International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 04 | April - 2021 ISSN: 2582-3930

CATTLE HEALTH MONITORING SYSTEM USING WIRELESS SENSOR NETWORK

K.Ramya
Assistant Professor/EIE
Bannari Amman Institute of Technology,
Sathyamangalam,India

S.Sakthi vel
Student/EIE
Bannari Amman Institute of Technology,
Sathyamangalam,India

M.Vedhagiri
Student/EIE
Bannari Amman Institute of Technology,
Sathyamangalam,India

K.Vignesh
Student/EIE
Bannari Amman Institute of Technology,
Sathyamangalam,India

ABSTRACT:- Clinical techniques for monitoring cattle health are insufficient, as they provide only occasional information for which we need to commit huge investment on resources in terms of time and consulting veterinary doctors. An advanced system has the capability of monitoring the cattle health continuously by collecting the required health data thus providing the results to the concerned farm owners and local authorities. Hence it would provide huge benefit to the cattle farm owners. Such a monitoring system would not only take care of cattle health, it would be helpful to prevent and diagnose from spreading natural infectious diseases. This paper deals with the existing prototypes for monitoring the livestock and the system which utilizes the wearable technology for continuous monitoring of cattle health.

I.INTRODUCTION

In today's world, agriculture acts as a backbone of the economy for many developing and developed countries. Modern day agriculture includes forestry, cultivation of fruits, dairy, beekeeping and poultry farms. These farms are rapidly growing across the globe. In owing to this, domestic cattle farming has progressively improved over recent years due to the increase in the demand of dairy products worldwide. These factors made the people to show more interest towards dairy farming but recent environmental conditions cost the farmers in cattle breeding and different ailing health issues. The less availability of veterinary doctors in rural areas for frequent monitoring of cattle health has become quite difficult. If cattle get affected with any diseases, the farmers need to travel long distances for consulting the veterinary doctors. To provide a solution to this problem, many devices have been found in recent years with advanced technologies. Still many researches are going on to collect information about cattle health which plays a major role in monitoring their health. In this paper we are going to review the application, benefits and drawbacks of existing technologies.

II.LITERATURE SURVEY

Mr. Steve Warren et.al [1] have presented an idea about developing “Electrocardiographic Pill for Cattle Heart Rate Determination” published in IEEE Conference, Columbia, August 20th, 2008. Mr. Steve Warren developed a device using wired communication and a monitoring technique consisting of an electrocardiographic sensor and temperature sensor which can be operated in the form of ingestible pill.

Mr. Kunja Bihari Swain et.al [2] have presented an idea about developing “Cattle health monitoring system using LabVIEW for early detection of diseases". By Using LabVIEW, results can be viewed in a form of graphical nature that will be easy for test environments, instrument control, automation, data collection, and analyzing purposes.

Mr. S. Jegadeesan et.al [3] has presented an idea about developing“Distant Biometry in Cattle Farm Using Wireless Sensor Networks” which was published in 2017. The wearable non- invasive device is used to measure biological parameters like temperature, P^h value, stress level and wound indication.

Mr. Vaishnavi Shinde et.al [4] have presented an idea about developing “IOT Based Health

Monitoring System", which was published in International Journal of Engineering Research & Technology (IJERT) in 2017. Sensors used in this device were made of SMD type to reduce the weight of the entire system. All sensor output is compared with the normal standard and compared results will be stored on the internet..If any abnormality is found, it will alert the farmer accordingly.

III PROBLEM STATEMENT

Each and every cow in a herd is important. In early days farmers used different techniques for identifying cattle diseases and it requires continuous observation and more number of labours. Sometimes this technique provides the wrong results which is different from actual health status of the cattle. For this analysis farmers need to spend more money and also travel long distances. Sometimes results from the existing system may be harmful to the cattle. Because of this problem milk production of the cow has decreased and it causes a huge burden to the farmers. Closely monitoring the behavior of cows around calving enables you to identify which cows need extra attention during this risky period, when they are more susceptible to disease because of changes in the environment condition, feeding, Grassing, energy life balance and stress. So in the digital world many affordable devices have been found for this problem. Frames need to adopt the required device to get benefited.

