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Design and Implementation of a Proximity Sensor-Based Intelligent Borewell Safety and Automated Closure System

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Abstract: Borewells serve as essential water sources but become potential hazards when left uncovered, and manual supervision, lack reliability and real-time intervention, making them ineffective in preventing such incidents. To address these shortcomings, an Automated Borewell Safety System is designed to detect movement near an uncovered borewell and trigger preventive actions. Ultrasonic Sensors and Infrared (IR) Sensors continuously monitor a 1-foot radius around the borewell. Upon detection of movement, a buzzer and colorful LEDs are activated to provide an immediate visual and audible warning. A display unit offers real-time status updates, while an ESP8266 Wi-Fi module transmits alerts to the concerned authorities for prompt action. To enhance safety further, a servo motor-driven cover mechanism is programmed to automatically close the borewell with a slight delay, ensuring any detected object has time to move away before the closure. This system integrates real time monitoring, instant alerts, and automated preventive mechanisms to provide an efficient, cost-effective, and scalable solution, significantly reducing the risk of accidents caused by uncovered borewells and drainage pits.

Keywords- Borewell Safety, IoT-Based Monitoring, Real-Time Hazard Detection, Ultrasonic and IR Sensors, Automated Cover Mechanism, ESP8266 Wi-Fi Module

1. INTRODUCTION

Borewells play a vital role in ensuring access to groundwater, especially in regions where municipal water supply is inadequate or unavailable. In many parts of India and other developing countries, borewells serve as primary sources of water for both domestic and agricultural use. However, despite their utility, borewells have also emerged as significant safety hazards, especially when they are left uncovered, abandoned, or poorly maintained. Over the years, numerous tragic incidents involving children and animals falling into uncovered borewells have been reported, highlighting a critical gap in safety and monitoring infrastructure. These accidents are often fatal due to the narrow structure of borewells and the difficulties involved in executing timely rescues.

Traditional borewell safety measures primarily depend on manual monitoring, physical barricading, or temporary coverings using wooden planks or metal sheets. These approaches are unreliable and vulnerable to wear, environmental damage, and human negligence. Additionally, manual supervision lacks the real-time responsiveness required to prevent accidents, making it insufficient for ensuring consistent safety. The need for an intelligent, automated solution that can actively detect potential threats and initiate preventive measures is therefore imperative.

This paper presents an IoT-based Automated Borewell Safety System designed to detect movement near uncovered borewells and trigger a series of preventive actions. The system is engineered to combine real-time monitoring, instant alerts, and a mechanical intervention mechanism in a cost-effective and scalable design. Central to the system's functionality are ultrasonic and infrared (IR) sensors positioned strategically around the borewell to detect any movement or proximity within a one-foot radius. These sensors serve as the first line of defense by continuously scanning the surrounding area for unusual activity.

Upon detecting any motion—whether it be a child, animal, or object—the system immediately activates a set of visual and auditory alerts. A buzzer sounds to draw attention, while a series of colorful LEDs light up to provide a visual cue of danger. These signals serve both as a warning to nearby individuals and as an alert for local responders. Simultaneously, the system's ESP8266 Wi-Fi module transmits real-time alerts to concerned authorities, family members, or emergency services via cloud-based platforms or messaging systems. This ensures that necessary action can be taken without delay.

A unique feature of the system is its servo motor-driven automatic cover mechanism. After a brief programmed delay, which allows any detected object or person time to move away, the cover closes over the borewell. This mechanical response helps prevent accidents in scenarios where the visual and sound warnings are not sufficient. The delay mechanism is critical in ensuring the safety of nearby individuals while maintaining the responsiveness of the system.

The proposed system stands out for its practical advantages: it is low-cost, easy to deploy, and scalable for wider implementation. Unlike complex rescue operations that often cost significant resources and may not always succeed, this solution offers a preventive approach that can reduce the occurrence of such incidents altogether. Moreover, it can be adapted for use in other high-risk environments, such as drainage pits, manholes, and construction sites. By integrating Internet of Things (IoT) technology with simple yet effective mechanical components, this system aligns with the growing trend of smart public safety infrastructure. It demonstrates how affordable and accessible electronics can be harnessed to solve real-world problems and protect vulnerable populations, especially children, in rural and semi-urban communities.

