IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

WILDLIFE LIFELINE: THE ELEPHANT RESCUE SYSTEM

[1]Shalini N, [2]Shanthala J, [3]Sharanbasava, [4]Prithvi Patil, [5]Yogananda T

1 Assistant Professor, Department of Computer Science and Engineering,
Dr Ambedkar Institute of Technology, Bangalore, Karnataka, India
2,3,4,&5 Students, Department of Computer Science and Engineering,
[1]Dr Ambedkar Institute of Technology, Bangalore, Karnataka, India

Abstract: This work proposes an IoT based "Wildlife Lifeline: The Elephant Rescue System" addresses human-elephant conflicts caused by habitat encroachment as human settlements into traditional elephant habitats. This system is designed to propose a comprehensive solution using ESP32 microcontroller, sensors and self-injection to monitor and rescue elephants. The system utilizes a cloud database to provide real-time alerts on elephant movements and potential conflicts and promotes data-driven conservation strategies and proactive measures. Methodology Color sensor and MPU sensor are utilized to detect signs of elephant agitation, triggering a self-injection mechanism to calm the elephant and prevent potential conflicts. Health-related readings from sensors are transmitted to authorities through the cloud, ensuring timely medical intervention and continuous health monitoring.

Keywords: Elephant Rescue System, IoT, Cloud, Sensors, Self-Injection.

I. INTRODUCTION

In regions where human settlements encroach upon traditional elephant habitats, the "Wildlife Lifeline: The Elephant Rescue System" offers hope through technology. This collaborative effort integrates hardware and software to monitor, track, and rescue elephants at risk. Utilizing GPS tracking, sensor networks, and cloud databases, the system collects real-time data to inform proactive conservation measures. By leveraging the capabilities of the ESP32 microcontroller, sensors, and self-injection mechanisms, the system aims to monitor and rescue elephants in real-time, thereby preventing potential conflicts before they escalate. Furthermore, the integration of a cloud database enables the seamless transmission of vital data, facilitating timely alerts on elephant movements and health status to relevant authorities. It prioritizes ethical wildlife management and community engagement, aiming to reduce conflicts and promote sustainable coexistence. Through partnerships and authorities, it strives to create a future where humans and elephants thrive together.

In addition to its technological innovations, the Elephant Rescue System embraces a holistic approach to conservation, promoting data-driven strategies and proactive measures to safeguard both human communities and elephant populations. The utilization of color sensors and MPU sensors allows for the early detection of signs of elephant agitation, triggering interventions to calm the animals and prevent conflicts. Moreover, the transmission of health-related readings to authorities through the cloud ensures prompt medical intervention and continuous monitoring, enhancing the overall well-being of the elephant population.

II. LITERATURE SURVEY

[1] Elephant Intrusion Detection, Deterrence, and Warning System ("Tusker Alert") by RMTGP Rathnayaka et al., January 2021

The research addresses the Human-Elephant Conflict (HEC) in Sri Lanka, proposing a wireless sensor network-based detection system combined with a warning system and an artificial bee sound-based deterrence system. With the integration of PIR and infrared sensors, the system detects intrusions and emits recorded bee sounds for deterrence. Alerts are sent to relevant authorities through SMS, mobile app, and warning lights, while intrusion data is updated in a database for analysis and predictions. The system demonstrates a 92% detection rate from controlled environment testing.

[2] Modern Solution for Human Elephant Conflict by D.T.S. Wijesekera et al., 2021

This paper discusses the development of an integrated solution to mitigate the human-elephant conflict in rural areas of Sri Lanka. It addresses the vulnerability of humans to elephant attacks and emphasizes the importance of protecting both elephants and humans. The research aims to identify conflicts, propose solutions, and implement necessary precautions to safeguard elephants and make life convenient for humans.

[3] Surveillance and tracking of elephants using vocal spectral information by J. Nirmal Prince and S.J. Sugumar, 2021

The paper presents a method for detecting and tracking elephants along forest border areas using their vocal communications. It employs spectral energy magnitude and highest pitch frequency analysis to identify elephant vocalizations. When the signal crosses a threshold, alerts are sent to forest officials to redirect the elephants back to the forest, mitigating human-elephant conflicts.

