

Internet of Things (IoT) Based Cattle Monitoring and Management

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Abstract— Cattle are an important part of human life and they are to be taken care of. A system to track and monitor the cattle remotely is required. Lots of people leave their cattle for grazing on open roads which causes traffic congestion. This system should be intelligent enough to alert the owner of the cattle with the current locations, if it is causing any traffic congestion. This project is about designing an android based application that is able to track the current location of a farmer's livestock. This application can assist farmers to track their lost or stolen livestock. Currently, farmers need to manually look for their livestock without any proper assistance. In addition, the process can consume a lot of time and energy. The current location of the livestock will be collected and uploaded by the GPS collar to the database. Once the location data is successfully uploaded, the livestock location can be viewed with the farmer's android device. We use sensors to collect and transmit the data to Raspberry pi. Raspberry pi receives the data from sensors and transmits the content accordingly.

Keywords: Raspberry pi, Gsm module, gps system

I. INTRODUCTION

Most farmers do not own any dedicated monitoring system for their animals. Due to that, their animals are exposed to dangers such as theft. Many farmers leave their cattle for grazing nearby highways, roads which causes traffic congestion.

To overcome this problem, we developed a project called cattle monitoring and management system using IoT. This project works with a GPS collar. The collar will be strapped at the animal's neck. The function of GPS collar is to update the location of the animal via GPS. To locate the location of their livestock, farmers need to request the location of their livestock through the android application. Once requested, commands from the application will prompt the GPS collar to provide its current location. Finally, the GPS collar will send its current location back to the android application. While grazing if the cattle causes any traffic congestion, then an alert message should be sent to the owner of the cattle. This process will only take less than a minute depending on network speed and coverage. This application provides a better alternative for farmers to track their livestock whether it is missing or stolen. A primary advantage for monitoring livestock is to help farmers track their cattle, which will help to manage the livestock in an easier and efficient manner.

II. LITERATURE SURVEY

A. Existing System

The current system has no proper solution for monitoring and management of cattle in India. There exist separate solutions for separate problems like tracking location of cattle, health

issues of cattle and traffic related issues. There is no proper solution for traffic related problems.

B. Drawbacks of the existing system

1) Missing of data during tracking:

Current systems use geo-location tags that hold the information about the user. These tags do not submit live tracking data. The data has to be recovered by manually scanning each tag. This may induce loss in data by human errors such as forgetting to scan some tags.

2) Locating cattle was troublesome in case they wandered too far.

As the geo-location tags do not submit live tracking data, it would be very hard to locate the cattle if they went outside the city limits.

3) Limited knowledge about biosensors among farmers.

Biosensors that detect health issues in cattle are not frequently used in India as most farmers are unaware about these kind of sensors, their usage and their benefits.

4) Implementing all three systems separately for farmers makes it expensive.

Implementing all the systems separately will cause the farmer to have to go to multiple manufacturers. The maintenance of these systems separately would be cost inductive as different manufacturers will quote different prices.

C. Proposed system and merits

1) Using RFID chips embedded in collars of the livestock:

GPS tracking of cattle can be achieved by mounting RFID chips and GPS sensors which will transmit the data to owner.

2) Using IoT to send and receive data from the RFID chips:

We use Raspberry pi and GSM module for transmitting the message to the owner as well as the user.

Health related issues can be diagnosed by using the bio sensors.

3) Using an app based interface to manage and process all the data:

Developing an application for owner to track, manage and monitor cattle details.

Some of these advantages are

- 1) Bio sensors too can be embedded, for providing real time data about health status of each individual livestock.
- 2) This data can be used for breeding programmes, which require optimal conditions.
- 3) Better yield can be observed by this method.
- 4) Alert message sent to owner for traffic congestion which is useful for avoiding accidents.

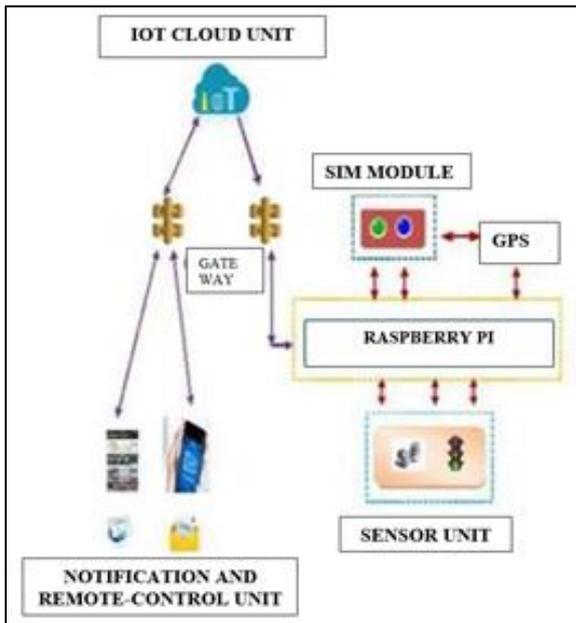


Fig. 1: Block diagram

The sensor unit in fig 1 will send raw data to Raspberry pi which process the data and update it to cloud storage. The gateway will authenticate which data belongs to which user. It also sends data to user API. GPS module track live location of the cattle and sends the data to Raspberry pi. Sim module will have information about user or owner and processed data from Raspberry pi will be sent to owner or user based on identification. The notification is sent to user or owner through notification and remote-control unit. Here the data from cloud storage is used.