2. LITERATURE SURVEY

1. Surya Saravana Pandian and Karthikeyan Sundarsamy (2018) – "Multi-Purpose Prosthetic Borewell Rescue Robot System"

This paper introduces a multi-functional rescue robot designed to address the challenges associated with retrieving victims from borewells. The proposed system integrates prosthetic limbs with robotic mechanisms to enhance the robot's ability to navigate the confined and often hazardous environment of a borewell. The robot is equipped with sensors to detect obstacles and assess the condition of the victim, allowing for precise and safe retrieval operations. Additionally, the system features a communication module to relay real-time data to rescue teams, facilitating coordinated efforts during emergencies. The design emphasizes modularity and adaptability, enabling the robot to be customized for various rescue scenarios beyond borewells.

2. K. Kanisha (2018) – "Design and Development of Robot for Rescue Operations for Borewell Victims"

In this study, the author presents the design and development of a robotic system aimed at rescuing individuals trapped in borewells. The robot is designed to descend into the borewell and reach the victim using a combination of wheels and tracks, ensuring stability and maneuverability in the narrow shaft. Equipped with a gripper arm, the robot can securely grasp and lift the victim, bringing them to safety. The system is controlled remotely, allowing operators to manage the rescue operation from a safe distance. The paper discusses the technical challenges encountered during development, including power supply constraints and communication issues, and the solutions implemented to overcome these obstacles.

3. Yong-Jin Liu et al. (2017) – "Real-Time Movie-Induced Discrete Emotion Recognition from EEG Signals"

This research focuses on developing a real-time system for recognizing discrete emotions induced by movie clips using electroencephalography (EEG) signals. The study involved 30 participants who watched 16 standardized film clips designed to evoke specific emotions. EEG data was collected during the viewing sessions and analyzed to identify patterns associated with different emotional states. The system achieved an overall accuracy of 92.26% in recognizing high-arousal and valenced emotions from neutrality, and 86.63% in

distinguishing positive from negative emotions. The findings highlight the potential of EEG-based emotion recognition systems in applications such as human-computer interaction and affective computing.Yong-Jin Liu+1ResearchGate+1

4. S. Sathishkumar et al. (2017) – "Design and Development of a Robotic System for Rescue of Children Trapped in Borewells"

This paper presents the design and development of a robotic system specifically tailored for rescuing children trapped in borewells. The robot is designed to navigate the narrow and often challenging environment of a borewell, employing a combination of wheels and tracks for movement. Equipped with a gripper arm, the robot can securely grasp and lift the child, bringing them to safety. The system is controlled remotely, allowing operators to manage the rescue operation from a safe distance. The paper discusses the technical challenges encountered during development, including power supply constraints and communication issues, and the solutions implemented to overcome these obstacles.

5. G. Kavianand et al. (2016) – "Smart Child Rescue System from Borewell (SCRS)"

This research introduces the Smart Child Rescue System (SCRS), a robotic system designed to rescue children trapped in borewells. The system utilizes a combination of sensors and actuators to navigate the borewell and reach the trapped child. Once in proximity, the robot employs a gripper arm to securely grasp the child and lift them to safety. The system is controlled remotely, allowing operators to manage the rescue operation from a safe distance. The paper discusses the design considerations, including the selection of materials and components to ensure the robot's functionality and safety during operations.

6. S. Simon et al. (2016) – "Borewell Rescue Robot"

This paper presents the design and development of a borewell rescue robot aimed at retrieving individuals trapped in borewells. The robot is designed to descend into the borewell and reach the victim using a combination of wheels and tracks, ensuring stability and maneuverability in the narrow shaft. Equipped with a gripper arm, the robot can securely grasp and lift the victim, bringing them to safety. The system is controlled remotely, allowing operators to manage the rescue operation from a safe distance. The paper discusses the technical challenges encountered during development, including power supply constraints and communication issues, and the solutions implemented to overcome these obstacles.

