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Animal Tracking & Detection System

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Abstract: The Animal Tracking and Detection System is an advanced smart solution designed to improve farm management by automatically monitoring animal movement and detecting their presence in real time. It helps farmers track livestock location, prevent crop damage, and enhance farm security using IoT-based technologies. The system helps farmers locate livestock, avoid losses, and protect crops through continuous monitoring and instant notifications. It minimizes manual effort, improves monitoring accuracy, and enhances overall farm management.

Keywords: Animal Tracking & Detection, GPS Module, ESP32, Livestock Monitoring, Farm Security, Real-Time Location, MIT App Inventor, Smart Agriculture.

I. INTRODUCTION

Agriculture plays a vital role in sustaining the economy and ensuring food security, especially in rural areas where livestock farming is an essential source of income. Farmers often face challenges in continuously monitoring their animals due to large farm areas, lack of manpower, and unpredictable animal movement. Traditional monitoring methods rely heavily on manual supervision, which is time-consuming, inefficient, and not always reliable. With the rapid development of the Internet of Things (IoT), smart farming solutions have emerged to address these challenges. Real-time tracking and detection technologies enable farmers to monitor animal movement, receive instant alerts, and improve overall livestock management, By integrating GPS modules, sensors, and wireless communication. The proposed Animal Tracking and Detection System helps to provide real-time location tracking and automatic detection of animals using IoT-based hardware.

II. OBJECTIVES

1. **To design a real-time animal tracking system** that continuously monitors livestock location using GPS-based positioning and wireless communication.
2. **To develop a smart detection mechanism** capable of identifying animal movement within farm boundaries and alerting farmers instantly.
3. **To reduce animal loss and theft** by providing live location updates and historical movement data through a mobile application.
4. **To enhance farm management efficiency** by allowing farmers to monitor multiple animals remotely in real time.
5. **To design a cost-effective and farmer-friendly system** that can be easily deployed in rural and large agricultural environments.
6. **To integrate mobile application support** for displaying live location, alerts, and tracking history.

III. MODULES OF PROJECT

- **Module 1: Designing Circuit**
  - The required hardware components are selected such as GPS module, microcontroller, and 3.7v Li-ion battery are used.
  - Device is attached as per shown in circuit diagram.
- **Module 2: Data Collection & Processing**
  - The code is tested and uploaded to the microcontroller.
  - GPS module collects real-time location of animals.

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- The GPS continuously acquires latitude and longitude coordinates from satellite.

- **Module 3: Communication Module**
  - Transfers GPS location data from ESP32 to mobile application using Wi-Fi.
  - Sends latitude and longitude at regular intervals.
  - Ensures reliable data transmission.
- **Module 4: Application Development**
  - Developed using MIT App Inventor and Receives location data from ESP32.
  - Displays live location on map with coordinates and tracking status.
  - If the animal moves outside the safe area, an alert is generated and sent to the user.

IV. REQUIREMENT ANALYSIS

Name of Equipment	Specification	Cost
Laptop	I5 processor, 4 GB RAM, Mouse, 500 GB HDD	55000
Operating System	Windows 10	-
GPS	Neo 6m	400
Microcontroller	Esp32	450
Power Supply	3.7v Battery or Power Bank	50-1500
Jumper Wires	Male-Male, Male-Female, Female-Female	100
Smartphone	Android 13/14/15	20000
Software	Arduino IDE, MIT App Inventer	Free