[4] Deep Learning for Elephant Behavior from Location and Rehabilitation in Captivity by Mrs. Bakhtawer Shameem and Dr. Bhavana Narain, 2024

This study focuses on identifying individual elephants based on color images of their bodies using deep convolutional neural networks (CNN). The system detects and categorizes elephant behavior, achieving high accuracy rates in automatic cropping and identification of elephant images. It addresses challenges in supervised learning due to missing behavioral data, making unsupervised learning suitable for behavioral annotation.

[5] Design and Simulation of Elephant Intrusion Detection System by Arya Singh S. et al., 2020

The project proposes an affordable solution for large-scale monitoring and early warning of elephant intrusion into human settlements. It utilizes wireless sensor networks and a two-level detection system using microphones and IR sensors. Sound data is transmitted to a PC via FM transceivers for real-time detection and warning of elephant intrusions.

[6] Elephant Intrusion Warning System using IoT and 6LoWPAN by Prasanna Venkatesan Theerthagiri and Menakadevi T, 2019

This study introduces an automatic IoT-based elephant intrusion warning system aimed at protecting villages near wildlife reserves. It detects elephant intrusions by analyzing vocalizations and employs ultrasonic sensors and PIR sensors for real-time monitoring. Alerts are sent to forest officials and local communities, enhancing safety measures against elephant intrusions

[7] IoT-Enabled Smart Elephant Detection System for Combating Human Elephant Conflict by Mohamed Fazil, 2018

The paper addresses the human-elephant conflict prevalent in many Asian and African countries due to habitat loss and encroachment. It introduces a smart elephant detection system designed to alert people when elephants approach human settlements. The system utilizes electric fences but aims to overcome their limitations by providing timely alerts. Initial laboratory testing showed promising results, suggesting the system's potential effectiveness pending further field testing.

