

information for version schooling had been employed. Feature engineering strategies precise to crypto currency statistics had been used to create applicable features. Five machine learning algorithms were implemented and their performances were evaluated using various performance metrics. Through rigorous analysis, insights into the predictive abilities of every version had been gained. This studies has yielded numerous key findings and contributions to the sector of crypto currency charge prediction. Firstly, the logistic regression model demonstrated outstanding performance across all prediction horizons, with high accuracy and good binary classification performance. It proved to be a beneficial desire for managing binary type tasks. Secondly, the neural community version confirmed robust predictive talents on positive prediction horizons, in particular the 14-hour look ahead predictions, however its overall performance numerous throughout distinct classes. This highlights the significance of thinking about the variety of the crypto currency marketplace while deciding on the proper model. Lastly, the examine supplied a complete contrast of the exclusive system gaining knowledge of algorithms' performance, dropping mild on their respective strengths and limitations. The findings of this studies have profound ramifications for the crypto currency marketplace as correct charge predictions can assist buyers make knowledgeable selections and higher manipulate dangers of their crypto currency buying and selling strategies. By knowledge the strengths and barriers of various device mastering algorithms, buyers can choose suitable fashions to match their buying and selling preferences. Moreover, the studies contributes to the developing frame of understanding with inside the area of crypto currency charge prediction, paving the manner for greater superior and dependable fashions to be developed in the future. In conclusion, this examine highlights the capacity of gadget getting to know algorithms in predicting destiny crypto currency prices. While the log it model stands out as a robust and versatile choice, the neural network model also shows promise with its strong performance on specific prediction horizons. Nevertheless, it's miles crucial to be aware about the restrictions and capacity re assets of bias within side the study, along with facts selection, set of rules desire and assessment metrics. Future studies ought to awareness on addressing those obstacles and exploring extra state-of-the-art strategies to in addition beautify the accuracy and generaliz ability of the prediction models. Overall, this have a look at presents full-size insights to the world of forecasting crypto currency prices, setting up a basis for upcoming trends on this dynamic and rapidly progressing area.

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BIO-INSPIRED AND GREEN SYNTHESIS OF METAL OXIDE NANOPARTICLES FOR MEDICINAL USES

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Abstract
The plant kingdom is a source of drugs which is the powerhouse of medicine to cure several ailments. Nowadays, biomaterials have motivated the synthesis of modern nanomaterials with accurate control over their morphology, dimension and also interesting properties. According to its properties and mode of transport, a particle in nanotechnology is a small object that acts as a single unit based on specific characteristics such as shape, size and distribution. Based on these advantages we synthesized zinc oxide nanoparticle using Cissus quadrangularis leaf extract. Characterization analysis shows that ZnO Nps is synthesized properly and the antibacterial assay depicts the effective antibacterial action.
Keywords: *medicinal plant, nano particles, biomaterials, antibacterial*

Introduction

Nanotechnology is a very important field of the 21st century though impact on the people's lives, industry and world's economy[1]. Nanotechnology is creating new materials at the nanoscale and can be applied to a wide range of scientific fields to create a wide range of products[2]. Nowadays, biomaterials have motivated the synthesis of modern nanomaterials with accurate control over their morphology, dimension and also interesting properties[3]. It is a new, fast-developing industry and environment that likely will produce a several number of novel materials during the future decades, which consequently will open the new era of life science and bionanoscience[4]. It is common to categorize nanomaterials based on their chemical structure, application or dimensionality and part of the social system[5].

Green nanotechnology produce new structures, materials and devices with unique properties (i.e. small size and large surface area) as well as economically and environmentally sustainable green innovations. Green nanotechnology only provides occupational safety and health[6]. Predominantly chemical and physical methods are harmful for the environmental and to human health because using highly concentrated reductants, high radiation and stabilizing agents. But green or eco-friendly and biological methods are single step reduction method, low cost, non toxic and less energy is required[7,8].

In recent times, green synthesis using medicinal plant extract has obtained specific value in the formation of nanoparticles and especially phytochemicals are backbone of plants and easily produce nanoparticles with less toxicity. Green synthesis was acquiring high interest based on the rich content of active metabolites in plant which act as a capping agent for nanoparticles synthesis, are now valuable over other biological processes.

Materials and Methods

Chemicals

All materials were purchased from Nice and Loba chemicals. Solvents used throughout the reactions were of high purity and used without further purifications.

Collection of Plant Materials

The plant material *Cissus quadrangularis* was collected from the local places of Perambalur area. Freshly collected whole plant was used for the synthesis of zinc oxide nanoparticles.

Preparation of Plant Extract

Zinc acetate salt and *Cissus quadrangularis* plant extract was used as the preliminary materials. The extract solution was equipped by using leaf of *Cissus quadrangularis* plant. The leaves of fresh plant that had been rinsed with de ionized water and finely cut into small pieces. Then the plant material was boiled with 100 mL of distilled water at 100°C, filtered by using whatmann No. 1 filter paper and stored at 4°C for further experimentation.

