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Reinforced Pet Healthcare Monitoring System using RSSI Technology and IOT

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Abstract:-The livestock and domestic need of a human depends on animals. There are increasing number of issues regarding various animal health condition and movements. In this paper proposes the methodology using wireless sensors based PMHS (Pet Health Monitoring System) to detect the health status of the animals, which prevents widespread diseases and also helps in early diagnosis of diseases. In this PHMS ,the parameters affecting animal health such as heart rate ,pulse rate ,respiratory ,temperature and stress level are monitored using sensors .For the implementation of sensor module we used RSSI device and Raspberry pi microcontroller .The RSSI module is connected to graphical user interface(GUI) to display the values in PC. This project will lie in developing the hardware further to a wearable device which can be connected to any device using the IOT.

Keywords:- *RSSI, Sensors, Monitoring, Wireless Transmission, Animal Health, Detecting, IOT etc.*

I. INTRODUCTION

With the increase in population, the needs of people have also increased. Many rural population depends on livestock sector for milk and egg production. Similarly, with the introduction of pet adoption a large number of people now have either a dog or cat at home. And hence taking care of animal health and becomes necessary .Public perception animal welfare and milk quality cause for continued use of grasslands for grazing in daily farming .For our research paper proposed a RSSI based pet healthcare monitoring system and they are focused on health issue of animals. The prototype system consists of the various sensors such as heart rate sensor, pulse rate sensor, respiratory sensor and pressure sensor. These various parameters measured have been used for different types of animal health judgement.

In Recent times, the livestock farmers faced cattle health problems around the world because of continuous rise in air temperature in the troposphere. The variations in temperature on animals health has harmful effect leading to diseases such as foot and mouth disease, swine fever, bovine spongioform encephalopathy (mad cow disease), bovine rhinotracheitis, squamous cell carcinoma, warts, web tear, necrotic pododermatitis, polioencephalomalacia, hypomagnesaemia, clostridia disease and hypoglycemia. In India every village farmer faced the cattle health problem around the world .Such as heart rate is the major of cattle health monitoring system. Successful grazing in developed caused for automated and efficient monitoring and control of the animal.

The existing system for Pet Health Monitoring uses either ZigBee or RFID for wireless communication link. And the sensors in few systems are implanted into the animal's skin which causes inflammation. Whereas in other they are used in the forms of collar, but however not all the parameters are taken into consideration for determining a healthy animal. The proposed system will overcome the drawbacks of the existing system. Four important sensors called, heart rate sensor, temperature sensor, pulse rate sensor and respiratory sensor are used. The data from the microcontroller is taken via the RSSI transceiver and given to PC which will have software that would analyse the severity of the animal health issues. And later the same software can be accessed via various devices implementing Internet of Things

II. REVIEW OF LITERATURE

According to research[1],Wearable Heart Rate Sensor System for Wireless Canine Health Monitoring as been developed. Interpreting the emotional state underlying canine behaviour is essential in human-canine interactions, to achieve effective training, and to improve canine welfare. Combined with parallel efforts to use IMUs to identify dog behaviours, these physiological sensors will contribute to a canine-body area network to wirelessly and continuously collect data during canine activities with a long-term goal of effectively capturing and interpreting dogs' behavioural responses to environmental stimuli that may yield measurable benefits to handlers' interactions with their dogs. There are some disadvantages that this system can be used only for certain conditions such as while the dog is sitting or running and the developed system can be used only for a particular animal here i.e., dog.

According to research[2],A Wireless Sensor Network for Feedlot Animal Health Monitoring. In this paper, in order to achieve early detection of each individual animal's illness, a wireless sensor network system is developed to monitor the

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animal's feeding and drinking behaviours. Electronic radio frequency identification (EID) tags on the feedlot animal to record and study the cattle feeding and drinking behaviours. The number of directional antenna used should be less in number as it occupies some of the valuable area of the feed bunk. The possibility of using drone assistance (instead of humans) for localizing an animal that has not been heard from eating or drinking has not been used.