III. METHODOLOGY

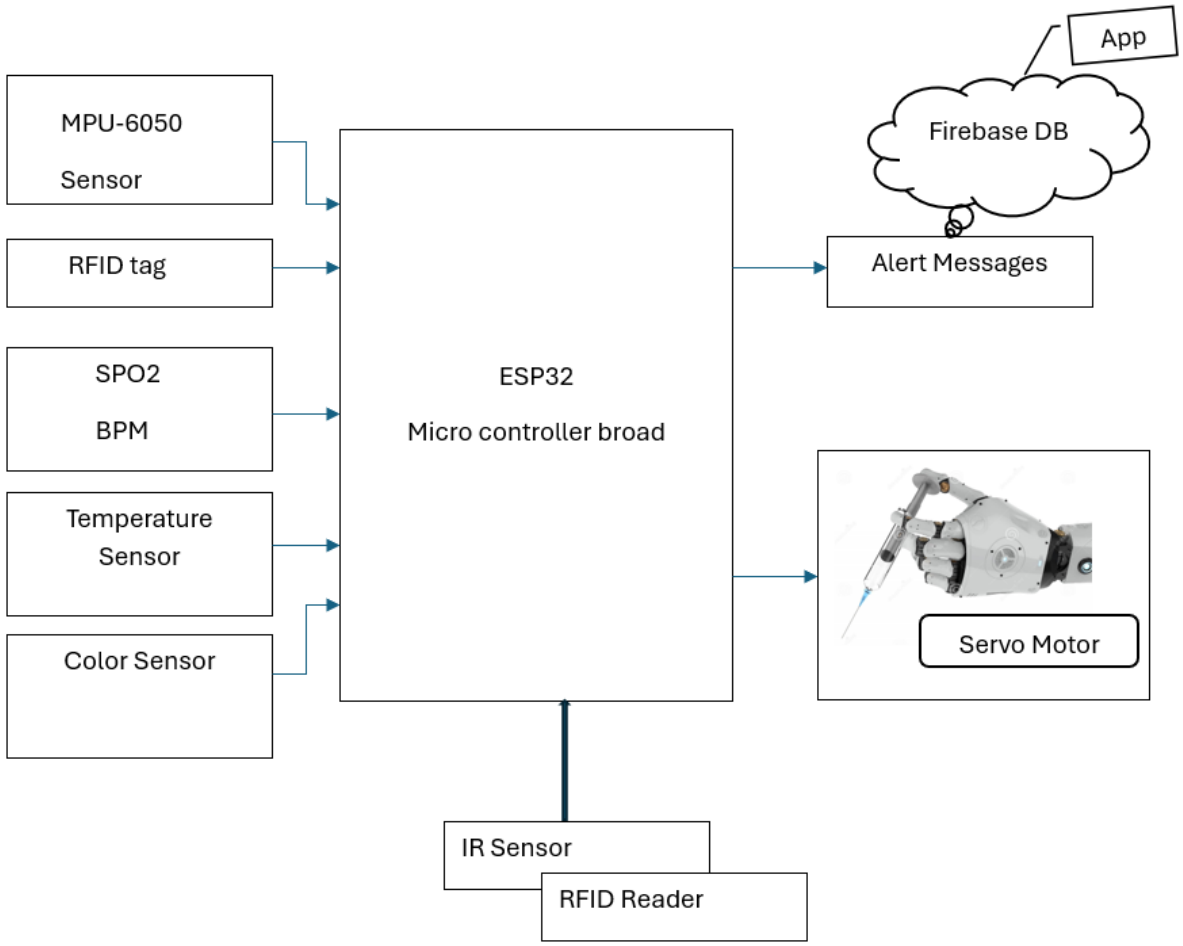


Fig 1: System Architecture.

Microcontroller board (ESP32): The ESP32 is the central processing unit of the system. It reads data from sensors. The ESP32 acts as the heart of the Elephant Rescue System, its processing power enabling real-time analysis of sensor data from the elephant's surroundings and health. The ESP32's built-in Wi-Fi in the Elephant Rescue System facilitates seamless transmission of sensor data to the cloud (Firebase DB), keeping wildlife authorities informed of the elephant's well-being. The ESP32 in the Elephant Rescue System allows for customization of how it interacts with sensors, analyzes data, and triggers self-injection mechanisms based on specific scenarios

Sensors: Multiple sensors are used to collect data about the elephant's health and movements. These include:

- **MPU-6050:** This sensor detects the elephant's movements, motion and orientation and which could indicate anger or agitation.
- **Temperature sensor:** This sensor measures the elephant's body temperature.
- **Color sensor:** This sensor is used to detect changes in the elephant's skin color near ears, which could indicate agitation or illness.
- **IR sensor:** This sensor is used to detect the presence of elephant or other objects in the elephant's vicinity.

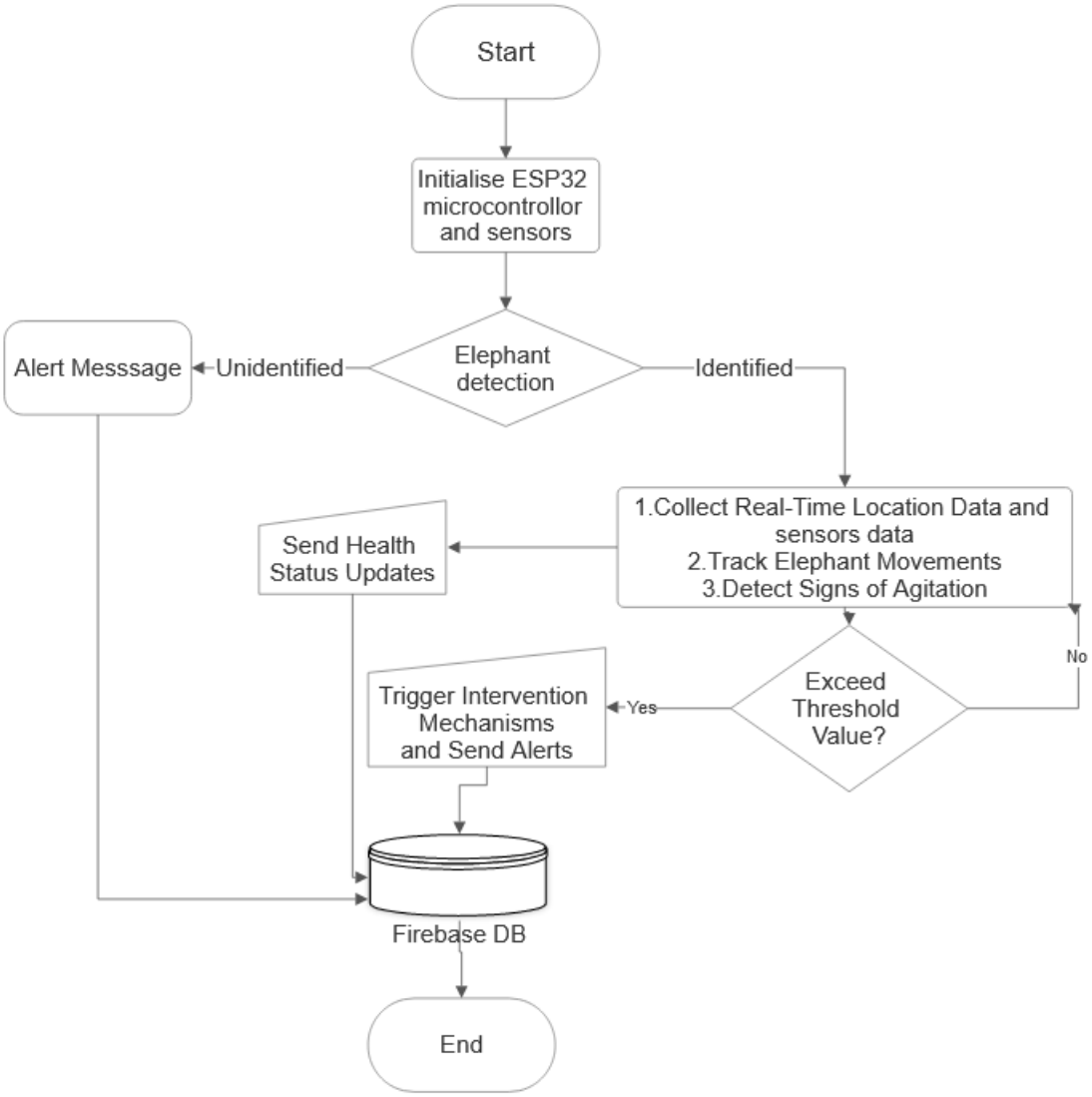
RFID reader: This device reads an RFID tag attached to the elephant. The RFID tag stores identification information about the elephant.

