Tracking behavior and location of cattle using IoT

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Abstract— *Dairy products play a vital role in our day-to-day life; for the better production of dairy products proper cattle farming becomes necessary. In huge cattle sheds a farmer alone cannot supervise all the cows at a time, which might also lead to mislay of cows. With the illustrious use of sensors (Posture Sensor, Temperature sensor, GPS Module) connected to Arduino, the device can track cattle activities and location throughout the day. Internet of Things (IoT) provides wide range of applications through which the sensor collected cattle information can be accessed and with the help of cloud computing the collected information can be processed. This paper deals with the system which analyzes the behavior of cattle and sends it to the website which will be monitored by farm head.*

Keywords:- Cattle farming, IoT, Cloud Computing.

1. INTRODUCTION

In the current scenario, livestock farmers face plethora of complications in monitoring the behaviour of cattle. There is no proper product in the market for the real time animal behaviour monitoring and location tracking. A farm owner cannot visit the cattle regularly and check health, activity and location of each cow in large farms. In the proposed device, IOT based sensor methods are used for Internet of things have experimented an important expansion during the last few years due to the evolution and improvement of wireless communication. IOT applications cover a wide range of areas such as medical, manufacturing, home automation. Several livestock IOT includes not only cattle monitoring and control but in some cases include field monitoring using wireless sensors. In the proposed idea tracking cattle and analyzing their behavior is performed, which is connected to cloud via IOT platform.

The Proposed system is designed to analyze cattle behavior and tracking the location of the cattle based on IOT. GPS is used to track the location of the cattle. The data collected from sensors is sent to arduino where it is processed and then stored in the cloud. If the temperature of the cattle increases or if the cattle move out of the boundary, the device triggers an alarm to the end users through mobile or laptop in the real time.

2. LITERATURE SURVEY

Most projects and innovations are built upon the roots or the foundation of most significant works of proficient research. Similarly, this project has been implemented upon referring the ideas and concepts of some prominent research. The below following concepts serve as the survey material for the project.

- Williams et al. applied computer learning techniques over the GPS trace captured, during 4 months and from 40 cows, in order to classify their grazing behavior. Their experiments used WEKA data mining suit and comprised the use of four ML algorithms.
- Estrus detection is one of the most documented animal monitoring use cases, possibly due to the economic gain obtained by an efficient management of inseminations. These studies typically report the use of accelerometer sensors coupled to the cows' necks or legs, monitoring animal activity. The gathered data is later analyzed and allows the detection of peaks of activity, which indicate estrus. In addition to the academic work there are some commercial products that send monitoring information over a wireless network, allowing remote data analysis about feeding, rumination and levels of activity, easing cattle management.
- In the work developed by Dutta et al, monitoring collars are placed on cows, retrieving tri-axial accelerometry and magnetometry measurements. These are analyzed by a set of ML algorithms to determine thresholds that are later used to differentiate activities, using individual classifiers like "Binary Tree", "Naive-Bayes" or ensembles of those classifiers. Precision and sensitivity rates are over 90% for some of the classified activities, even for the simpler individual classifiers like the "Binary Tree".
- Umstätter et al. applied supervised behavioral classification to differentiate active (e.g. grazing, walking) and inactive (standing, recumbent) behaviors in 10 sheep. They carry GPS tracker collars equipped with pitch and roll tilt sensors, and different location conditions were experienced (e.g. hill, flat fields and shed). The datasets used in classification included minimum and maximum pitch and roll tilts over 30 second periods. Three classification methods were used: a linear discriminant analysis, which was successful in classifying active and inactive behaviors with over 92% accuracy; a classification tree, which resorted only to maximum pitch tilt and produced accuracies similar to those of the previous method, although it proved to be sensitive to the location (outside conditions reduced overall accuracy by 5% and the method required pre-calibration for each location); a manually developed decision tree, which relied on frequency analysis and customized datasets (measurement of stability of behavior, moving sum of differences from minimum to maximum tilt values). This final method reduced false classifications to 2.0% for the outdoor dataset, proving to be the most reliable.

