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Cattle Health Monitoring System - A Review

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Abstract: Productive online cattle health monitoring can help those farmers who regularly suffer due to the poor health condition of their cattle and unavailability of good veterinary. Hence it is difficult for farmers to monitor and compare the present health parameters with the standard reference healthy parameters. By such comparison they would be able to spot any health issues in the cattle's health. To prepare such a system for real time application, very few researchers are working through use of Node MCU, Node MCU is an open source IoT platform, Step Counter and different types of sensors. This paper focuses mainly on existing different types of system used for monitoring the health parameters such as counting foot step, temperature, rumination and body humidity of the cattle.

Keywords: Node MCU, Step Counter, Rumination, Humidity & Temperature.

I. INTRODUCTION

In a developing countries, where there is an abundance of rural areas where people still depends on the cattle's as their source of income [1]. 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 farmer's who cannot afford advanced machinery for the agricultural purpose and still remain dependant on the cattle for it. Due to the unavailability of veterinarians in rural areas people with their cattle's visits the veterinarians by travelling a far distance which costs them a lot. But such a move can be a double edged sword as if the cattle's health condition is actually bad, they can get treated, but if such is not the case then it will be a total wastage of money on this journey. According to the survey, it can be noted that most of the person's of rural areas move to the urban area by getting disappointed from their rural life and by leaving their family member's in the village itself. In line to this, huge research is going on the human beings through which we are able to obtain valuable information regarding health parameters. But unfortunately with the help of advance technologies, there are only few researches are working on cattle's health monitoring. Some of available systems which are used to monitor health of cattle's by Cattle Heart Rate Determination using Electrocardiographic Pill [2], Cattle health monitoring system using Arduino and Lab VIEW for early detection of diseases [1], distant biometry in cattle farm using wireless sensor network. In this paper we are going to give the brief introduction to all such system with their advantages and disadvantage to summaries a best system for cattle health monitoring.

II. CATTLE HEALTH MONITORING

Cattle Health Monitoring system should be able to monitor health through monitoring different parameters of cattle such as counting of foot step, temperature, rumination and body humidity of the cattle. Different technologies can be used for implementation of such system. Some of such system is as follows

A. Electrocardiographic Pill for Cattle Heart Rate Determination

Mr. Steve Warren & Angel Martinez has given an idea about Health monitoring system using wired communication in his paper "Electrocardiographic Pill for Cattle Heart Rate Determination" published in IEEE EMBS Conference Vancouver, British Columbia, Canada, August 20-24, 2008 As per result HMS system is promising but having loophole of wired medium. This system design for health monitoring of cattle was based on wired system in that they only monitor the parameter like heart rate and temperature of cattle's. The technique provides heart rate by way of an electrocardiographic sensor that operates in the form factor of an ingestible pill such as those used to acquire core body temperature. This pill will be used with a wearable cattle health monitoring system under development at Kansas State University which seeks to record animal heart rate, core body temperature, head motion (three axes of acceleration), absolute position via GPS, and the ambient temperature and humidity of the surrounding environment [4,6-9]. The system can buffer data for several days. When an animal comes within range of a ZigBee-enabled base station at a water trough

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or feed bunk, its health data are uploaded for storage and analysis. These health data can then be sent to a larger veterinary information network which collects electronic health records from many herds and promotes the identification of health trends useful for epidemiological research.

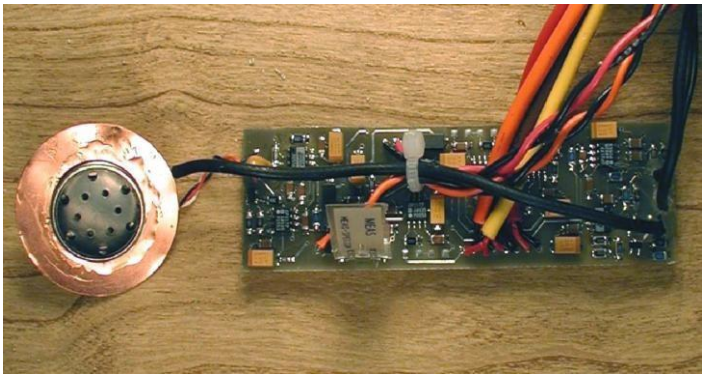

Fig. 1 Circuit board containing the microphone and ECG circuitry.

This paper presented prototype hardware and early data for an electrocardiographic pill that will allow continuous acquisition of cattle heart rate and other cardiopulmonary parameters. But the system has some disadvantages as this system is able to monitor core body temperature and heart rate only, It is wired system and The system is complicated.