3. PROPOSED SYSTEM

The Intelligent Borewell Safety System is designed with an emphasis on automation, safety, and real-time monitoring. This IoT-based system integrates a set of environmental sensors, actuators, and communication modules to identify potential threats near uncovered or unattended borewells and respond autonomously to prevent accidents. The design utilizes a modular approach that ensures reliability, efficiency, and scalability for deployment in both urban and rural environments.

Borewell Web Application

The Borewell Web Application serves as the primary interface for monitoring and managing the safety system remotely. It is designed to provide real-time information on the borewell's status, including sensor data, alerts, and actions taken by the system. End users, such as local authorities, maintenance teams, and safety personnel, can access this web-based platform to receive alerts and view detailed logs of the system’s performance. The application supports notifications and displays a dashboard with essential system information, allowing quick responses to potential safety issues around the borewell

The diagram of the Automated Borewell System is designed using a modular and layered approach that integrates both hardware and software components to ensure efficient water management, system reliability, and real-time monitoring. At the core of the architecture is the Arduino Uno microcontroller, which functions as the

central processing unit. It handles logic execution, data acquisition, and communication between connected sensors and actuators to automate the water pumping process. The hardware system includes several key modules interfaced with the Arduino Uno.

An Ultrasonic Sensor is used to monitor the water level within the borewell shaft. This sensor continuously sends distance data to the Arduino, enabling the system to determine whether the water level is sufficient for pumping. This prevents dry-run conditions that could damage the pump and waste energy. Upon verifying that there is enough water, the Arduino activates a relay module that switches on the submersible water pump. The pump draws water from the borewell and transfers it to an overhead tank or a storage facility. The automated control of the pump not only ensures optimal operation but also reduces human intervention and operational inefficiencies.

Real-time status updates are provided through an LCD Display, which shows information such as the current water level, pump status (ON/OFF), and potential warnings like low water or pump fault. This user-friendly feedback enhances monitoring and is particularly helpful in rural areas where technical expertise may be limited. To enhance remote control and monitoring, the system integrates a GSM Module, which can send SMS alerts to the user's mobile phone. These alerts may include information such as pump activation, water level status, or any system malfunctions. This feature ensures that users are always informed, even if they are not physically present at the site.

