SURVEILLANCE OF CATTLE HEALTH MONITORING USING IOT WITH REAL TIME DATASET

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Abstract : In India there are abundant rural areas where people still rely on the cattle as their source of income. Their mode of living largely depends on the cattle's health condition as most of the people depend on the dairy products for their livelihood and also for those farmers who cannot afford advanced machinery for the agricultural purpose and still remain dependent on the cattle This project helps to research and identify the principal dairy cow/cattle diseases and to determine the non-invasive, wearable sensor types required to aid in the monitoring of disease symptoms. This, in turn, will lead to the research and development of automated solutions for animal health monitoring for application within the livestock industry, focusing on the dairy industry. The resulting system will continuously monitor the cattle's health in order to maintain high milk quality, increase productivity, predict the presence of abnormal health issue to prevent its spread within the cattle as well as the herd and have a significant bearing on farm profitability.

IndexTerms - **IOT, Cattle health, Sensors, Esp8266, Arduino UNO, Veterinarian.**

I. INTRODUCTION

In India there are abundant rural areas where people still rely on the cattle as their source of income. Their mode of living largely depends on the cattle's health condition as most of the people depend on the dairy products for their livelihood and also for those farmers who cannot afford advanced machinery for the agricultural purpose and still remain dependent on the cattle for it. Availability of veterinary doctors is also very rare in rural areas. Farmers residing at rural areas have to travel a lot with their cattle to veterinary hospitals which cost a lot to them. When the cattle's health is bad, they get it treated. After treatment, if the cattle's health does not improve then again it is a total waste of money spent on both travel and treatment.

This project helps to research and identify the principal dairy cow/cattle diseases and to determine the non-invasive, wearable sensor types required to aid in the monitoring of disease symptoms. This, in turn, will lead to the research and development of automated solutions for animal health monitoring for application within the livestock industry, focusing on the dairy industry. The resulting system will continuously monitor the cattle's health in order to maintain high milk quality, increase productivity, predict the presence of abnormal health issue to prevent its spread within the cattle as well as the herd and have a significant bearing on farm profitability.

To observe an animal's health, it is important to develop a per-animal unit that will collect bio-medical data from sensors and wirelessly transmit this data to a base station. The sensors will be chosen through the assessment of which sensors are necessary for the detection of the presence of any abnormal behaviour in the cattle. This project presents the methodology used to determine the relevant sensor that may be used to develop a health monitor for the cattle. In last two decades an important aspect of farm automation that is being researched is area of automated animal health monitoring system.

In this project we will be focusing on monitoring the health of animal's by using non-invasive, low cost sensors technology that detect sudden change in body parameter like temperature, body movements etc. The parameter that is taken by sensors are access by using wireless technology collect data use for early detection of disease this things are going to develops by using IOT.

II. EXISTING SYSTEM

For earlier year, dairy farm and farmers used the special technique for detection of animal health related diseases and it require the continuous or daily to daily base observation which again require the excessive labour if we consider the dairy farm cattle's health monitoring. Sometime such technique gives the wrong result which was different from the actual health status of cattle's. This can cause the harmful effect on the cattle health. There is no such system developed to predict the diseases of cattle in the initial stage and provide treatment to the cattle on time. So there must be the proposed automatic health monitoring system which keeps the record health parameter fast and accurate so that proper treatment use.

III. PROPOSED SYSTEM

In the proposed system, it provides machine learning algorithms for effective prediction of various disease occurrences in disease-frequent societies. It experiment the altered estimate models over real-life cattle health data collected. To overcome the difficulty of incomplete data, it use a latent factor model to rebuild the missing data. Machine learning is a sub field of artificial intelligence which allows forecasting through learning past behaviours and rules from old data. In today's world, machine learning is being used almost in any fields such as education, medicine, veterinary, banking, telecommunication, security, and bio-medical sciences. In cattle health, although machine learning is generally preferred particularly in predicting diseases and identifying respective risk factors, it is obvious that there are a limited number of publications where this method was applied on veterinary or indicates whether it is correct and applicable. Naïve Bayes algorithm is used to predict the cattle health condition.