In research[3], ZigBee-Based Animal Health Monitoring System. In this paper, we have reported a novel design goal of the animal health monitoring system with a capability to monitor heart rate, body temperature, and rumination with surrounding temperature and humidity. It has a variety of features such as high speed, energy efficient, miniaturization, and intelligence, new materials at lower cost, portability, and high performance. It can also determine the stress levels in terms of Thermal Humidity Index. The output signal of the developed sensor modules are sent to a host computer through ZigBee module. The values of body temperature, surrounding humidity, surrounding temperature, rumination, heart rate, stress level, and TH index (THI) can be displayed on the GUI PC. The transmission for heart rate data is only up to 5 meter. The heart rate sensor module's transmission range requires modification and also the major cost of the developed system comes from the use of ZigBee modules and T56H transmitter.

According to research[4],Tracking Cows Wirelessly, the utilization of Dairy cows require careful monitoring for milking, weighing, and other activities, so the ability to reliably track these animals in large numbers is particularly important ,Ear tags are used to typically identify these Dairy cows. The scanner must be within a few inches of the tag. The researcher designed and built a prototype wireless network that combines long-range ultra-high-frequency (UHF) RFID tags with low-cost wireless and computing components. The load sensor, RFID reader, and the ZigBee communication has not been consolidated into a single processor causing overhead of being separate devices.

The possibility of using drone assistance (instead of humans) for localizing the cow that has not been heard from eating or drinking has not been used.

In research[5],Smart RFID Antenna System for Indoor Tracking and Behaviour Analysis of Small Animals in Colony Cages. In this paper, a novel RFID-based approach enabling an effective localization and tracking of small-sized laboratory animals is proposed. It is mainly based on a near-field (NF) RFID multi antenna system working in the UHF bandwidth, to be placed below the animal's cage. The basic idea is to firstly design and realize a particular NF antenna system suitable for UHF RFID readers to be placed below the animal cage. In such a way, after appropriate NF tags have been implanted into the laboratory animals, when only one of the antennas reads a RFID tag. In particular, the system is thought for small-sized laboratory animals, usually mice. Consequently, a resolution of the order of the animal size is satisfactory. Antennas in the centre are more influenced by neighbouring antennas while the antenna in the corner is weakly affected from them. And hence, these can be corrected only by software. The adopted experimental setup was not able to measure the actual velocity.

III. COMPARISON ANALYSIS OF MONITORING TECHNIQUES

Figure 1 shows the comparison analysis of the monitoring techniques with RSSI.

The table clearly shows that RSSI,IEEE 802.11 has the highest frequency band, standard range is more than 100m whereas the other technologies provide a range less than or equal to 100m,RSSI also comparatively has the maximum number of channels .Although the data transfer rate seems to be less comparatively the data transfer will be efficient, it provides communication reliability; packet delivery ratio is almost 100%.

STANDARD	BLUETOOTH	WIFI	ZIGBEE	RSSI
IEEE	802.15.1	802.11A/B/G	802.15.4	802.11
FREQUENCY	2.4GHz	2.4GHz,5MHz	868/915 MHz,2.4 Ghz	2.1 GHz to 2.8GHz
RANGE	1-100m	100m	10-100m	>100m
CHANNELS	79	14	1/10,16	3-127
DATA RATE	3Mbits/s	54Mbits/s	250Kbits/s	100 Kbits/s

Fig 1:- Comparison analysis

IV. PROPOSED SYSTEM

To overcome the drawbacks of existing module, we have developed an efficient module using RSSI(Received Signal Strength Indicator) for the sake of good animal health. We are implementing this system with the help of four sensor modules i.e. heart rate, temperature ,respiratory. pressure. The proposed system will avoid animals suffering from many diseases and also track good health of animals. The main contribution is securely distributing data in an efficient manner.