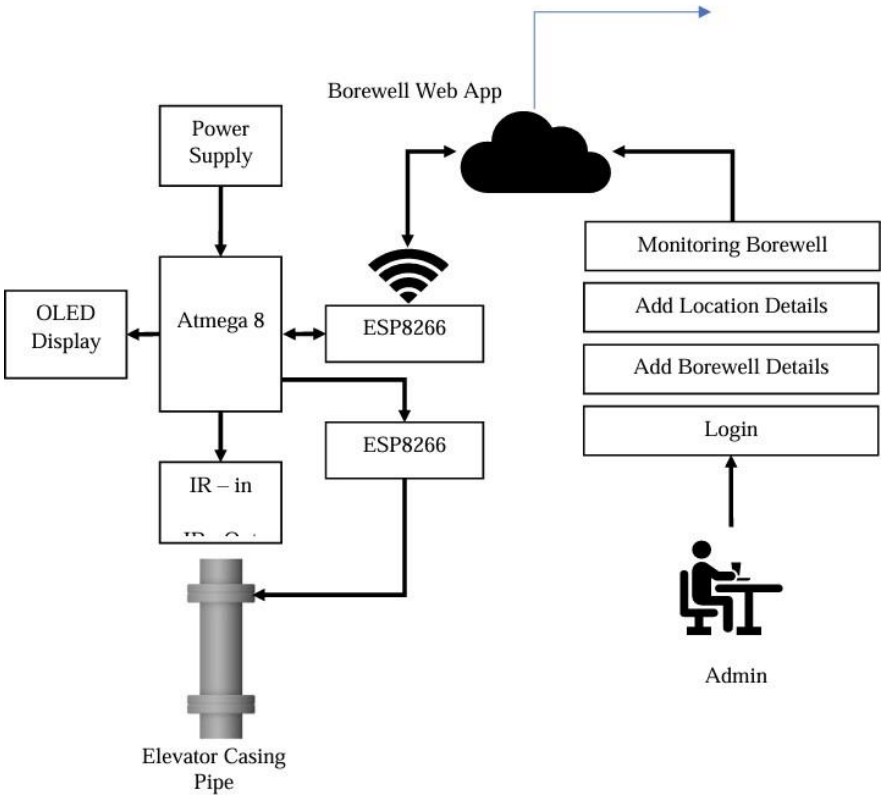

FIGURE 1. Three-Tier Web Application Architecture.

4. CONCLUSION

In conclusion, open and unmonitored borewells have emerged as a serious threat to public safety, especially for children and animals in rural and urban areas. Traditional safety measures often fall short due to their lack of automation and real-time responsiveness. This paper presents an intelligent, IoT-enabled borewell safety system designed to prevent such life-threatening incidents by integrating

real-time proximity detection and automated closure mechanisms. Using a combination of ultrasonic and infrared sensors, the system can effectively monitor any movement around the borewell and trigger immediate alerts through buzzers, LEDs, and Wi-Fi-based notifications to concerned authorities. The servo motor-driven lid ensures timely physical closure of the borewell, thereby eliminating access risks. The system is powered by a microcontroller and supported by a responsive web application, allowing authorities and residents to monitor borewell safety remotely. By automating detection, alert, and response processes, this project significantly reduces the likelihood of accidents and enhances public safety. In the future, this system can be further upgraded with AI-based predictive analytics and solar-powered components to make it more sustainable, autonomous, and adaptable to various terrains and weather conditions.

REFERENCES

1. Surya Saravana Pandian and Karthikeyan Sundarsamy, "Multi-Purpose Prosthetic Bore Well Rescue Robot System", IAET SD Journal for Advanced Research In Applied Sciences, vol. 6, no. 10, 2018.
2. K Kanisha, Design and Development of Robot for Rescue Operations For Borewell Victims, 2018, [online] Available: https://ieeexplore.ieee.org/document/8739674.
3. Yong-Jin Liu, Minjing Yu, Guozhen Zhao, Jinjing Song, Yan Ge and Yuanchun Shi, Real time movie-induced discrete emotion recognition from EEG signal IEEE Transactions on Affective Computing, vol. 9, no. 4, pp. 550-562, 2017.
4. S. Sathishkumar, S. Senthil Kumar and K.P. Muthukumar, Design and Development of a Robotic System for Rescue of Children Trapped in Borewells, 2017, [online] Available: https://ijcrt.org/papers/IJCRT2305320.pdf.