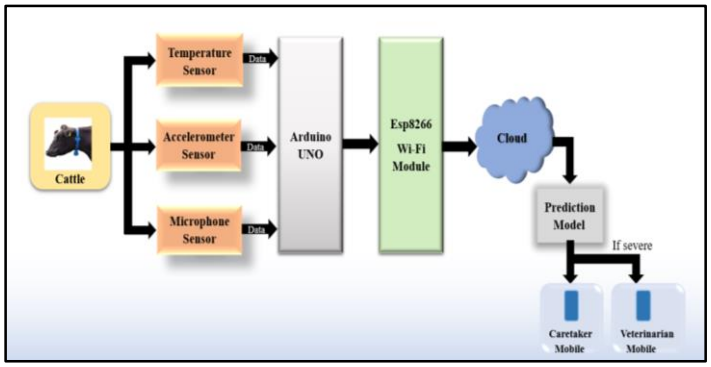


Figure 1: System Architecture for cattle health monitoring system

IV. System Requirement

A. **Sensors:** To track the temperature, blood pressure and movements of cattle we use sensors**.**
B. **Thresholding:** In this fragment, threshold is set to identify the object so that classification of the vehicle and its position is easy.
C. **Classification:** In this fragment, classification of the object is done based on every co-ordinates of the object in the frames that is from x co-ordinates, y co-ordinates and z co-ordinates.
D. **User interface:** User can get notified about cattle health condition through push notification using android smart phone.
E. **Communication Interfaces**: Communication overheads of system are through HTTP protocols shall below.

Hardware requirement:

- Arduino
- Esp8266
- Internet connection hotspot is mandatory
- Sensors
- Esp8266
- Jump Wires
- Patch Chords
- Laptop
- Mobile phone

Software requirement

- My SQL Server
- Software development IDE
- Asp dot net
- Visual studio

Sequence Diagram

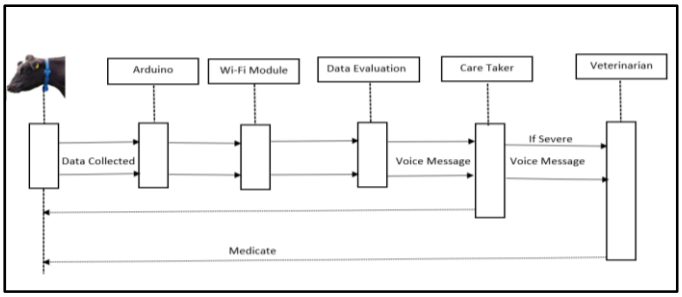


Figure 2: Sequence Diagram of Cattle Health Monitoring System

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are sometimes called event diagrams, event scenarios.

- The major objective of this project is to identify the diseases in the cattle before it affects the livestock
- Cattle health monitoring system provides accurate and real time health parameters of the cattle which are incredibly helpful in monitoring the health condition and detecting any change in behaviour and health problems.
- A voice message is sent to the caretaker as well as the veterinarians about the cattle's health conditions

Data Flow Diagram

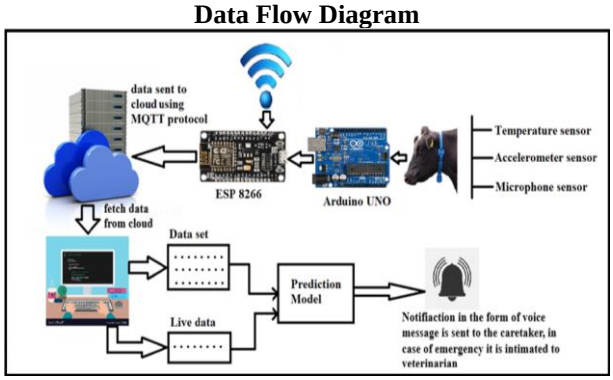


Figure 3: Data flow Diagram of cattle health monitoring system

Above figure depicts the Data Flow diagram of cattle health monitoring System , where the data from sensors is collected and analyzed . We use three main sensors ie.., temperature sensor, Accelerometer sensor and microphone sensor. Temperature sensor senses the temperature of the cattle , Accelerometer sensor senses the neck movement of cattle and microphone sensor senses the intensity of sound . These data are sent to the cloud using wi-fi module ESP8266.In cloud the data is analyzed and using prediction model Naive Bayes algorithm we predict the changes in cattle health. If there is any variation in cattle health the notification is sent to the caretaker and veterinary doctor.