Fig. 2 depicts the block diagram of the pet health monitoring (PHM) system. The PHM system has been developed according to the IEEE802.11 standards. The developed PHM system can be used of detecting the animal physiological parameters also has been classify the stress level of the animal. The PHM system consists of four sensor modules i.e., heart rate temperature ,respiratory ,pressure ,RSSI module ,Raspberry pi microcontroller and PC .The output signal of the developed sensor modules are sent to a host computer through RSSI module.

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Block Diagram Of The Model

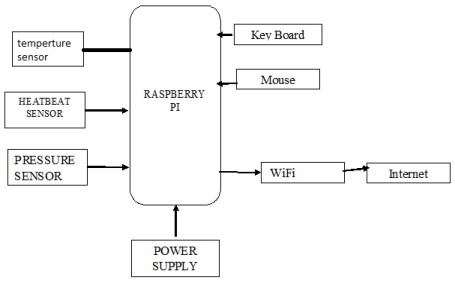

Fig 2:- Architecture of Pet Healthcare Monitoring System.

In figure 2,The data may be raw and needs editing. However, a software system will be developed in next phase to analyse the data.

- *Working of PHMS*

The sensors are connected as shown in fig. The output signals of the modules which are developed are sent to the host computer through RSSI module.

A. Temperature Sensor Module

Domestic animal has a core body temperature (CBT) which gives an indication of their body temperature. Any deviation from their usual temperature is a cause for abnormality. For example, a domestic cow has body temperature between 38.0-39.3 degree Celsius. Whereas, for a dog it is between 37.9-39.9 degree. And any deviation from these temperatures can tell us that there is an abnormality. The body can only work properly at a certain temperature. The normal body temperature is different in different types of animals.

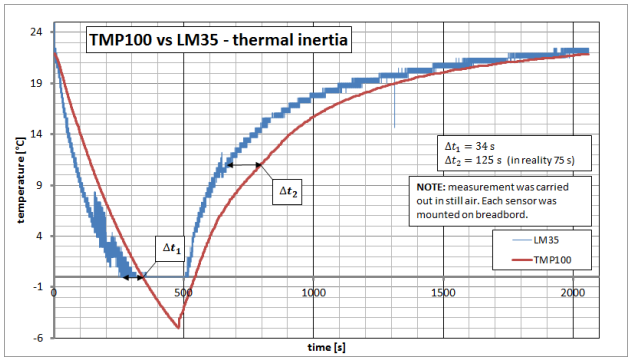

Fig 3:- Temperature sensor analysis

B. Heart Rate Sensor Module

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. This digital output can be connected to microcontroller directly to measure the beats per minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

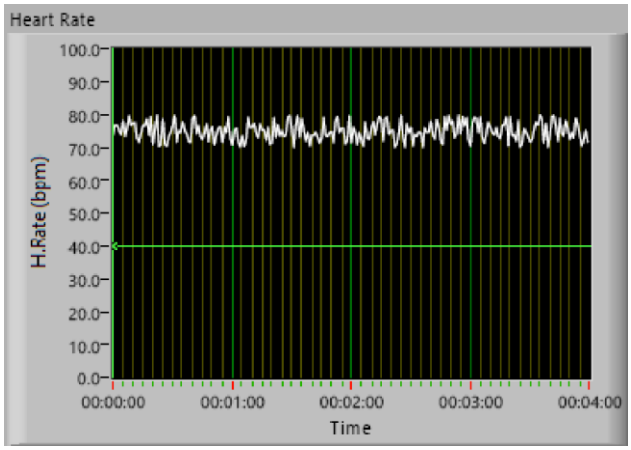

Fig 4:- Heart rate sensor output

C. Pulse Rate Sensor Module

The sensor clips onto a fingertip or earlobe and with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings.