IV PROPOSED SYSTEM

In this Advanced Cow Monitoring System which is specifically designed to collect and analyse critical data for each dairy cow. Our major motive is to design a compact device that can be mounted on the cow's ear to monitor heart rate, real-time location and temperature of a cow thus providing the feasibility to monitor every cow as if we were present near the cow. The main constraint in the sensor based technology for biomedical application is the size. The sensors that are developed will be in minimal size and weight. The major measuring parameter of the monitoring device is cattle temperature and heart rate. To analyse the data gathered from the device Esp8266 mirocontroller is used. To transmit the sensor data wirelessly, a lora module is used. To find abnormal conditions of the cow the microcontroller compares sensor data with the normal data and alerts the farmers if any abnormality is detected and we have externally used the GPS to find the exact location of the cattle in a grazing field. It is an added advantage for human supervisors. The ESP8266 has advanced feature called wifi which sends the sensors output data to the internet which can be viewed graphically through IOT application like Blynk, Ubidots etc.,It is cost efficient and highly feasible and reliable.

OBJECTIVE

- To study cattle health and various parameters affecting it.
- To study Wireless Sensor Network and its application in cattle monitoring systems.
- To propose a new device for cattle health monitoring in grazing fields.
- To validate the proposed device by simulating data in the cattle fields.

V HARDWARE &SOFTWARE REQUIREMENTS

NODE MCU

IoT products can be prototyped with a development kit known as NODE MCU which is also an open source firmware.ESP8266 is a low cost System on Chip (SoC) device that enables the working of advanced microcontroller units and open source equipment called Node MCU.The ESP8266 board is made as a standard circuit board that combines the chip and the development kit board.Network protocols like FTP, TCP, IPV4, HTTP,UDC are in use.3.0 to 3.6 is the operating voltage. 4 to 2.6 GHz is the operating frequency. Both Android and iOS devices can be configured.

Figure 1 NODEMCU

LM35 TEMPERATURE SENSOR

The LM35 is an accurate IC Temperature sensor, based on the temperature around it ,results of the output vary. The measuring temperature ranges between -55°C to 150°C. It can be interconnected with any microcontroller which has ADC function. IC can be powered by giving +5V regulated voltage to input pin and neutral pin is connected to the ground of the circuit. The output is linear about 10 milliVolt per degree celsius.The ensured accuracy of LM35 is 0.5 degree celsius. It will range between -55 deg celsius to +150 deg celsius.It is affordable to buy because of vapour trimming.

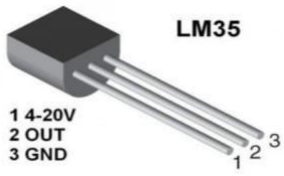

Figure 2 LM35 - Temperature Sensor

PULSE OXIMETER

Pulse oximeter-MAX30100 is a biomedical device used to measure the heart rate. It is an optical device that produces the output from emitting the wavelength of two led lights. The two led lights are red and infrared. The photo detector is used to measure the absorbance of pulsing blood.This particular developed device through different led colour combination is optimized for collecting the output data through the tip of one's finger. MAX30100 functions in a range of 1.8 to 3.3 volt. It is used in various applications such as fitness tracker, compact patient wearable device, medical parameter monitoring devices .It consumes negligible amount of power supply.

Figure 3 Pulse oximeter-MAX30100

LONG RANGE RADIO

LoRa is an exclusive radio modulation technology owned by Semtech. LoRa operates with the open source ISM band in the sub Gigahertz frequency. With the help of the SX1278 chip, the RF module is designed. The rf module is used for long range spread spectrum communication. The device is designed to restrict the minimum current consumption.It has a high sensitivity of -148 dBm with a resulting power output of +20 dBm.This device has a long transmission range and high reliability.

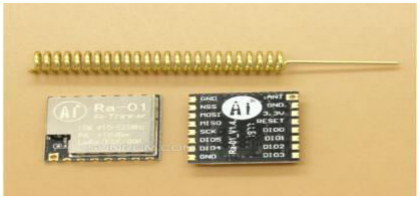

Figure 4 Long Range Radio

GPS- GLOBAL POSITIONING SYSTEM

The GPS is a global radio navigation system which was originally developed by the United states space force.It provides the geolocation and the time information of receivers anywhere in the earth under signal range of GPS satellites. It is used for the military related, civil and commercial purposes. It provides the location of the user with coordinates. It also has an in built for batteries so that we can obtain a GPS lock faster. The position update rate of 5hz. It can be operated in a temperature range of -40 TO 85°C. It has EEPROM to save settings and configurations, A rechargeable battery is provided for Backup. It is provided with Supply voltage of 3.3 V. It has a different configuration range between 4800 Baud to 115200 Baud rate.