Servo motor: This motor controls the movement of the self-injection. The inclusion of a servo motor in the Elephant Rescue System introduces a potential for more precise delivery of medication. A servo motor's controlled movement allow for targeted self-injection into specific locations on the elephant's body.

Cloud database (Firebase DB): The system transmits the collected data to a cloud database. This allows authorized personnel to monitor the elephant's health and location remotely. Firebase DB acts as a central hub for sensor data collected from the elephant's collar. This data is transmitted wirelessly from the ESP32 microcontroller, providing near real-time updates on the elephant's health and location. Wildlife authorities can access this data from anywhere with an internet connection, allowing for immediate response if needed.

Alert System Integration: Firebase DB is configured to trigger alerts based on pre-defined thresholds in the data. For example, if the elephant's body color and movements exceeds a certain threshold limit, an alert could be sent to wildlife authorities phones or a central monitoring System.

IV. FLOW CHART



V. ADVANTAGES

1. Real time Monitoring and response
2. Individual Tracking
3. Health Management
4. Automated Alerts
5. Automated Intervention
6. Reduced Human – Wildlife Conflict

VI. DISADVANTAGES

1. Implementation and Maintenance Cost
2. Sensor Accuracy
3. Power Supply

VII. APPLICATIONS

1. Human – Elephant Conflict Mitigation
2. Elephant health Monitoring
3. Emergency Response
4. Tourism Management
5. Wildlife Conservation

VIII. RESULT

The expected outcome is the integrated system that successfully mitigates Human-Elephant conflicts by providing real time monitoring and pro-active health interventions. It enhances elephant conservation efforts through detailed data collection, enabling timely responses to potential threats.