Table No: 4.1

V. SYSTEM ARCHITECTURE

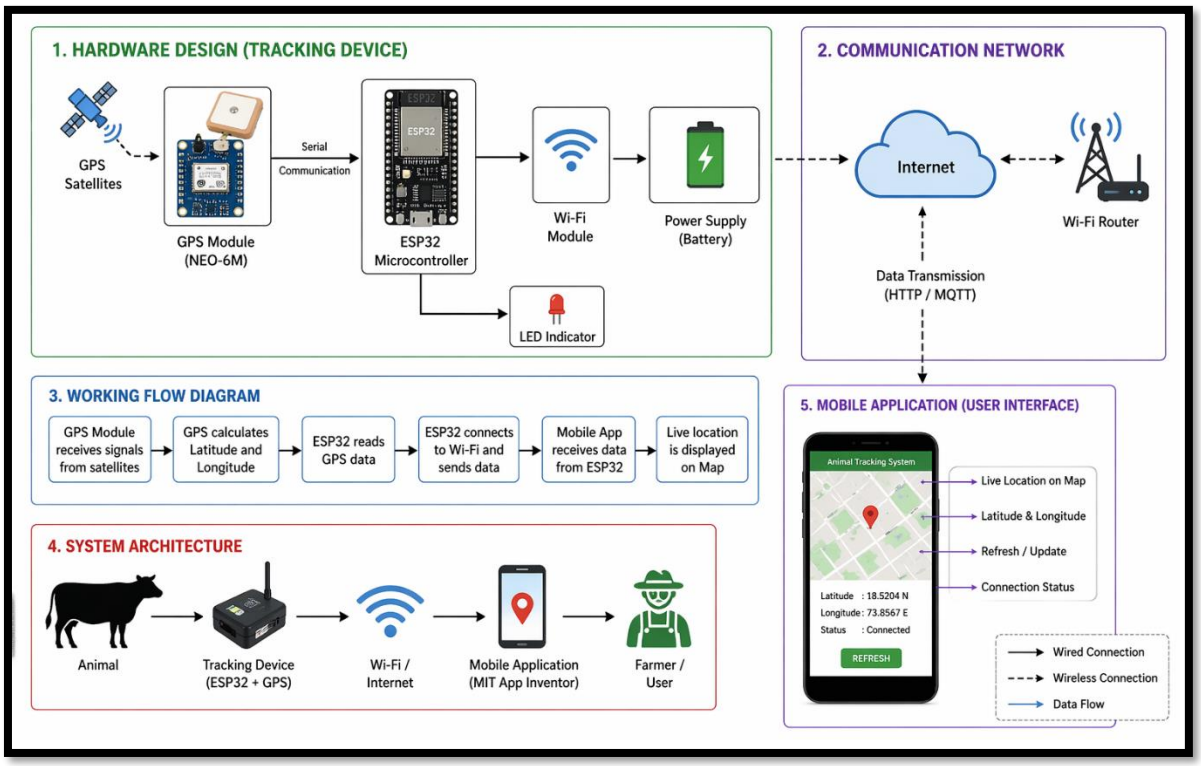

Fig 5.1 Flowchart

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The flowchart represents the working process of the animal tracking and detection system. The system starts by powering on the device, after which the GPS module collects latitude and longitude coordinates from satellites. The collected location data is then transmitted to the server through the ESP32 module. If the data is not successfully sent, the system retries the transmission. Once the data is received by the server, the animal's position is displayed on a map for real-time monitoring. If the animal moves outside the predefined safe zone, alerts are sent to the user via SMS or push notification. The process continues in a loop to provide continuous tracking and monitoring.

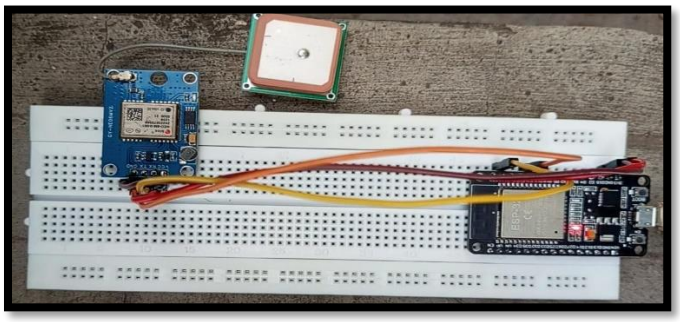

Fig 5.2 Circuit Diagram

In above Circuit diagram as shown there are Microcontroller and GPS module are connected with each other for getting the actual data and then processing this data and sending to user dashboard or application.

VI. RESULT

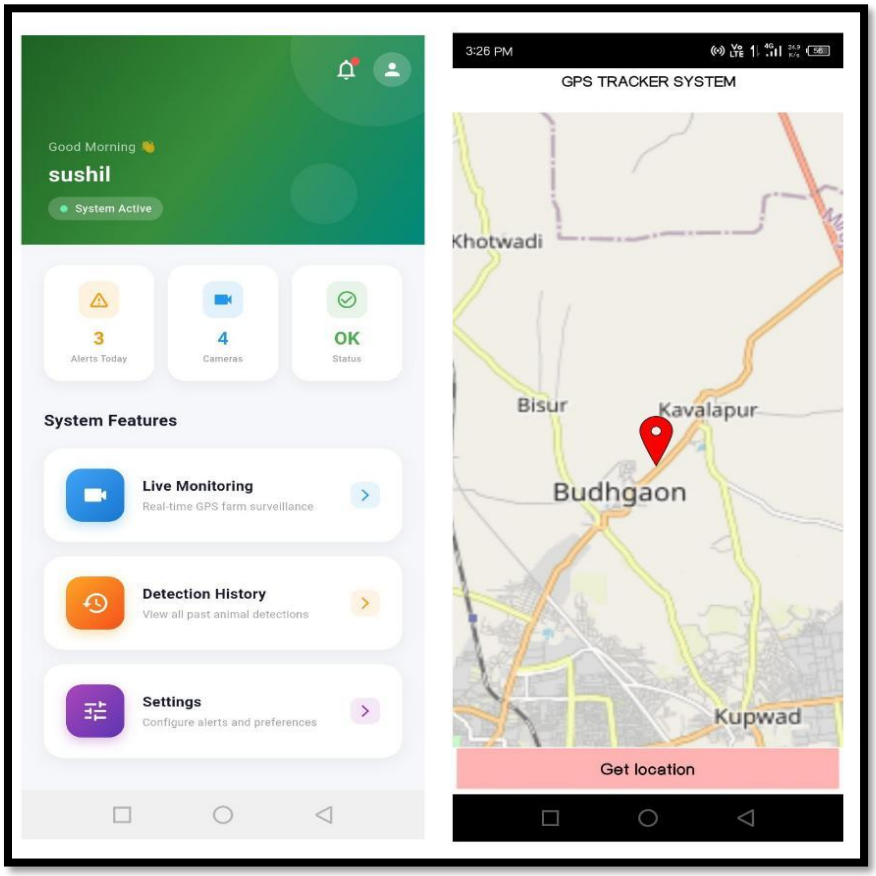

Fig 6.1 App Interface

- The mobile application dashboard is successfully developed.
- The dashboard shows system status (active/inactive).

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- Live monitoring option displays real-time animal location.
- Detection history stores previous tracking records.
- Alerts section shows warning notifications.
- The system displays animal location on the map.
- GPS coordinates are received from the tracking device.
- Real-time position is updated continuously.

VII. CONCLUSION

The Animal Tracking and Detection System provides an efficient solution for monitoring livestock in real time. Using ESP32 and GPS module, the system successfully tracks animal location and sends live data to a mobile application. This helps farmers easily monitor animals, reduce the risk of loss, and quickly locate them when needed. The system improves farm security by reducing the chances of animals getting lost or stolen. In case animals move far from the farm, the farmer can quickly check their live location and take necessary action. The rechargeable battery makes the system portable and suitable for outdoor use. The system is compact, low-cost, and easy to use, making it suitable for farm environments. Overall, the project improves animal safety, reduces manual effort, and supports smart farming practices.

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