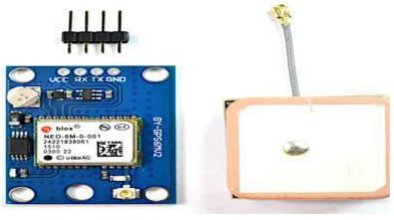

Figure 5 GSM Module

BLYNK APPLICATION

Devices like NodeMCU, Raspberry Pi, and Arduino can be controlled by an Android and iOS application platform known as Blynk. Over the internet Blynk can control a few sheets. The fundamental idea behind the creation of blynk was the Internet of Things. It is capable of performing several functions like displaying and storing several real world information like sensor data, pictures, and control devices remotely.Blynk Mobile Application - The variety of gadgets available in the Blynk mobile application enables the user to create user friendly and impressive interfaces. Blynk Libraries – They are available for a variety of microcontrollers to receive processes and send commands to the Blynk server. Blynk server – Smartphone to hardware communication is established by the server. Local private Blynk servers or Blynk cloud can be used.

VIII WORKING OF CATTLE HEALTH MONITORING SYSTEM

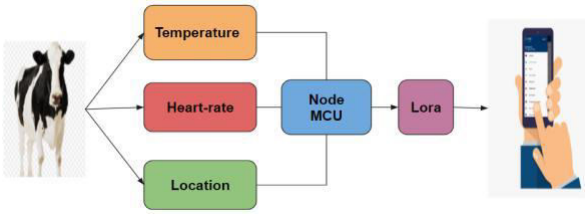

Figure 7 Block diagram of cattle health monitoring system

On above study of all existing devices, it is known that some of the cattle health parameters can be monitored easily which are listed below. Major parameters in the above system are temperature, location and heart rate. These parameters are measured by the sensors which are attached with the cattle body. The normal body temperature of the cattle ranges between 99.5 to 101.5 degree Fahrenheit and the normal heart beat rate of cattle ranges between 48 to 84 beats per minute. The environment temperature and humidity will affect the cattle extremely. If the temperature of the cattle is very high, it may drop the amount of feed intake and also the milk production. The normal rumination range will fall under 400-500 minutes per day. The ESP8266 wifi module acts as a controller which collects the cattle health parameters such as temperature, heart rate ,blood oxygen level and location. The collected sensor input from the device is stored in the internet with help of wifi by using ESP8266. Then the information collected is stored in the form of excel sheet(.xls). If the collected values goes beyond the normal range value then it will alert the farmers or users to take a quick remedy for the cattle. The stored data in the excel sheet will be useful for the offline view and also helpful for the doctor to diagnose the cattle health state effectively. The IOT platform is useful to check the cattle health state in any location for the farmer.

IX RESULTS AND DISCUSSION

After connecting all the required sensors on the cattle's ear it will give the resulting body temperature and heart beat in LCD. Initially we have tested in proteus software.Using this data we can observe the health of the cattle and detect diseases from which the cattle are suffering. The screenshots of proteus simulation are shown below.

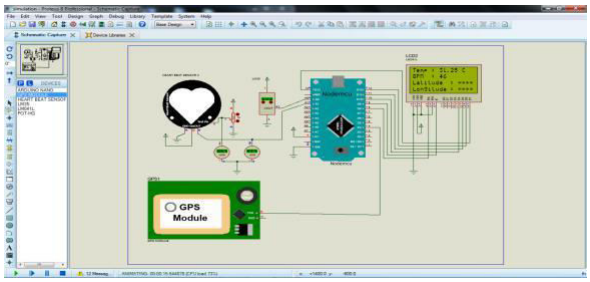

Figure 8 Proteus Simulation developed device

After checking the implementation with the proteus software we started designing our hardware and tested our device in a real time farm and obtained the results with an adult cow. The output of temperature, pulse oximeter and gps, displayed from the IOT - Blynk application are shown below through picture.For diagnose the cattle effectively we stored the resulted data in cloud (excel sheet). The offline stored data of the excel sheet is shown below. If sensor value falls above the threshold values will alert the farmers to treat the cattle with remedies. Iot application and stored data of excel sheets will be useful for farmers and doctors to treat cattle in early stages.