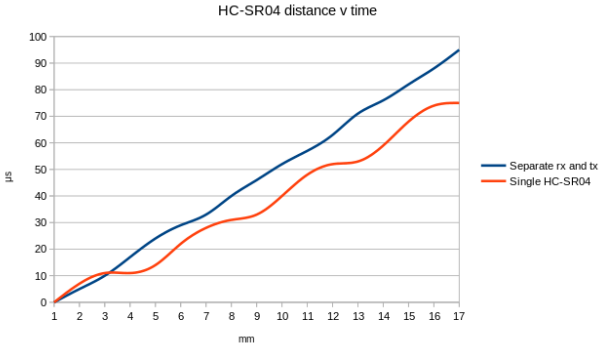

Fig 5:- Pulse rate sensor analysis

D. Respiratory Sensor Module

The Respiration Rate Sensor includes a Relative Pressure Sensor and inflatable belt, which wraps around the chest. As the person breathes, respiration rate and pressure changes can be displayed in a graph on a computer. The pressure of the lungs and chest cavity expanding causes

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pressure against the bladder of the belt, but the pressure measured is not the actual pressure change in the lungs.

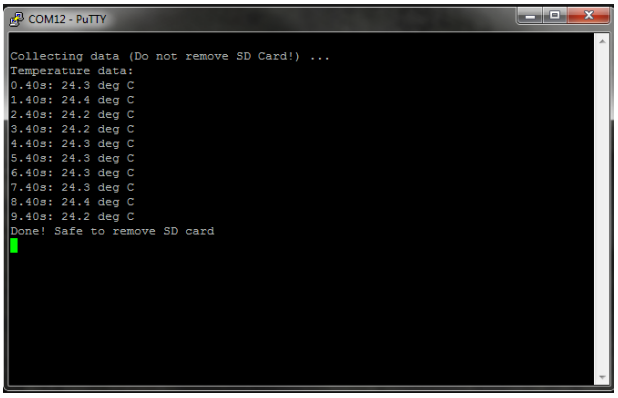
V. IMPLEMENTATION

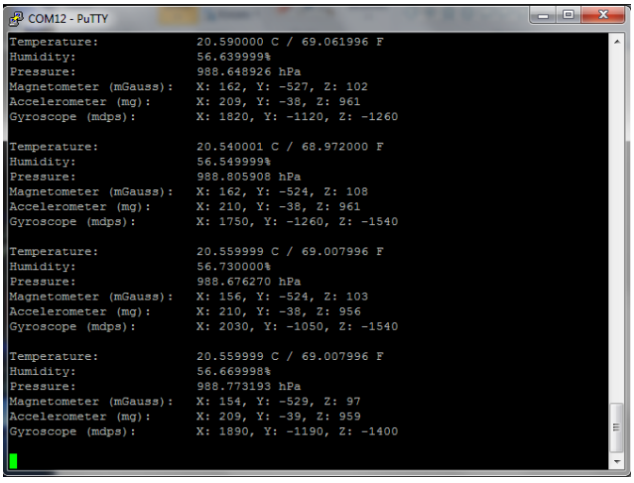
The proposed pet health monitoring system was implemented with all the four mentioned sensors. All the sensors are integrated together with the microcontroller and it has been programmed to get the data from the sensor. The integration of all sensors helps monitor the health of the pet.

In this module ,RSSI transmitter and RSSI receiver has been used. The data from the MC is transmitted to the RSSI transmitter and the receiver receives the data using UART protocol.

The received values from sensors was transferred over the wireless RSSI communication channel through UART protocol and is shown in the computer.

VI. SCREENSHOTS





VII. CONCLUSIONS

The main idea of this paper is to integrate two existing modules developed in different platform and technology to a single module and platform. The accuracy of the values relies on the microcontroller which uses explicit ADC to give the accurate details in case of health monitoring. In order to overcome various health issues and problem related to animal, we have proposed a PHMS. Based on their study the following work is an improvisation on the real time monitoring system with wireless technology of data transfer.

The future of this paper will lie in developing the hardware further to a wearable device which can be connected to any device using the internet of things. One advantage is that it is using IOT so website can be monitored anywhere using internet. But since the wearable device can possess as a serious security threat i.e., the device can be removed from the animal's body and can result in theft. And hence, a smart theft detection system or burglar alarm can be placed on the hardware to alert the user and sending a notification to their device.

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