5. G. Kavianand, K. G. Ganesh and P. Karthikeyan, "Smart child rescue system from Borewell (SCRS)", 2016 International Conference on Emerging Trends in Engineering Technology and Science (ICETETS), 2016.
6. "Smart Robotics in Manufacturing: AI-Driven Automation for Enhanced Production Efficiency" – Murali Krishna Pasupuleti, 2024, International Journal of Academic and Industrial Research Innovations.
7. Energy Consumption of Robotic Arm with the Local Reduction Method –2025, arXiv.
8. Realization of Highly Energy Efficient Pick-and-Place Tasks Using Resonance-Based Robot Motion Control –2015, Advanced Robotics, DOI: 10.1080/01691864.2015.1134345.
9. Energy-Efficient Robot Configuration and Motion Planning Using Genetic Algorithm and Particle Swarm Optimization –2023.
10. Sidharth, S. (2016). The Role of Artificial Intelligence in Enhancing Automated Threat Hunting
11. Sidharth, S. (2016). Establishing Ethical and Accountability Frameworks for Responsible AI Systems.
12. Sidharth, S. (2017). Cybersecurity Approaches for IoT Devices in Smart City Infrastructures
13. Innovations in Energy-Efficient Automation Systems –2025, Iris Publishers.
14. A New Energy-Efficient Approach to Planning Pick-and-Place Operations –2022, MDPI Energies, DOI: 10.3390/en15238795.
15. Robot Piece Picking Advances with Artificial Intelligence –2022, Automation World.
16. AI-Driven Warehouse Automation: A Comprehensive Review of Systems –2024, GSC Advanced Research and Reviews.
17. Energy-Efficient Control of Cable Robots Exploiting Natural Dynamics and Task Knowledge – Boris Deroo, Erwin Aertbeliën, Wilm Decré, Herman Bruyninckx, 2023, arXiv.
18. Intelligent Control of Robots with Minimal Power Consumption in Pick-and-Place Operations – Valery Vodovozov, Zoja Raud, Eduard Petlenkov, 2023, MDPI Energies, DOI: 10.3390/en16217418.
19. Booma Jayapalan,Sathishkumar, R.,Prakash, I.A.,Venkateswaran, M."Optimizing wind energy efficiency in IoT-driven smart power systems using modified fuzzy logic control"AI Approaches to Smart and Sustainable Power Systems, 2024, pp. 250–273.
20. Sidharth, S. (2017). Access Control Frameworks for Secure Hybrid Cloud Deployments.
21. Sidharth, S. (2018). Post-Quantum Cryptography: Readying Security for the Quantum Computing Revolution.