V. IMPLEMENTATION

1. Code for Arduino

```
#include <OneWire.h>
#include <DallasTemperature.h>
#include <MPU6050_tockn.h>
#include <Wire.h>
#define ONE_WIRE_BUS 12
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);
float temp, X, Y, Z;
MPU6050 mpu6050(Wire);
int pin = 7;
int val = 0;
void setup(void)
{
  Serial.begin(9600);
  sensors.begin();
  Wire.begin();
  mpu6050.begin();
  mpu6050.calcGyroOffsets(true);
  pinMode(pin, INPUT);
}
void loop(void)
{
  sensors.requestTemperatures();
  temp = sensors.getTempCByIndex(0);
  mpu6050.update();
  X = mpu6050.getAngleX();
  Y = mpu6050.getAngleY();
Z = mpu6050.getAngleZ();
  val = digitalRead(pin);
  Serial.println(String(temp) + "," + String(val) + "," + String(X)  + "," +
  String(Y)  + "," + String(Z) );
  delay(2000);
}
```

2. Code for Node Mcu

```
#include <ESP8266WiFi.h>
#include <PubSubClient.h>
#include <PubSubClientTools.h>
#include <ESP8266WebServer.h>
WiFiServer server(80);
char* mqtt_server = "broker.hivemq.com";
char* mqtt_username = "";
```

```
char* mqtt_password = "";
const char* clientID = "Node";
String sndtp = "message";
WiFiClient wifiClient;
PubSubClient client(mqtt_server, 1883, wifiClient);
PubSubClientTools mqtt(client);
void setup()
{
  Serial.begin(9600);
  WiFi.begin("vivo 1819" , "shekar123");
  Serial.print("Connecting to ");
  while (WiFi.status() != WL_CONNECTED)
  {
    Serial.println(".");
    delay(300);
}
  Serial.println("WiFi connected");
  Serial.print("IP address: ");
  Serial.println(WiFi.localIP());
  if (client.connect(clientID, mqtt_username, mqtt_password)) {
    Serial.println("Connected to MQTT Broker");
  }
else
  {
    Serial.println("Connection to MQTT Broker failed...");
  }
}
void loop()
{
  client.loop();
  while (Serial.available() > 0)
  {
    String data = Serial.readStringUntil('\n');
    mqtt.publish(sndtp, data);
  }
  delay(2000);
}
```

VI. RESULT

Hardware part

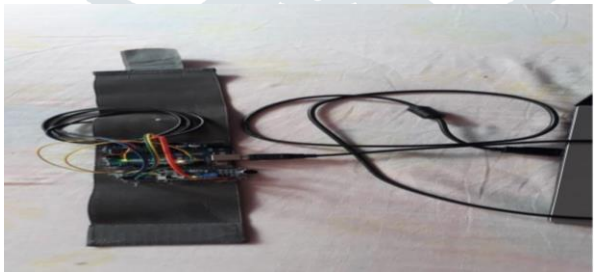
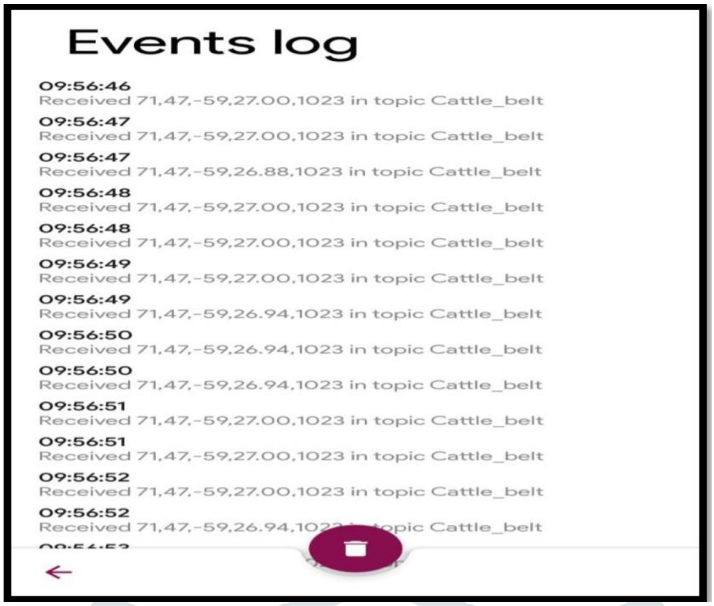
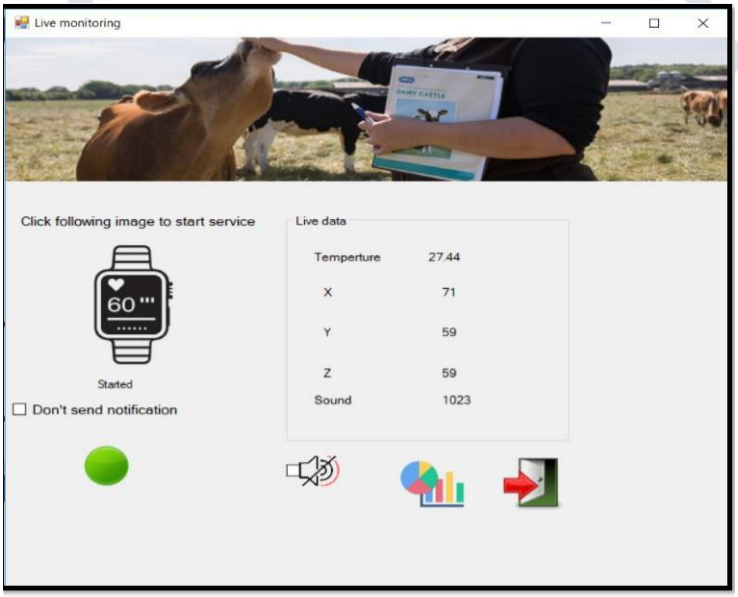


