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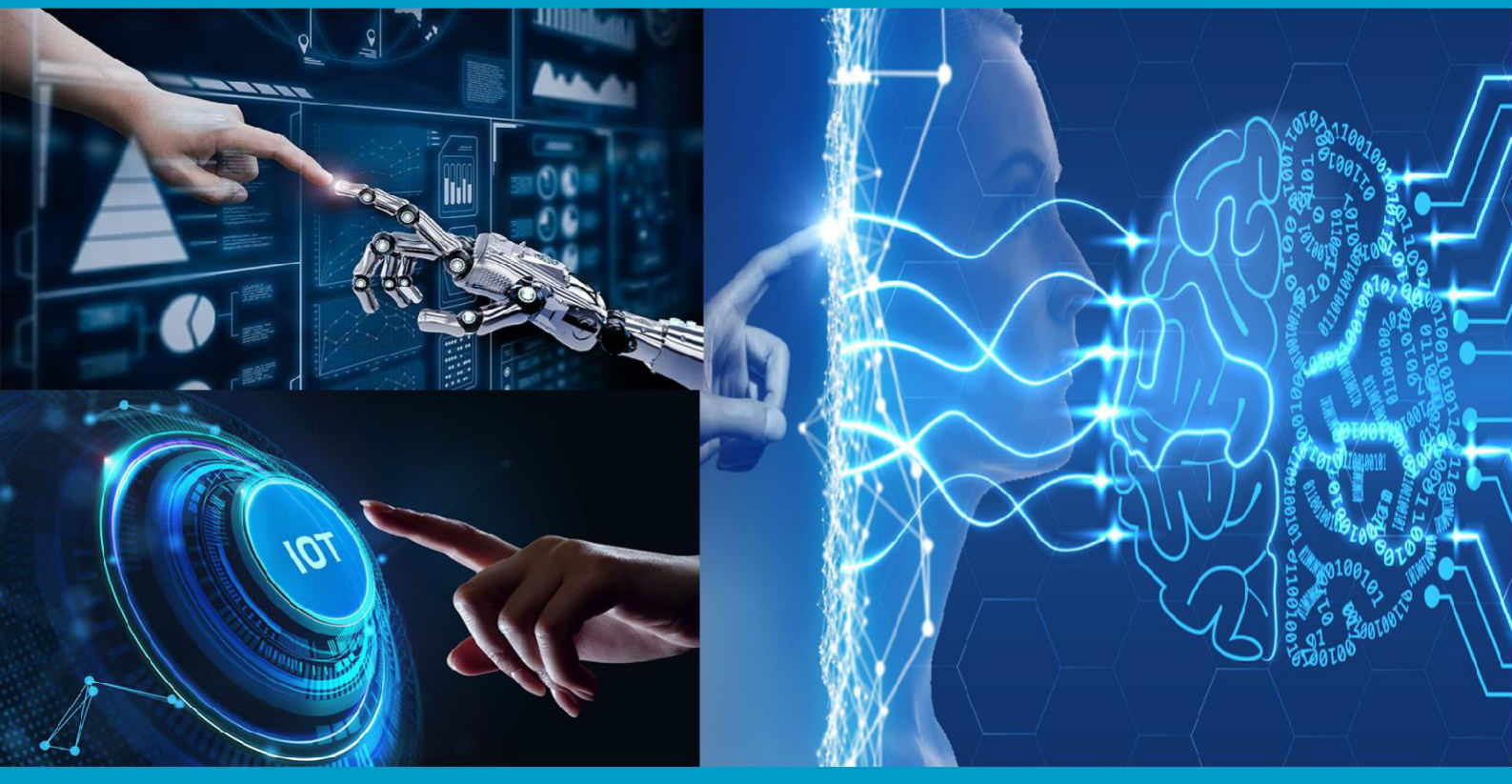

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Wildlife Monitoring System Using IoT