22. Booma Jayapalan, Mahadevan Krishnan, Karunanithi Kandasamy & Kannan Subramanian, 2018, "Integrated Strategies for load demand management in the State of Tamil Nadu", Journal of Electrical Engineering, vol. 18, edition 4, ISSN: 1582-4594, pp.151-160.
23. Booma Jayapalan, Mahadevan Krishnan, Karunanithi Kandasamy & Kannan Subramanian, 2017, "Renewable energy penetration and its impact on Reliability: A case study of Tamil Nadu", Journal of Computational and Theoretical Nano science, vol. 14, no. 8, pp. 4036-4044, DOI: 10.1166/jctn.2017.6752.
24. Booma, J., Anitha, P., Amosedinakaran, S., & Bhuvanesh, A. (2025). Real-time electricity capacity expansion planning using chaotic ant lion optimization by minimizing carbon emission. Journal of the Chinese Institute of Engineers, 1–15. https://doi.org/10.1080/02533839.2025.2464575.
25. Sidharth, S. (2015). Privacy-Preserving Generative AI for Secure Healthcare Synthetic Data Generation.
26. Sidharth, S. (2015). AI-Driven Detection and Mitigation of Misinformation Spread in Generated Content.
27. Pandey, A., Shukla, K., Pandey, S. P., & Sharma, Y. K. (2007). Haemato-biochemical profile in relation to normal parturient buffaloes and buffaloes with retained fetal membranes. Buffalo Bull, 26(2), 46-49.
28. Jain, R., Pandey, A., & Pandeya, S. S. (2009). Mechanism of dissolution of delayed release formulation of diclofenac sodium. Chemistry, 18(4), 131-138.
29. Tripathi, S. K., Kesharwani, K., Kaul, G., Akhir, A., Saxena, D., Singh, R., ... & Joshi, K. B. (2022). Amyloid-β Inspired Short Peptide Amphiphile Facilitates Synthesis of Silver Nanoparticles as Potential Antibacterial Agents. ChemMedChem, 17(15), e202200251.
30. Sidharth, S. (2017). Real-Time Malware Detection Using Machine Learning Algorithms.
31. Rokade, U. S., Doye, D., & Kokare, M. (2009, March). Hand gesture recognition using object based key frame selection. In 2009 International Conference on Digital Image Processing (pp. 288-291). IEEE.
32. Kshirsagar, K. P. (2015). Key Frame Selection for One-Two Hand Gesture Recognition with HMM. International Journal of Advanced Computer Research, 5(19), 192.
33. Sidharth, S. (2018). Optimized Cooling Solutions for Hybrid Electric Vehicle Powertrains.
34. Sidharth, S. (2019). DATA LOSS PREVENTION (DLP) STRATEGIES IN CLOUD-HOSTED APPLICATIONS.
35. Kumbhar, K., & Kshirasagar, K. P. (2015). Comparative study of CCD & CMOS sensors for image processing. International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, 3, 194-196.
36. Kshirsagar, K. P., & Doye, D. (2010, October). Object Based Key Frame Selection for Hand Gesture Recognition. In 2010 International Conference on Advances in Recent Technologies in Communication and Computing (pp. 181-185). IEEE.
37. Kshirsagar, K. P., & Doye, D. D. (2015). Comparing key frame selection for one-two hand gesture recognition using different methods. International Journal of Signal and Imaging Systems Engineering, 8(5), 273-285.
38. Baladari, V. (2024). Designing trustless identity: A multi-layered framework for decentralized verification in Web3 ecosystems. International Journal of Advanced Research in Science Communication and Technology, 4(1), 685-691.
39. Harini, P. P., & Ramanaiah, D. O. (2009). An Efficient Admission Control Algorithm for Load Balancing In Hierarchical Mobile IPv6 Networks. arXiv preprint arXiv:0912.1013.
40. Ramya, C. (2019). PB Shelley and Bharathidasan on the Miserable Lot of Women in Society: A Comparative Study. Language in India, 19(12).
41. Ramya, C. (2019). Arun Joshi's Art and Skill: Depicting East and West and Tradition and Modernity. Strength for Today and Bright Hope for Tomorrow Volume 19: 10 October 2019 ISSN 1930-2940, 21.
42. Harini, P. (2019). GESTURE CONTROLLED GLOVES FOR GAMING AND POWER POINT PRESENTATION CONTROL. GESTURE, 6(12).
43. Kumar, N. S., Harini, P., Kumar, G. D., & Rathi, G. (2017, June). Secured repertory of patient information in cloud. In 2017 International Conference on Intelligent Computing and Control (I2C2) (pp. 1-4). IEEE.