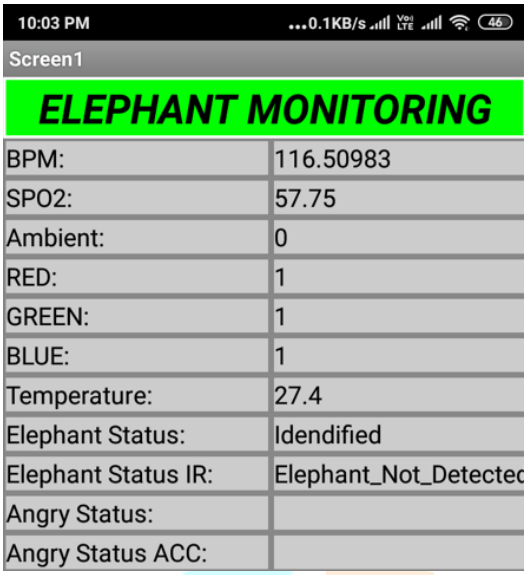


Fig 2: Sensor Readings

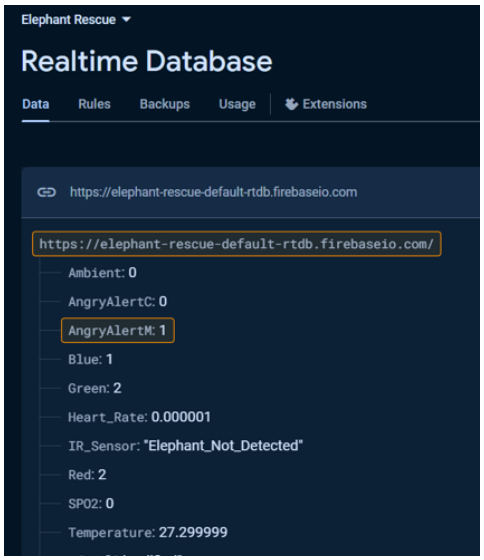


Fig 3: Angry Alert

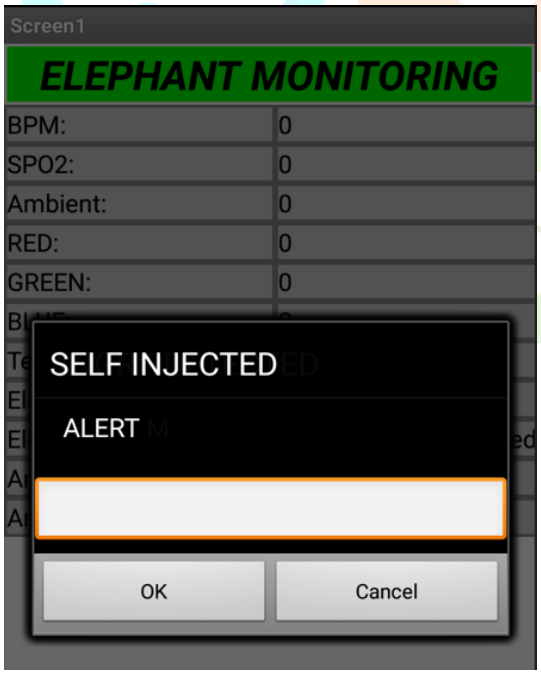


Fig 4: Self Injection Alert

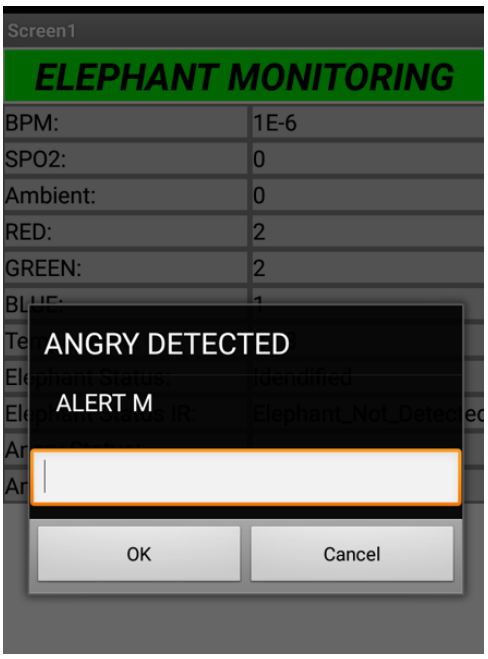


Fig 5: Angry Alert

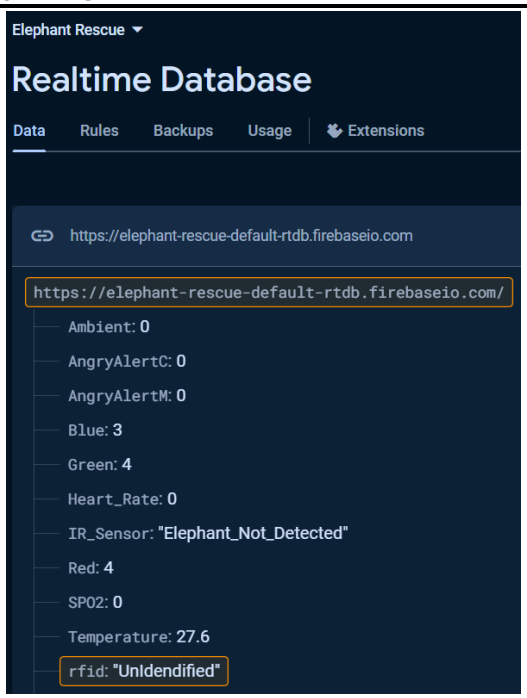


Fig 6: Elephant Unidentified

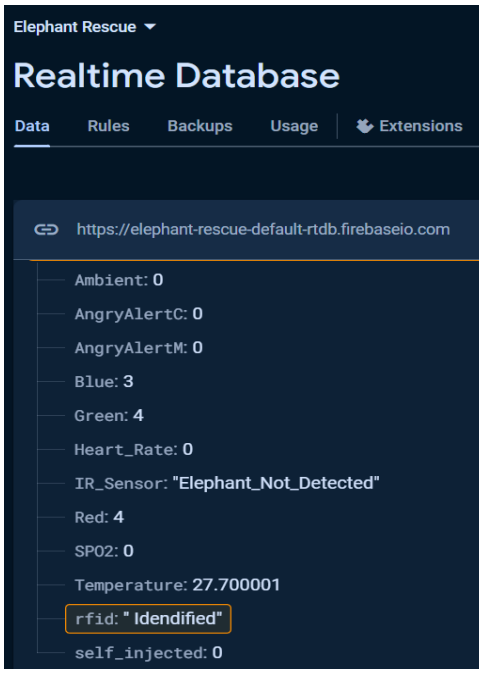


Fig 7: Elephant Identified

IX. CONCLUSION AND FUTURE WORK

This system addresses various challenges of human-elephant coexistence with an innovative approach. By integrating sensor technology, real time data processing and automated intervention mechanisms it ensures the detection and identification of elephants and thus helps in mitigating conflicts between humans and elephants. It also helps in assessing the health of elephants and sending timely alerts to the concerned authorities in any case of deviation in the sensor readings. This not only enhances the safety and well-being of elephants but also protects human communities, fostering a more harmonious relationship between the two.

The system can be enhanced further through incorporating various machine learning algorithms to analyze sensor data more accurately that can help predict potential conflicts and health issues before they happen. By expanding the sensor network that includes environmental sensors like air and water quality monitoring, would provide a more comprehensive understanding of the ecosystem's impact on elephant health.

REFERENCES

[1] John Smith, "IoT-Enabled Smart Elephant Detection System for Combating Human Elephant Conflict", 2018