Figure 4: wearable device for cattle health monitoring

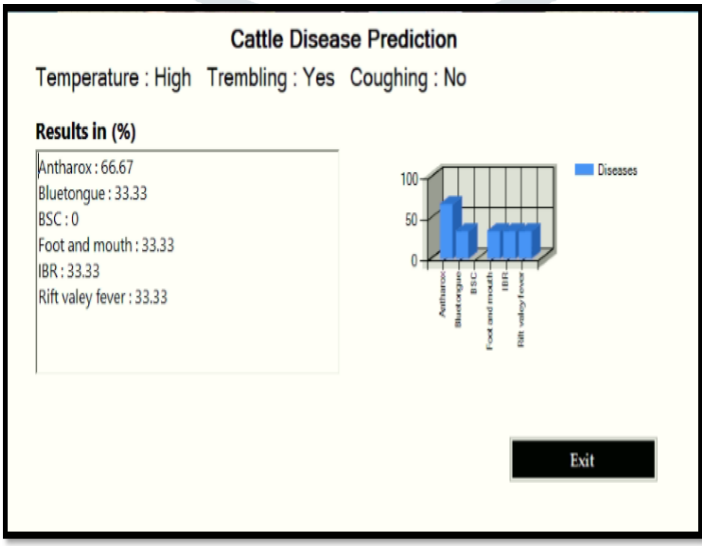
Wearable device for cattle health monitoring consists of the three different sensors they are temperature sensor, microphone sensor and accelerometer sensor connected to the Arduino board and node mcu to transfer this data to server.



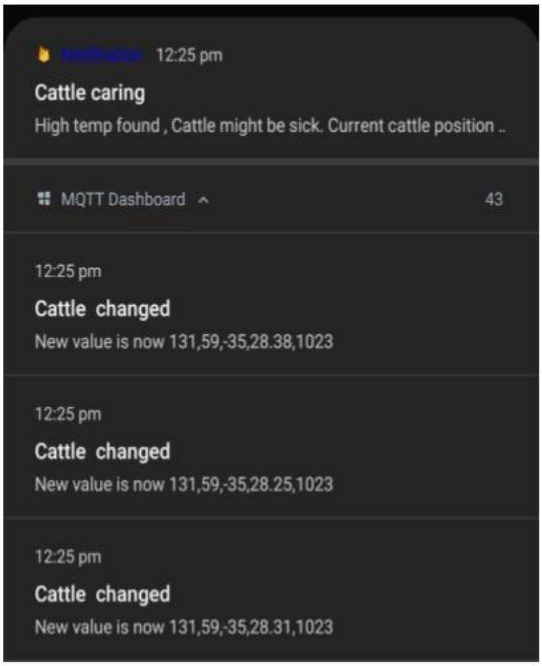
Snapshot 1: Live Data in MQTT dashboard



Snapshot 2:Live data monitoring



Snapshot 3: Report of the disease Predicted



Snapshot 4: Notification of the cattle condition and the body parameters

VII. Conclusion

The proposed project which we have developed is a IOT and ML oriented project which is first of its kind that is implemented for Cattle Health Monitoring System. The project involves prediction and analysis of Cattle Health condition based on records. We have three objectives which involves the early prediction of the cattle diseases. The First objective is real time monitoring the cattle body temperature, cattle movements and sound variations using Sensors. The Second objective is to store the sensor values through node µcu and send notification to farmers using android smart phone. The Third objective, for prediction and analysis of cattle diseases using Naïve Bayes algorithm.

VIII. References

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