Synthesis of Zinc Oxide Nanoparticles

In the preparation of Zinc Oxide nanoparticles, samples $Zn(ac)_2.2H_2O$ (0.2g) was first dissolved in enough quantity of de ionized water and mixed with 20 mL of *Cissus quadrangularis* plant extract solution under vigorous stirring with magnetic stirrer at 1000 rpm at room temperature for 3hr. Then the reaction mixture's pH was adjusted by adding 1 milliliter of a 10% NaOH solution. The precipitated solid was filtered and dried. The crude product was maintained at 150°C for 12 hrs in oven. The resulting powder was first ground into a fine powder using a pestle and mortar after being calcined at 400 °C for five hours.

Characterization Studies

Zinc oxide nanoparticles synthesized by using green chemistry technique were confirmed with the help of UV-Visible spectrophotometer (Shimadzu) and FT-IR spectrophotometer (Shimadzu) spectrum in the range 4000-400 cm^{-1}, Powder XRD, SEM and EDX examination.

Antibacterial Activity

Antibacterial behavior of the aqueous leaf extract of *Cissus quadrangularis* (**1**) ZnO NPs (**2**) was checked against two-gram negative bacteria (*Escherichia coli, Pseudomonas aeruginosa* along with two-gram positive bacteria *Staphylococcus aureus and Bacillius cereus*) that were preserved on the agar slants of the nutrient. The antimicrobial behavior was performed as defined by Institute of Clinical and Laboratory Standards. Bacterial immunity to ZnO NPs was tested using an assay to disperse the disks.

Triplicates of the ZnO NPs were used in sterile deionized water dilutions of (200, 100, 50, 25, and 12.5). Initially, the isolates were incubated at 4°C for 15min, and then overnight at 37°C. Good test outcomes were graded when an inhibition zone was found across the well after the incubation time then a digital vernier caliper was used to calculate the inhibition zone diameter.

Minimum Inhibitory Concentration (MIC) Determination

The bacterial isolates, which were used to prepare 0.5 McFarland, were incubated at 37°C overnight. A minimum of 10ml tube nutrient broth medium was prepared and each sample was inoculated aseptically with 1ml of the respective bacterial suspension (approximately 108 CFU / mL). Five dilutions of aqueous leaf extract of *Cissus quadrangularis* (**1**) ZnO NPs (**2**) (200, 100, 50, 25 and 12.5) were prepared in sterile deionized water and a negative control (without ZnO NPs) was used. Tests for each isolate were performed in triplicates. The inoculated sets were overnight incubated to 37°C. The apparent turbidity in each tube was examined during the incubation time. Of the measured strain the lowest concentration without turbidity is defined as the MIC. Tubes showed no turbidity on nutrient agar plates cultivated and incubated overnight at 37°C.

Results and Discussion

The *Cissus quadrangularis* plant was collected around Perambalur and was identified using the *Flora of presidency of Madras* and the fresh plant extract plays a key role in zinc oxide nanoparticle synthesis.

Optical Characterization

The reduction of Zn^{2+} ions to ZnO NPs by aqueous leaf extract of *Cissus quadrangularis* was visually observed by color variation in the reaction mixture. The gradual color change in solution from light green to pale yellow. This indicates that the metal chlorides were reduces to form its respective nanoparticles.

UV-Visible Spectroscopy

The UV-visible absorption peak arises from 300-600 nm denote the development of ZnO NPs. In our investigation, the distinct SPR band for ZnO NPs with smaller particle sizes is directed by the extreme absorption peak observed at 465 nm. The UV-vis spectra of ZnO NPs made using a greener protocol are shown in Figure 1.

FT-IR Analysis

The FT-IR spectrum, which falls between 400 and 4000 cm^{-1}. A wide peak at 3432 cm-1 agrees to the O-H group which may be appeared as a result of the manifestation of alcohols. The bands at 2800 - 3000 cm-1 signify the existence of C-H functional group of alkanes. The peaks at 1647 and 1377 cm-1showed the incidence of carbonyl (C=O) and imine moiety (C=N) which confirms the leaf extract having enzymes or proteins. The band at 492 cm-1 approves the existence of Zn-O vibrations. ZnO NP formation and the existence of functional groups in the capping agent were both validated by FT-IR analysis. Figure 2 showed the green synthesized ZnO NPs' FT-IR spectra.
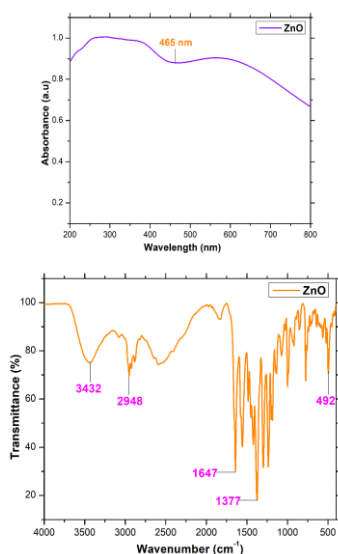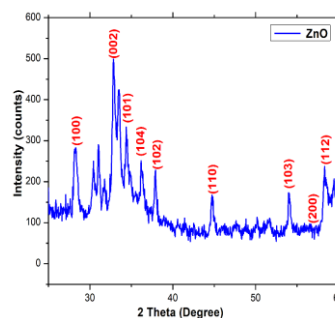
SEM and Mapping Studies ZnO Nanoparticle

The size and morphology of the green synthesized ZnO NPs by *Cissus quadrangularis (*aqueous leaf extract) were controlled by scanning electron microscopy (SEM) analysis. The obtained ZnO NPs were confirmed to have a sponge-like shape by the SEM image displayed in Figure 3. In nature, the green ZnO NPs that were synthesized were dispersed as separate particles with monodispersivity. Phytochemicals in *Cissus quadrangularis* aqueous leaf extract turns as a capping agent which prevents the aggregation of particles causes monodispersivity of ZnO NPs.