III. METHODOLOGY

The study helps to clearly understand the concept, approach and certain terminology that revolve around the project. The data from the GPS collar will be uploaded to the database and then the database will send the last data uploaded to the Android application.

The development of both GPS collar and Android application are done separately. This is because, both tasks are connected only to the database. For GPS collar, the task that is required to accomplish is to link the collar to the database. While for Android application development, the task does not limited to program code but also designing user interface of the application.

As soon as GPS collar and the Android application are working, the system will be tested.

This project is divided into two implemented parts: software and hardware. The software part is programmed and that works in (Java /other programming language) Environment and the large database system is designed by (MySQL Database Server version). The website uses (PHP scripting language, CSS and HTML), and the web server uses (Apache web server) using Wamp Server program. The hardware part consists of RFID 125kHz card readers and its own tags, USB to Serial Converter (to interface with the RFID reader) and PL-2303 Win 7 USB drivers to work with RFID, and AC to DC Adapter to run the RFID device. Heat sensors for detecting the temperature of cattle, Raspberry pi

for managing the process and GSM module for message sending.

A. Cattle Tracking and Monitoring

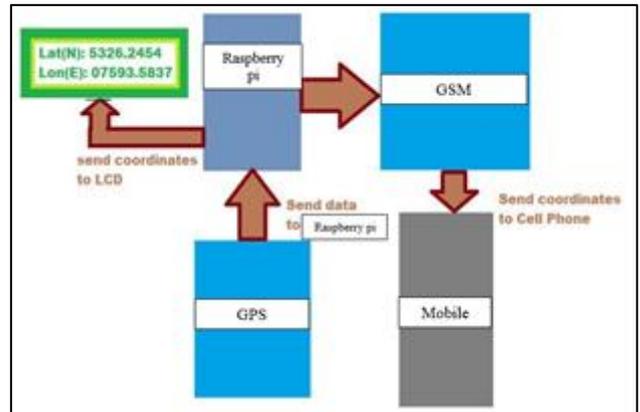


Fig 2: Tracking Module

The Global Positioning System (GPS) in fig 2 provides users with positioning, navigation, and timing (PNT) services. This system consists of three segments: the space segment, the control segment, and the user segment. A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system.

1) Components

GPS Module, Raspberry pi, GSM Mobile

2) Working

The GPS Receiver sends raw data (location and time) to Raspberry pi which process the data. Where GSM Module (sim module) will have information about user or owner based on identification of cattle and processed data from Raspberry pi will be sent to owner or user based on identification.

B. Cattle Health Management

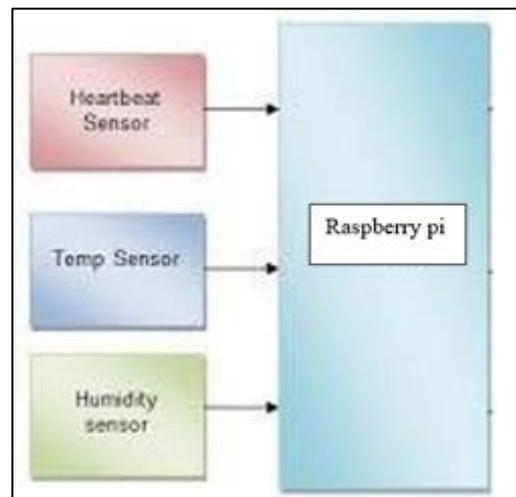


Fig. 3: Health Management

Here we are using three main sensors to collect the data of cattle. Heart beat sensor measures the pulse rate per minute. If it crosses normal value, then shows the reading to owner.

Temp sensors measure body temperature of cattle. Body temperature varies depending upon the condition of cattle

IV. COMPONENTS

A. Heartbeat Sensors

1) Optical Sensor:

This uses light on the skin to measure the pulse. The sensors can be used to measure the rate at which blood is pumped through the capillaries, thereby measuring the heart rate. They are preferred to galvanic skin response by most manufacturers of popular fitness trackers - these are the little lights that sit flush with the skin to measure the pulse.

2) Bioimpedance Sensor:

This checks the resistance of the skin to a small electric current. The galvanic skin response is a method of measuring the electrical resistance of the skin and interpreting it as a certain activity of the body. It is also known as electrodermal response or psycho galvanic reflex. That does not mean that the fitness tracker will be giving shocks, but some of them may use this sensor to collect data for heart rate.

3) Temperature Sensor:

To keep track of temperature changes. While it is not exactly like a thermometer, the concept of the sensor is similar, i.e. it provides a reading of the body temperature. The more the body heats up, the tougher the workout seems to the fitness tracker.

V. WORKING

The sensors collect the data and transmit it to Raspberry pi which process the data and display the reading. Based on the reading available owner can take action.

VI. CONCLUSION

By doing this project we can eliminate road accidents that happen by cattle. Also we can easily find the missing cattle. By implementing this methodology we also able manage health issues related to cattle.

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