IOT BASED PROTECTION FOR WILDLIFE

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ABSTRACT: *This paper presents a novel IoT-based system that protects animal life from train accidents. The main objective of this paper is to propose an IoT-based system designed to address the pressing issue of animal mortality and train accidents. The alarming statistics from Indian Railways reveal a concerning trendof increasing animal deaths, highlighting the urgent need for effective preventive measures. To sort out this problem a monitoring system was developed using IoT that can be fixed on the wild animals with the forest department's support. The central concept of this tracking system is to leverage the Internet of Things (IoT) for real-time monitoring of wild animal movement which can be monitored from anywhere at any time. This project utilizes a Radio Frequency Identification Device (RFID) module and a Global System for Mobile Communication (GSM) under IoT and these devices are connected with LoRa-WAN for long-range transmission and further analysis. This paper outlines the architecture and functionality of the proposed system, emphasizing its potential to mitigate animal fatalities, reduce train accidents, and enhance overall railway safety.*

KEYWORDS: RFID, GSM, LoRa-WAN, IoT.

I.INTRODUCTION

In recent years, the global community hasincreasingly recognized the critical importance ofwildlife conservation And the protection of endangered species. Nations worldwide are intensifying their efforts to create safe and flourishing environments for wildlife to thrive.However, amidst these efforts, there remains asignificant challenge: the impact of railwayinfrastructure on wildlife populations.Wildlife conservation and protection of endangered species has become a priority for manynations as they are ramping up efforts to create asafe and flourishing wildlife environment.Looking into the insights, we find, IndianRailways which said that about 35,732 animalsdied on the railway tracks in the last four years. Outof the total, 65 were elephants.

All in all, 31 animals per day have lost their lives on the tracks for the last threeyears. According to the official data, thenumber has been continuously increasingevery year. Train accidents killed 3,479 animals until June this year. Last year, the number stood at 12,625. The animal deaths were no more than 3,000-4,000 in 2014-15.Internet of Things (IoT) harness the power of interconnected devices, enabling seamless data collection, analysis, and automative control across various domains. IoT leverage sensors, connectivityprotocols, cloud infrastructure, data analytics, and security measures to create innovative solutions. Thus utilization of the Internet of Things (IoT) technology can significantly aid in addressing theissue of wildlife mortality on railway tracks

II. LITERATURE SURVEY

Sapni De Soysa, Shakthi Manawatu, and SisuruSenanayake (2020) in their paper titled “Computer Vision, Deep Learning and IoT Based Enhanced Early Warning System for the Safety of Rail Transportation” stated that the proposed prototype model for detecting elephant intrusion in real-time and a detection method. To find the elephant on thetrack, the system uses IOT and image processing concepts. An ultrasonic sensor is used to find objectsin front of the sensor, and an LCD is used to calculate the object's distance.

Rakesh Kumar Mandal et al. (2019) in their paper titled "A Prototype Model to Detect Elephants nearthe Railway Tracks “states that a prototype model that detects the vibrations of elephants roaming close to the railway tracks has been created using geophone sensors.

Mr. Prashant K. Kulkarni, Akshay Suyash Bal, Yogesh Namdev Bandekar, Pratap Pradeep Amar (2022) et al., in their paper titled “Elephant IntrusionDetection System” states that the proposed system will keep track of real-time video data to look for elephants and alert the train driver if one crosses therailway track as it approaches.

Train Accident Prevention System designed by Yash Verma, Vineet Kesharwani, Tushar Kesharwani, and Vaibhav Agrawal, was aimed to detect obstacles on railway tracks (e.g., animals andboulders) using piezoelectric and PIR sensors with a microcontroller, and alert nearby stations and upcoming trains to take preventive measures. GPS is used to determine the location, and the system candifferentiate between landslides and animals

Automation of animal fault detection in railway tracks using PLC designed by M.Balamurugan, T. Prathinban, V. Kilivalavan, and S. Manoj Kumar proposed an automated fault detection system for railway tracks, using PLCs, vibration, and ultrasonicsensors. The system detects cracks and breakages, triggers an IR camera, and sends information via GSM to warn nearby trains and

railway stations. The system aims to reduce accidents and loss of lives by providing a reliable and user-friendly automated fault detection system with human intervention.