44. Harika, K. K. S., Harini, P., Kumar, M. K., & Kondaiah, K. (2012, July). A distributed CSMA algorithm for maximizing throughput in wireless networks. In Wireless Commun. (Vol. 4, No. 11, pp. 591-594).
45. Baladari, V. (2023). Intelligent Tier-Based Data Management: A Predictive Approach to Cloud Storage Cost Optimization. Framework, 1(6), 7.
46. Baladari, V. (2022). Cloud Without Borders: Software Development Strategies for Multi-Regional Applications. European Journal of Advances in Engineering and Technology, 9(3), 193-200.
47. Baladari, V. (2022). Evolving Cloud-Native Architectures: Leveraging Serverless Computing for Flexibility and Scalability in Applications. Journal of Scientific and Engineering Research, 9(9), 126-135.
48. Baladari, V. (2021). Monolith to Microservices: Challenges, Best Practices, and Future Perspectives. European Journal of Advances in Engineering and Technology, 8(8), 123-128.
49. RAMYA, C. (2020). Sri Aurobindo as 'The Pioneer of the New Age and the Spokesman of the New Truth': An Appraisal. International Journal on Multicultural Literature, 10.
50. Ramya, C. (2019). Concept and Emergence of Time in the Modernist novel: A Note.
51. Ramya, C. (2020). A House for Mr. Biswas VS Naipaul's Journey from Self-discovery to Search for Identity and Stability. Strength for Today and Bright Hope for Tomorrow Volume 20: 6 June 2020 ISSN 1930-2940, 68.
52. Balamurugan, M., Hakami, K. H., Ansari, M. A., Al-Masarwah, A., & Loganathan, K. (2024). Quadri-polar fuzzy fantastic ideals in bci-algebras: A topsis framework and application. European Journal of Pure and Applied Mathematics, 17(4), 3129-3155.
53. Byeon, H., Balamurugan, M., Stalin, T., Govindan, V., Ahmad, J., & Emam, W. (2024). Some properties of subclass of multivalent functions associated with a generalized differential operator. Scientific Reports, 14(1), 8760.
54. Balamurugan, M., Muhiuddin, G., & Dhilipkumar, K. (2024). GENERALIZATIONS OF (∈,∈V(κ⁎, qκ))-ANTI-FUZZY B-IDEALS OF BCI-ALGEBRAS. Palestine Journal of Mathematics, 13.
55.
56. Ramya, C. (2019). Anita Desai-Psychological Exploration of the Inner Psyche of Her Existential Characters. Strength for Today and Bright Hope for Tomorrow Volume 19: 9 September 2019 ISSN 1930-2940, 27.
57. Ramya, C. (2019). Claude McKay and Black Diaspora. Strength for Today and Bright Hope for Tomorrow Volume 19: 6 June 2019 ISSN 1930-2940, 289.
58. Ramya, C. (2019). Ernest Hemingway's Portrayal of Female Characters. Strength for Today and Bright Hope for Tomorrow Volume 19: 5 May 2019 ISSN 1930-2940, 268.
59. Baladari, V. (2020). Adaptive Cybersecurity Strategies: Mitigating Cyber Threats and Protecting Data Privacy. Journal of Scientific and Engineering Research, 7(8), 279-288.
60. Baladari, V. (2021). The Role of Software Developers in Transitioning On-Premises Applications to Cloud Platforms: Strategies and Challenges. Journal of Scientific and Engineering Research, 8(1), 270-278.
61. Baladari, V. (2023). Building an Intelligent Voice Assistant Using Open-Source Speech Recognition Systems. Journal of Scientific and Engineering Research, 10(10), 195-202.
62. Ramya, C. (2020). Paule Marshall and Feminine Aesthetic. Language in India, 20(10).
63. Ramya, C. (2018). Anita Desai as an Existentialist Exploring the Emotional Turbulence and Chaotic Inner World. Language in India, 18(9), 197-202.
64. Bohrey, S., Chourasiya, V., & Pandey, A. (2016). Polymeric nanoparticles containing diazepam: preparation, optimization, characterization, in-vitro drug release and release kinetic study. Nano Convergence, 3(1), 3.
65. Chourasiya, V., Bohrey, S., & Pandey, A. (2016). Formulation, optimization, characterization and in-vitro drug release kinetics of atenolol loaded PLGA nanoparticles using 33 factorial design for oral delivery. Materials Discovery, 5, 1-13.
66. Dare, M., Jain, R., & Pandey, A. (2015). Method validation for stability indicating method of related substance in active pharmaceutical ingredients dabigatran etexilate mesylate by reverse phase chromatography. J Chromatogr Sep Tech, 6(263), 2.
67. Chourasiya, V., Bohrey, S., & Pandey, A. (2021). Formulation, optimization, and characterization of amlodipine besylate loaded polymeric nanoparticles. Polymers and Polymer Composites, 29(9_suppl), S1555-S1568.
68. Tripathi, S. K., Patel, B., Shukla, S., Pachouri, C., Pathak, S., & Pandey, A. (2021, March). Donepezil loaded PLGA nanoparticles, from modified nano-precipitation, an advanced drug delivery system to treat