XRD Analysis

The XRD pattern of aqueous leaf extract of *Cissus quadrangularis* derived ZnO NPs was represented in Figure 4. The diffraction peaks at 2θ = 58.3° , 56.7°,54.1°, 44.9°, 37.9°,36.3°, 34.5°, 31.7° and 28.3° were respectively indexed to(112), (200), (103), (110), (102), (104), (101), (102) and (100) planes of hexagonal wurtzite structure of ZnO NPs. The diffraction peaks that were obtained matched those of standard ZnO nanoparticles. Each and every diffraction peak agrees well with the reference pattern for pure face centered cubic phase of copper nanoparticles. There is a few impurity peaks were notedThe strong peaks show that the generated nanoparticles are extremely crystalline. The Scherer equation can be used to determine the average crystalline size based on the main diffracted peak that has been observed,
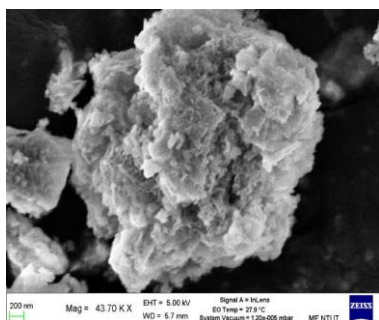
$$D_{(hkl)} = \frac{k\lambda}{\beta cos\theta}$$

Figure. 1. & Figure. 2. UV - Visible spectra of ZnO nanoparticle FT-IR spectra of ZnO nanoparticle

Figure. 3. Figure. 4. SEM image of ZnO nanoparticle XRD spectra of ZnO nanoparticle

Where, $D(hkl)$ - average crystalline size, k - constant (0.89), λ - wavelength of the incident x-ray (Cukα source, λ = 0.15405 nm), β - full width half maximum (FWHM), θ - incident angle of x-ray. The synthesized ZnO nanoparticles had an average crystallite size of 30.46 nm.

In Vitro Antibacterial Activity

Screening was done for the in vitro antibacterial activity against two Gram-negative bacteria namely, *E. coli*, *P. aeruginosa* and two Gram-positive bacteria namely, *S. aureus*, *B. cereus* using ciprofloxacin as standard drug. Minimum inhibitory concentration (MIC) values were resolved using standard agar method. MIC values of the aqueous leaf extract of *Cissus quadrangularis* (**1**) and synthesized ZnO nanoparticle (**2**) were presented in Table 3. The synthesized ZnO nanoparticle. shows remarkable antibacterial activity than aqueous leaf extract of *Cissus quadrangularis* (**1**). ZnO nanoparticle **2** shows high antibacterial activity with the MIC value of 21.64 μg/mL than control **ciprofloxacin** with the MIC value of 25.00 μg/mL in *E. coli*. ZnO nanoparticle **2** shows high antibacterial activity with the MIC value of 32.12 μg/mL than control **ciprofloxacin** with the MIC value of 50.00 μg/mL in *B. cereus*. ZnO nanoparticle **2** displayed significant activity in bacterial cultures *P. aeruginosa* and *S. aureus* with the MIC value of 28 and 18 μg/mL than standard **ciprofloxacin**. Interestingly, the synthesized ZnO nanoparticle (**2**) shows remarkable antibacterial activity than control **Ciprofloxacin** in all pathogens.

Antibacterial activity of aqueous leaf extract of *Cissus quadrangularis* (**1**) and synthesized ZnO nanoparticle (**2**)

Comp.No.	MIC μg/mL			
	E. coli	P. aeruginosa	S. aureus	*B. cereus*
1	32.35 ± 0.16	38 ± 1.34	30 ± 0.82	34.82 ± 0.45
2	21.64 ± 1.04	28 ± 0.16	18 ± 1.36	32.12 ± 1.45
Ciprofloxacin	25.00 ± 0.95	30 ± 0.0	20 ± 0.0	50.00 ± 1.75

Values were the means of three replicates ± SD

Conclusion

The present research reveals that the zinc oxide nanoparticle was synthesized using fresh leaf extract of *Cissus quadrangularis*. The synthesized nanoparticle was characterized and confirmed using UV-Visible, FT-IR, XRD, FE-SEM, analysis, the results showed that ZnO Nps were synthesized properly. The antibacterial assay depicts the effective antibacterial action of ZnO Nps. This conclude that the further studies on ZnO Nps helps for the antibiotic development.

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