B. Cattle health monitoring system using Arduino and LabVIEW for early detection of diseases

Mr. Kunja Bihari Swain and Satyasopan Mahato has given an idea about Health monitoring system using zigbee module in his paper "Cattle health monitoring system using Arduino and LabVIEW for early detection of diseases" LabVIEW is a graphically-based programming language developed by National Instruments. Its graphical nature makes it ideal for test and measurement (T&M), automation, instrument control, data acquisition, and data analysis applications [18]. Kunja et.al published the detail system in 2017 IEEE 3rd International Conference on Sensing, Signal Processing and Security (ICSSS).This system was designed to overcome the problems which was in previous system. The first system was using wire and now the new system has overcome this drawback. New system design was wireless system using zigbee module. In this paper, a device which provides an opportunity to the farmers to monitor and compare the present health parameters of the cattle with the standard reference healthy parameters, by which they would be able to spot any deterioration in the cattle's health. To prepare such a device for real time application, Arduino UNO, Arduino NANO, Xbee module and different types of sensors for taking the cattle body parameters have been used. This paper focuses mainly on the parameters like heart rate, temperature, rumination and body humidity of the cattle [1].

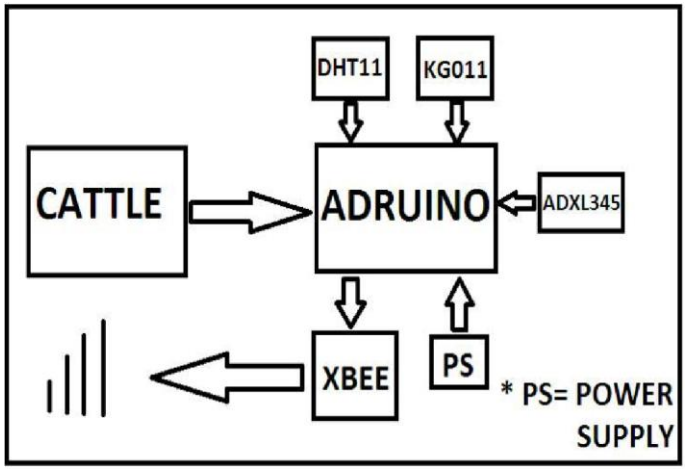

Fig. 2 Block diagram of system using Zigbee

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Online 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. system has advantages as mention above but some of disadvantages are Use of zigbee modules the system becomes bulky, zigbee module range is short, only one cattle can be monitored at a time and Cost of Lab view may not be economical to farmers. Lab VIEW is also called system design platform and development environment for a visual programming language.[3]

C. Distant Biometry In Cattle Farm Using Wireless Sensor Networks

Health monitoring system using ARM7 microcontroller and biological parameter was suggested by Mr. S. Jegadeesan & Dr. G. K. D. Prasanna Venkatesan his paper "Distant Biometry In Cattle Farm Using Wireless Sensor Networks" published in 2017.In this measure biological parameters such as temperature, ph value, and wound indication. These parameters are measured using wireless sensors, which are attached on the cattle's body. All these sensors form Wireless Body Sensor Network (WBSN). The wireless sensors are coordinated by a microcontroller. The sensors sense the parameters and transmit them to amonitoring system. To reduce power consumption, whenever there is abnormal change in temperature, it enables the other two sensors, which means that the temperature sensor acts as a wake up devices. In the monitoring system, all three values are viewed, and if any value seems to exceed the default value, an alarm will be produced. Here, ph value of cattle's urine is noted, because when the acidity in the cattle's urine increases, liver may gets damaged. The RGB sensor is used to identify starting stage wound, by identifying the changes in colour. The RGB sensor with temperature sensor is used to identify foot mouth disease. The microcontroller that we used here is ARM7 Microcontroller. Thus, the parameters are sensed and transmitted to the monitoring system, from which health status is monitored. To implement a health monitoring system for cattle in the cattle farm using the wireless technology, the parameters like temperature; pH value of the cattle is noted [10], [11], and [12].

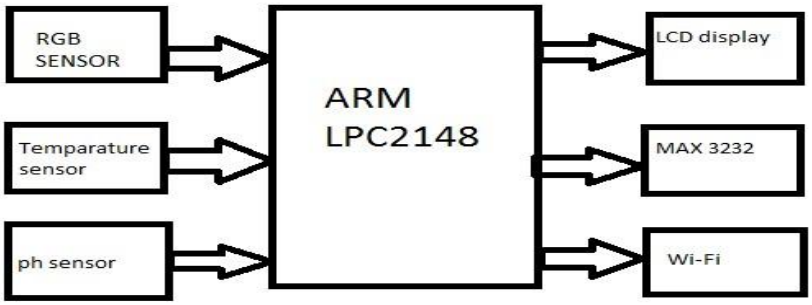

Fig. 3 System implementation using ARM7

Health monitoring system using ARM7 microcontroller has advantages as stated but parallel it has some disadvantages as Cost is high, Complex instruction set, Complicated to designs because number of pin is more [5] [20]. GSM technology can also be used to transmit data through wireless networks.[19]