Alzheimer disease. In Journal of Physics: Conference Series (Vol. 1849, No. 1, p. 012001). IOP Publishing.
69. Naik, P. R., Pandeya, S. N., & Pandey, A. (1996). Anti-inflammatory and analgesic activities of 1-[2-(substituted benzothiazole)]-1, 3-diethyl-4-aryl guanidines. Indian Journal of Physiology and Pharmacology, 40(2), 189-190.
70. Pandey, A., Mishra, R. K., Mishra, S., Singh, Y. P., & Pathak, S. (2011). Assessment of genetic diversity among sugarcane cultivars (Saccharum officinarum L.) using simple sequence repeats markers. J. Biol. Sci, 11(4), 105-111.
71. Singh, N., Suthar, B., Mehta, A., Nema, N., & Pandey, A. (2020). Corona virus: an immunological perspective review. Int J Immunol Immunother, 7(10.23937), 2378-3672.
72. Bohrey, S., Chourasiya, V., & Pandey, A. (2016). Preparation, optimization by 23 factorial design, characterization and in vitro release kinetics of lorazepam loaded PLGA nanoparticles. Polymer Science Series A, 58(6), 975-986.
73. Ramya, C. (2020). Kanthapura Protagonists as Representation of Gandhi. Strength for Today and Bright Hope for Tomorrow Volume 20: 1 January 2020 ISSN 1930-2940, 130.
74. Ramya, C. (2020). Sri Aurobindo‟ s Poetry as The Imprint of Mighty Imagination and Philosophical Contemplation: An Appraisal. DYNAMICS OF LANGUAGE, LITERATURE & COMMUNICATION, 51.
75. Reddy, D. B. E., Harini, P., MaruthuPerumal, S., & VijayaKumar, D. V. (2011). A New Wavelet Based Digital Watermarking Method for Authenticated Mobile Signals. International Journal of Image Processing (IJIP), 5(1), 13-24.
76. Baby, M., Harini, P., Slesser, Y. E., Tejaswi, Y., Ramajyothi, K., Sailaja, M., & Sumantha, K. A. (2013). Sms based wireless e-notice board. International Journal of Emerging Technology and Advanced Engineering, 3(3), 181-185.
77. Kesavulu, O. S. C., & Harini, P. (2013). Enhanced packet delivery techniques using crypto-logic riddle on jamming attacks for wireless communication medium. Int. J. Latest Trends Eng. Technol, 2(4), 469-478.
78. Harini, P., & Ramanaiah, D. O. (2008). An Efficient DAD Scheme for Hierarchical Mobile IPv6 Handoff. IJCSNS, 8(8), 182.
79. Karunya, L. C., Harini, P., Iswarya, S., & Jerlin, A. (2019). Emergency Alert Security System for Humans. Int. J. Commun. Comput. Technol, 7, 1-5.
80. Ramachandran, V., Kumari, Y. S., & Harini, P. (2016). Image retrieval system with user relevance feedback. Computer Science Engineering, St. Anns College of Engineering, Chirala.
81. Nandan, M. J., Sen, M. K., Harini, P., Sekhar, B. M., & Balaji, T. (2013, December). Impact of urban growth and urbanization on the environmental degradation of Lakes in Hyderabad City, India. In AGU Fall Meeting Abstracts (Vol. 2013, pp. B31E-0452).
82. Sahithi, D., & Harini, P. (2012). Enhanced hierarchical multipattern matching algorithm for deep packet inspection. IRACST-International Journal of Computer Science and Information Technology & Security (IJCSITS), ISSN, 2249-9555.
83. Harini, P. (2011). A novel approach to improve handoff performance in hierarchical mobile ipv6 using an enhanced architecture. IJCST, 2(1).
84. Kavitha, M., Abhang, L. B., Kumar, M., Balamurugan, M., & Mallesh, M. P. (2025). Advanced Finite Element Methods for Solving Fluid Dynamics Problems in Engineering Applications. Metallurgical and Materials Engineering, 31(3), 201-209.
85. Wange, N. J., Chaudhari, S. V., Seelam, K., Koteswari, S., Ravichandran, T., & Manivannan, B. (2024). Algorithmic material selection for wearable medical devices a genetic algorithm-based framework with multiscale modeling. The Scientific Temper, 15(01), 1581-1587.
86. Sudha, I., Donald, C., Navya, S., Nithya, G., Balamurugan, M., & Saravanan, S. (2024, January). A Secure Data Encryption Mechanism in Cloud Using Elliptic Curve Cryptography. In 2024 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE) (pp. 1-5). IEEE.
87. Dutta, A., Harshith, J., Ramamoorthy, A., Raj, A. S. A., Balamurugan, M., & Vinodhini, D. (2024). Prognosis of breast cancer using machine learning classifiers. In Computational Intelligence and Modelling Techniques for Disease Detection in Mammogram Images (pp. 129-149). Academic Press.
88. Balamurugan, M., Alessa, N., Loganathan, K., & Kumar, M. S. (2023). Bipolar intuitionistic fuzzy soft ideals of BCK/BCI-algebras and its applications in decision-making. Mathematics, 11(21), 4471.