III . PROPOSED SYSTEM

a. Block Diagram

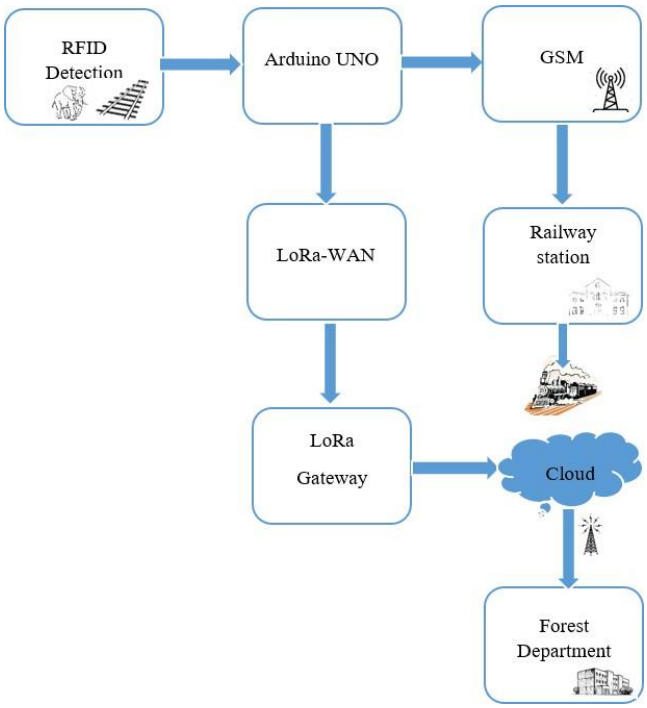


Figure 1. Block diagram

RFID Detection: This section is used to detect the tagged animals which is connected withMicrocontroller

Arduino UNO: This is the microcontroller block where all the components connected together formonitoring

GSM: Global System for Mobile Communication that is connected to send the alert message to loco pilot or nearby railway station

LoRa-WAN: LoRa-WAN is used for long-range data transmission. It is used to transmit the acquired data to the cloud

LoRa Gateway: This gateway connects the LoRa- WAN with the cloud for further analysis of the obtained data

Cloud: Cloud is used to store the obtained data and implement various techniques for analysis