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ABSTRACT: Ecosystem is balanced when there is proper and mutual interaction between the living species. Each and every organism that is present in the Earth is having a major role in the ecosystem. If there is a loss to these animals, there is certainly an imbalance in the ecosystem. There have been several plans made by the Governments all over the world to protect the threatened species. Without monitoring, threatened species would slide toward extinction without being noticed. We have also come across several news regarding the death of elephants in the railway track during the nighttime. It is essential to prevent the death of these large creatures so that it doesn't fall into the category of threatened species. In this paper, we have planned to use sensors to detect the movement of animals inside the forest. When the movement of the animals is detected, the signals from the sensors are sent to the cloud and the information is used to alert the people about the movement of those animals. Forest fire and deforestation (or any illegal activities in the forest) can also be monitored through this system and it helps us to preventing the destruction of wildlife**.**

I.INTRODUCTION

Every living thing on this earth has equal importance in the environment. But wildlife these day animals are endangered. Development of environmental awareness and public concern wildlife that began in the 1980s has continued to this day 21st century. Large-scale changes in landscape such as Hydroelectric development, or its increasing effects. Tree surveys provide detailed information needed undertaken to address and assess environmental concerns. New Principles, Globally Based Telemetry Systems Positioning System (GPS) was developed in the 1990s. from Commercial development of GPS based telemetry systems. Started in 1991 in different categories to track animals. Configurations are designed for use by researcher's different situations. In addition, many improvements GPS systems are built for size and performance and their prices have been dramatically reduced. The amount of data generated by these systems is evident. A challenge to data management and analytics practices. Various structures and features of electric current are given. GPS systems require careful planning and selection by researchers. A suitable system to solve specific biological problems.

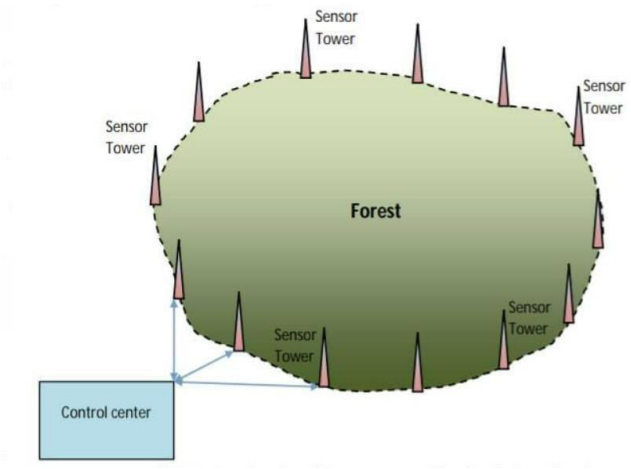

Figure 1: Position of Sensors

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II.LITERATURE REVIEW

The dream of smart world has been suggested for many years, and the research on Internet of Things (IOT), pervasive and pervasive computing, Wireless Sensor Network (WSN), Cyber-Physical Systems (CPS), Machine-to-Machine (M2M) have been discussed in academy and industry fields. There is an growing overlap and combination of research topics, and these technologies have been applied in many fields such as disaster, agriculture, environment, health, industrial control, transportation, etc.

These days, a standard IOT platform consists of three components: sensing, wireless communication, and cloud service. In distinct research or industrial field, the IOT architecture plays different according to the quality and application.In the past years, the ecosystem is increasingly demolished, and the examining and protection of wildlife is becoming more and more significant. In this manuscript, we introduce the investigation on IOT for wildlife monitoring, and we focus on three important and vital application topics for relative ecology and zoology research: location tracking, habitat environment observation, and behaviour recognition.