[2] IRJET- Comparative Study on IoT Enabled Smart Solutions to Avoid Human Elephant Conflicts, 2021

[3] Ayushi, Annu Mishra, Anuj Maurya, Kajal Jaishwalf, "IoT based animal detection system illumination by using ultrasonic sensor", 2023

[4] Prasannavenkatesan Theerthagiri and Menakadevi T, "Elephant Intrusion Warning System using IoT and 6LoWPAN", 2019

[5] T. K. Dutta, A. K. Bhattacharjee, and S. Chakraborty, "A Review on IoT-Based Smart Solutions for Human-Elephant Conflict Mitigation," International Journal of Advanced Computer Science and Applications, vol. 11, no. 5, pp. 63-70, 2020.

[6] S. Kumar, P. Singh, and S. Verma, "An IoT-Based Real-Time Elephant Detection and Alert System for Human-Elephant Conflict Management," International Journal of Advanced Research in Computer Science, vol. 11, no. 3, pp. 72-78, 2021.

[7] R. Sharma, S. Garg, and S. Mishra, "IoT-Enabled Smart Solutions for Elephant Conservation: A Review," International Journal of Engineering Research & Technology, vol. 9, no. 8, pp. 12-17, 2022.

[8] A. Banerjee, S. Roy, and A. Chatterjee, "Smart Elephant Tracking and Alert System using IoT and GSM Technology," Journal of Electronics and Communication Engineering Research, vol. 8, no. 2, pp. 45-50, 2023.

[9] M. S. Rahman, M. A. Islam, and S. H. Khan, "An IoT-Based Smart System for Early Detection and Prevention of Human-Elephant Conflict," International Journal of Computer Applications, vol. 197, no. 2, pp. 34-40, 2022.

[10] S. Gupta, P. Sharma, and R. Singh, "A Survey on IoT-Enabled Solutions for Human-Elephant Conflict Mitigation," International Journal of Engineering Research & Technology, vol. 10, no. 6, pp. 112-119, 2022.