3. METHODOLOGY

In this proposed system, two applications are implemented. Those are as follows:

- Location Tracking
- Posture Recognition

Location Tracking: GPS is the basis for tracking the location of cattle from which latitude and longitude of that particular area is tracked.

Posture Recognition: Accelerometer device is used for the analyzing behavior of cattle; with this accelerometer data we can find different postures of cattle like eating, sleeping, standing, etc.

All this processing is done in real time in embedded board, same board does processing of incoming GPS data for the location of cattle. The final processed information from IOT devices is sent to Data collector module and is then sent to IOT platform via Wi-Fi interfacing module from where respective Web application can use the data as per requirement and applications. These devices are inserted in the form of neck belt to the cattle.

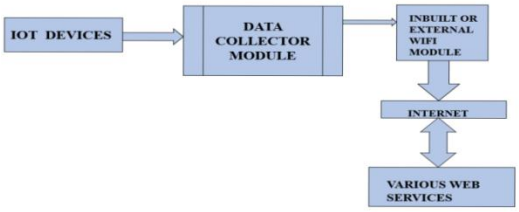

Fig1: System block diagram

4. PROPOSED WORK

The proposed product helps to identify the posture, location and temperature of cattle in the real time. The system comprises a computational platform running on the cloud that receives the data gathered locally and processes it in order to retrieve additional information from them.

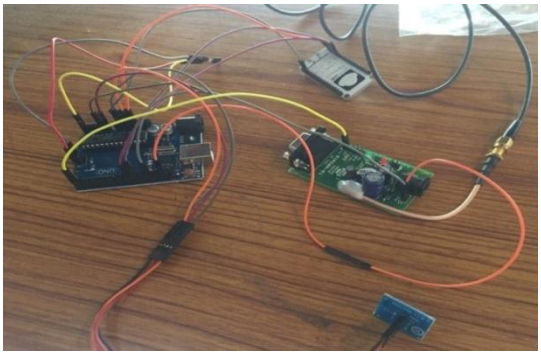

Fig2: System prototype

As a part of this idea, Implementation of an application model that will track the animal behaviour is done. The application works on smart phones, laptop and desktop. Data collected by sensors will be sent wirelessly to the web application via internet using HTTP request protocol running on cloud platform. This web application will be responsible of collecting the data, processing of data. Admin can check the complete behaviour and posture of cattle using this application. In case of any emergency application will display emergency message and an alert message will be sent to concerned person.

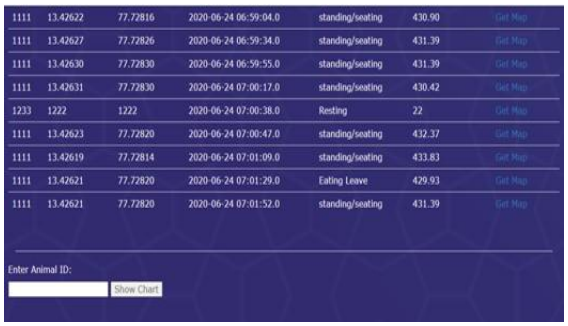

Fig3: Sample outcome

5. CONCLUSIONS

The efficient and real time prototype of cattle behavior analysis and tracking system is implemented. Through this system, the farm owners can keep track of each cattle's behaviour, location and variations in body temperature. This can help in prevention of missing of cattle. With the help of this prototype the farm owner can also keep a proper digital record of cattle's health for further requirement which help the veterans to treat the cattle in effective manner whenever they get sick. This furthermore helps in better production of milk.

Internet of Things (IoT) and its services are becoming part of our everyday life. There is a great deal of research on developing crucial building blocks and models for the next generation. Internet services supported by a plethora of connected things.

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