A typical wildlife supervising unit comprises of hardware, software, sensing, and communication elements.The hardware component consist of Microcontroller Unit (MCU), memory, and power supply (battery and solar panel).The software element consists of lightweight operating systems (TinyOS, uCOS, etc), drivers (sensor driver, memory driver, etc), recognitionstructure, and middleware. The middleware contracts with the back issue on standardization of heterogeneous hardware and software boundary, data stream processing, location, and context analysis, etc.,

In sensing component, we employ different sensors for separate monitoring applications. For tracking, there are kinds of localization approaches, since the wildlife goes in wide area, we employ satellite positioning receivers, such as GPS, Beidou, Glonass, Galileo, etc.,For behaviour identification, we employ acceleration, gyro sensors.For habitat ecosystem observation, we use monitoring sensors such as temperature, humidity, height, wind, light, camera, etc.,

There are two kinds of communication components: cellular and capillary. For cellular type, we smear Global Systems for Mobile Communication (GSM), Third Generation (3G), Long Term Evolution (LTE) for long range communication; for capillary type, IEEE 802.11 protocol could be applied for long range communication, while IEEE 802.15.4, IETF 6lowpan, Radio Frequency Identification (RFID), etc., could be applied for short range communication.

Even though both cellular and capillary communicationelements could be applied for long range data transmission, the cellular element may cover nation-wide communication boundary and involve big size base station; while the capillary module could provide better mobility and have self-organizing characteristic, the size of the base station could be small according to the application necessity.

Habitat environment opinion: sensor knots are set up in the observation area, and are connected through sensor networks, such as IEEE 802.15.4. A sink node gathers the observation data and connects with a mainstay Wireless Mesh Network (WMN), such as IEEE 802.11s. The sink node plays as a mesh Access Point (AP) in WMN. Capillary communication is required in this scenario.

Wildlife stalking: a tracker with a satellite locating receiver transmits the location data to the data centreover cellular network or IEEE 802.16 when the tracker is in the interior of effective communication area. Mobile AP (drone, balloon, vehicle, etc) could be employed to relay the data when the tracker is out of the communication area. The behavior identification unit with acceleration and gyro sensors could be fitted in the tracker. Cellular and capillary communications could be incorporated in this scenario.

Some wildlife such as relocation bird travels in wide area, so an ID is essential for identification. The architectures of Networked Auto-ID and uID IOT. Each device (or tag) has a global unique ID in the communication platform, and main data processing is in the back information server (IS).

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For wildlife tracing, the Networked Auto-ID and uID IOT could work similarly; while for habitat monitoring, the uID IOT may have good quality performance since the terminal in the style could develop both identification (uCode) and context information.

In practical execution, we could record recognition information in the analysis server and information server and install a Near Field Communication (NFC) module in the hardware and add unique identification code in the transmission data.

III.METHODOLOGY OF PROPOSED WORK

The image sensor situated at four corners of the forest tower encapsulates images at frequent intervals which is shown in fig. 1. With the proximity sensor (Time of flight) the animals can be tracked and can determine its location. The image processing can be done by the MCU and Edge AI ecosystem can be applied to classify the image of the wild animals to determine their identity as elephant, tiger, wild dogs etc., Bluetooth mesh technology is used to establish connectivity to the Internet of Things through edge nodes to the cloud.

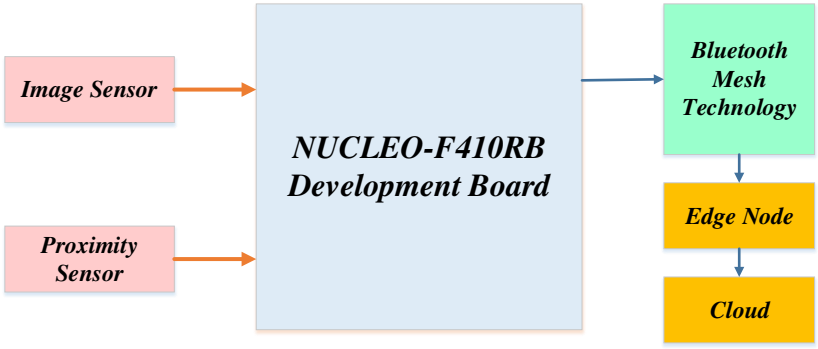

Figure 2: Proposed System Block Diagram

Hardware Details:

- NUCLEO-F410RB Development Board
- High resolution Image sensor
- Proximity sensor
- Power Supply (Preferably Solar Panel)
- Blue tooth Mesh Technology

Software Details:

- Suitable drivers for the peripherals
- Open Development Environment
- An integrated development environment (IDE)
- Edge AI ecosystem

IV. EXPERIMENTAL RESULTS

We use PIR sensors for motion detection. An alternative can be to use IR camera but for simplicity we use PIR sensors. The sensor tower also has GPRS/3G module to connect to the control centre. The boundaries of the forest have GPRS connectivity as they are closer to the human population. This makes communication easier. The flow of the proposed work is explained in the flow chart shown in figure 3.