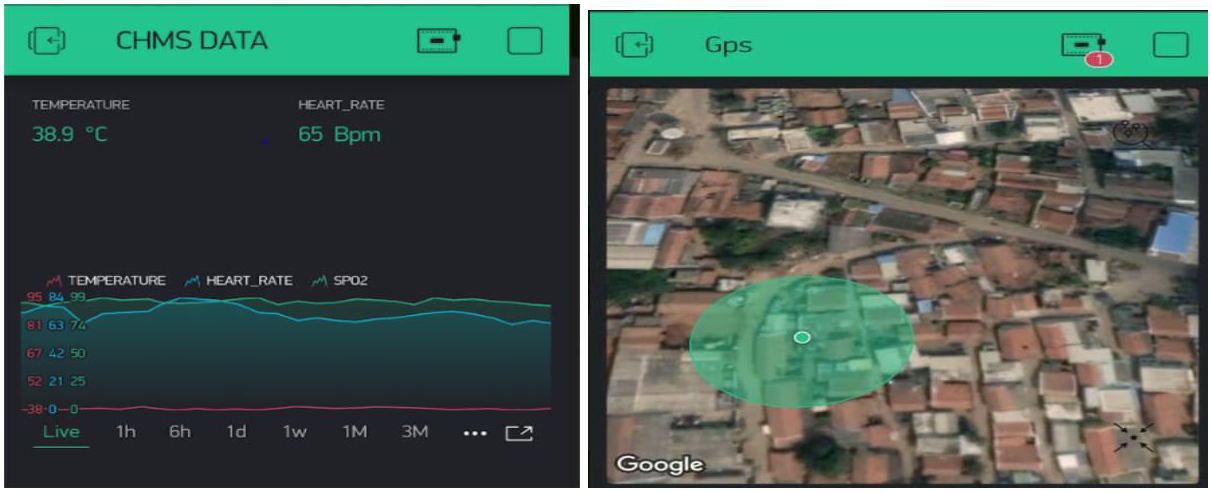

Figure 9 Output of the Device using Blynk application - IOT

X CONCLUSION

The proposed system is used to monitor the cattle health behaviour accurately with change in environment and to track cattle location exactly. It is used to detect the physiological parameters like estrus, mastitis etc. The developed device is supported by Internet of things infrastructure consisting of hardware devices, cloud platforms and end user applications. The innovative techniques in the implemented system like data measurement, indicating the aggregate behavior of cattle and enables us to precisely determine the discrimination of cattle activities. If any abnormalities are identified in cattle, it will be noted and alert the farmers by IOT platform to take necessary remedies quickly. The sensor will be continuously monitored and updated on the internet. System or device should be portable so that it can be tied up with a cattle neck and the parameters can be monitored using a web application. The entire requirement can be fulfilled, if the system is designed using the Internet of Things.Hence the results are more effective and helps the farm owners in increasing their cattle health and milk protection.

XII REFERENCE

[1] Mr. Steve Warren & Angel Martinez (August 20-24, 2008) *Electrocardiographic Pill for "Cattle Heart Rate Determination"*, Vancouver, British Columbia, Canada: IEEE EMBS Conference.

[2] Mr. Kunja Bihari Swain and Satyasopan Mahato (2017) "*Cattle health monitoring system using Arduino and LabVIEW for early detection of diseases"*, India: IEEE 3rd (ICSSS).

[3] Mr. S.Jegadeesan & Dr.G.K.D.Prasanna Venkatesan (2017) "*Distant Biometry In Cattle Farm Using Wireless Sensor Networks"*, India: IEEE.

[4] Kumar, Anuj, and Gerhard P. Hancke "*A ZigBee-based animal health monitoring system*", *IEEE,* sensors Journal 15.1(2015), pp. 610-617.

[5] MurizahKassim, Mat IkramYusof *"IoT-based Personal HealthCare Monitoring Device for DiabeticPatients*", *IEEE*-2017.

[6] S. Warren, L. Nagl et.al (April 17-20, 2005) "Veterinary Telemedicine: Wearable and Wireless Systems for Cattle Health Assessment", 10th Annual Meeting of the American Telemedicine Association,Colorado Convention Center, Denver.

[7] K. Smith, A. Martinez, R. Craddolph, H. Erickson, D. Andresen, and S. Warren (August 30 - September 3, 2006) "*An Integrated Cattle Health Monitoring System*", 28th Annual Conference of the IEEE EMBS, Marriott Times Square, New York.