A. System Flow chart

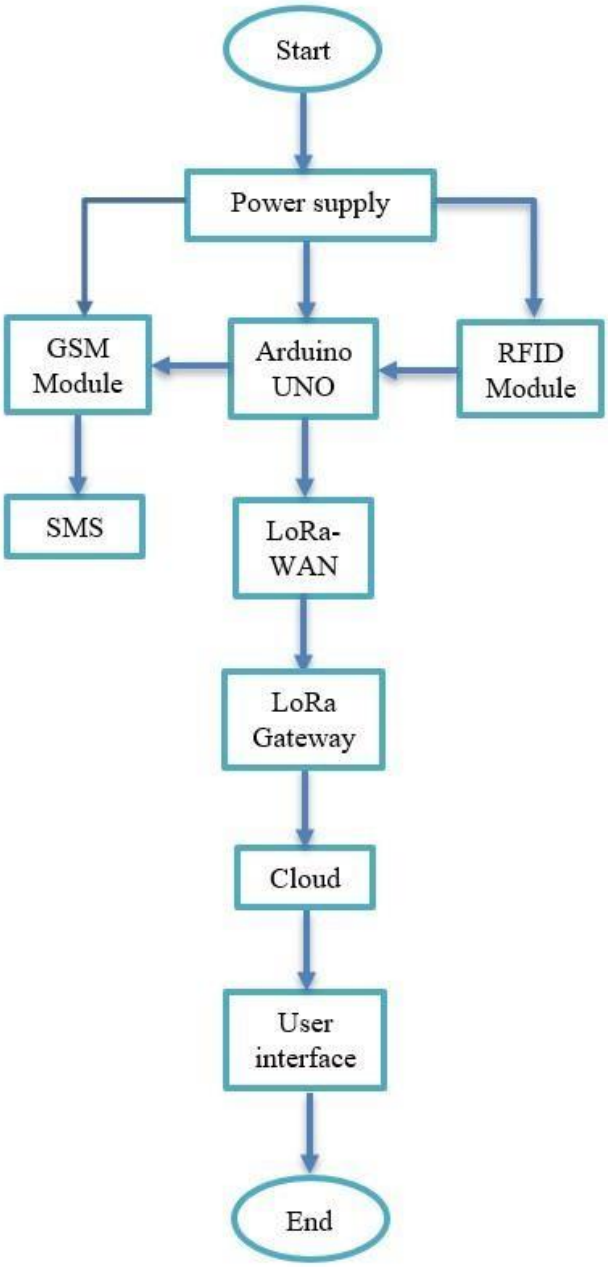


Figure 2. Flow chart

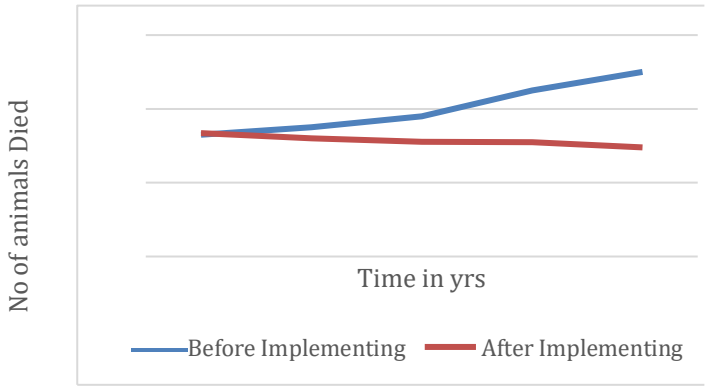
This project integrates a Radio Frequency Identification (RFID) module and a Global System for Mobile (GSM) modem to enhance railway safety measures. The RFID module enables automated wireless identification and data capture through RFID tags, a reader, and antennas. This technology exhibits remarkable efficiency, offering detection capabilities within a range of up to 15 meters for RFID-tagged animals. Upon detecting RFID-tagged animals in proximity to the railway track, the GSM module is triggered to activate, initiating the transmission of SMS alerts to designated personal such aslocomotive engineer or station authorities.

These alerts prompt timely intervention, prompting the necessary measures to slow downthe train speed. This proactive approach aims to mitigate the risk of accidents involving animals near the railway tracks, thus bolstering railway safety protocols. This module utilizes LoRa WAN connectivity to establish a robust link between sensor nodes and a LoRa gateway for the purpose of long-range data transmission.The transmitted data is subsequently stored in cloud storage infrastructure. The primary objective of this system is to facilitate the monitoring of animal movements, through a sophisticated user interface.

IV.IMPLEMENTATION

This innovative project aims to address the critical issue of train-animal collisions in areas where wildlife intersects with railway tracks. By leveraging cutting-edge technology such as RFID readers, GSM modules, and LoRa WAN connectivity, it offers a real-time solution to mitigate these collisions and safeguard both animal populations and train passengers.

Strategically positioned RFID readers alongside railway tracks serve as the frontline detectors, identifying animals equipped with RFID tags asthey approach the track. This seamlessintegration enables swift detection of potential collisions before they occur. Upon detection, thesystem springs into action with the activation of the GSM module, promptly alerting relevant stakeholders such as train conductors or nearby railway stations. This timely notification empowers them to take proactive measures, such as slowing down the train, thereby minimizing the risk of collision and averting potential harm to both animals and passengers. Furthermore, the project incorporates LoRa WAN technology to facilitate the transmission of crucial data to the cloud for storage and comprehensive analysis. By leveraging the power of cloud computing, this system enables researchers and conservationists to access valuable insights into wildlife behavior and movement patterns, aiding in the monitoring and protection of endangered Species. By implementing this project in Real- Time we can conserve our bio-diversity also the train delay can be minimized



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V. RESULT AND ANALYSIS

To conduct a comprehensive analysis of the effectiveness of the integrated RFID-tagged animal detection system, GSM module, and LoRa WAN with cloud integration for enhancing railway safety, several key metrics were assessed. The focus was on evaluating the system's performance in detecting animals near railway tracks, the accuracy of alert notifications, response times of designated personnel, and the overall impact on reducing the risk of accidents. When the tagged animal detected, the alert message sent to loco pilot or the nearby railway station within 1 seconds to 5 second and it is based on signal strength and interference.

Additionally, the utilization of LoRa WAN technology for transmitting RFID-tagged animal data to the cloud was evaluated. This integration facilitated real-time monitoring of animal activity near railway tracks through a user-friendly interface accessible via the cloud platform. By leveraging LoRa WAN, the system enhances data transmission efficiency and enables comprehensive monitoring and analysis of animal movement patterns.

Data was sent to cloud and the information was passed out to the loco-pilot and the animal lives were saved. The representation was shown below.

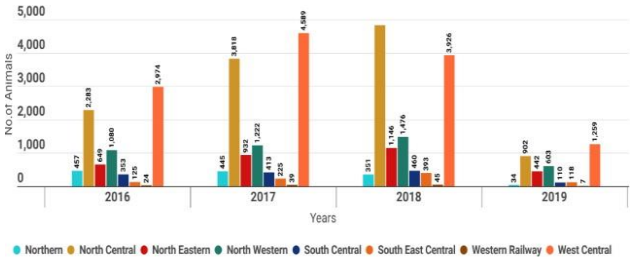

Figure 3. Accident data chart

VI. CONCLUSION

The automation project was initiated after careful consideration of the shortcomings in existing systems, coupled with firsthand observations of critical incidents at railway tracks. Leveraging cutting-edge IoT technologies, a robust system has been meticulously designed to mitigate animal fatalities and prevent train accidents caused by natural disasters such as landslides and obstructions on tracks. This initiative aimed to not only save the increasing number of animal lives

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