D. IOT Based system

IOT based system is one of the best technique for implementation of cattle health monitoring system as it overcome all drawbacks of systems design using Electrocardiographic Pill, Arduino, Lab VIEW and Wireless Sensor Networks,
IOT based system can be implemented using node MCU. Node MCU is used to monitor health of many cattle's at a time through Wi-Fi module. It is less complicated as Wi-Fi module is inbuilt in node MCU. To design such a system for real time application, Node MCU, pedometer and different types of sensors are required for monitoring the cattle body parameters. This system focuses mainly on the parameters like counting foot step, temperature, rumination and body humidity of the cattle.

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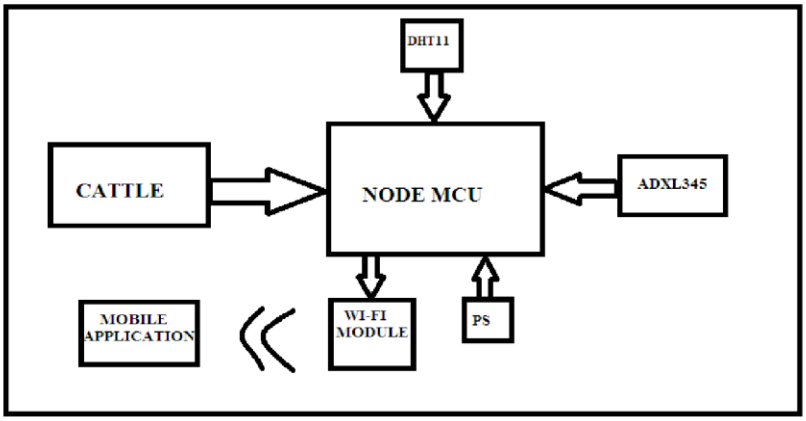

Fig. 4 IOT Based system block diagram.

In this system the entire setup is divided in two sections: the transmission and receiver section. The transmission section consists of power supply, Node MCU, different sensors and Wi-Fi module. The receiver section consists of mobile as a receiver. Firstly, the sensors are placed on the cattle using a belt. The sensors are interfaced using Node MCU and the signal then read and transmitted through Wi-fi module. The rumination sensor is placed on the side of the mouth. The DHT11 sensor is placed on the back of the neck of the cattle. Now when the data is sent from the transmission section it is received by the second Wi-fi module in the receiver section and then is processed through Node MCU and displayed in the mobile.

III. Experimentation and Expected Result

On review study of all above systems some of health parameters are listed bellow through which cattle health can be monitor. In experimental analysis we will take into account cattle with age reference by veterinary and will try to monitor parameters as Foot steps, Temperature, Humidity and Rumination. It is also expected that the system will be able to give the values of all the parameters by comparing with the reference values. The system must have an advantage that farmer will be automatically intimated if any of parameter will cross the threshold value which may produce health problem through mobile application. As per standard reference healthy parameters system must give the comparative analyses of actual footsteps per day, body temperature, humidity index (THI). Milk production is affected by heat stress when THI values are higher than 72, which corresponds to 22 ° C at 100% humidity, 25 ° C at 50% humidity, 28 ° C at 20% humidity. Johnson (1980) reported that when THI reaches 72, milk production as feed intake begins to decrease. The standard body temperature of a healthy cow is 101.5 ° F (38.6 °C)[1] [13] [14]. The cattle generally ruminate 400 to 500 minutes per day [15]. From system we are also expecting the primary precautions if any parameter cross its threshold value.

IV. Conclusion

In this paper we have given a brief literature review study of different systems implemented for cattle health monitoring through their used techniques and advantages, in very first system using Electrocardiographic Pill for Cattle Heart Rate Determination it is design to monitor only for heart rate and core body temperature. Also the said system is wired system hence it is somewhat complicated to implement. Whereas system implemented through Arduino and LabVIEW is more convenient but cost of Lab view may not be affordable to farmers. This drawback can be overcome by the system design with the help of Distant Biometry. In which Wireless Sensor Networks is used to monitor cattle's health. This system is design using ARM 7 and it is necessary to have computer system to monitoring parameters. On above review we have concluded that system for monitoring the health of cattle's should be simple to implement and cost effective. System or device should be portable so that it can be tie up with cattle and parameter con be monitor on mobile application through internet connectivity. The entire requirement can be fulfil, if system is developed by IOT concept. Hence IOT based cattle's health monitoring system is more prominent in above conditions.

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