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If a motion is detected by thePIR sensor, we take the picture of the region and send it to thecontrol centre. We also send a SMS to the concerned official.control centre needs to make a warning sign or noise, it can send a signal to the concerned tower to make loud noise and scare the wildlife from crossing the forest boundary. We know the location of each tower as it is fixed. If needed the officials can go the location quickly and can take further measures. To validate the proposed work, the hardware module is developed which is shown in figure 4 & 5 and it gives the satisfactory performance.

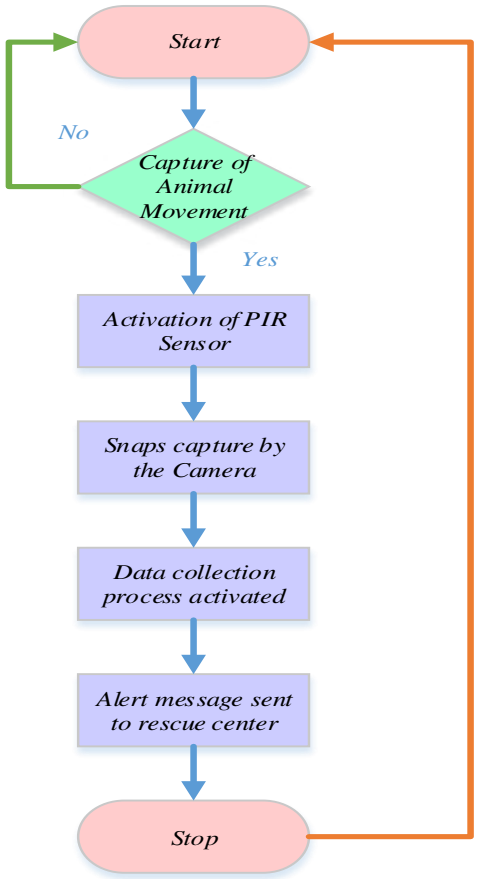

Figure 3: PIR Activation Flow Chart

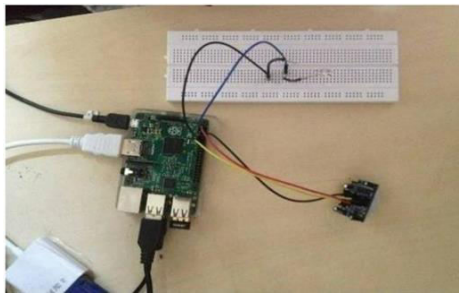

Figure 4: Proposed Work Hardware Model before PIR Activation

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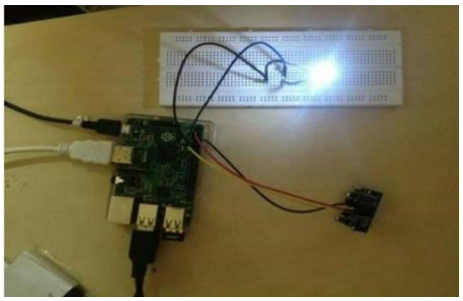

Figure 5: Proposed Work Hardware Model after PIR Activation

V. CONCLUSION

This system will help to prevent the loss of wildlife through train accidents, poaching and habitat loss. Using this system, we can track and monitor the movements of animals. This system provides accurate location of the animal. System provides automated solution for data prediction. This system helps to divert the animals while entering the village. Because of this the human work can be minimized and the death of wildlife also can be minimized. This paper discusses the IOT platform for wildlife monitoring applications, especially on location tracking, habitat environment observation, and behaviour recognition.

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