Seminar Report

by Bhavya Nair

Submission date: 15-Oct-2019 02:27PM (UTC+0700)
Submission ID: 1193177328
File name: Bhavya.docx (1.36M)
Word count: 5051
Character count: 26718

Animal Health Monitoring System using Zigbee

A SEMINAR REPORT

Submitted by

Bhavya Nair

MBT16CS040

In partial fulfilment of the requirements

for the award of the degree

of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

Of the A.P. J. Abdul Kalam Technological University

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

MAR IVANIOS VIDYANAGAR, NALANCHIRA

THIRUVANANTHAPURAM – 695 015

October 2019

Mar Baselios College of Engineering & Technology

Mar Ivanious Vidyanagar, Nalanchira,

Thiruvananthapuram - 695 015

(Affiliated to A. P. J. Abdul Kalam Technological University)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Seminar Report titled '*Animal Health Monitoring System using Zigbee*' is a bonafide record of seminar presented by Bhavya Nair (MBT16CS040).

Ms. Jesna Mohan	**Mr. Praveen G.L**	**Dr. Tessy Mathew**
Seminar Co-ordinator	Seminar Guide	Head of the Department

Place: Thiruvananthapuram

Date: 2 /10 /2019

ACKNOWLEDGEMENT

First and foremost, I thank God Almighty for His divine grace and blessings in making all these possible. May He continue to lead us in the years. It is to render my heartfelt thanks and gratitude to our principal**, Dr. T. M. George** for providing the opportunity to do this seminar during the 7th semester (2019) of my B. Tech degree course.

I am deeply thankful for our Head of the Department **, Dr.Tessy Mathew** for her support and encouragement. I would like to express my sincere gratitude to my seminar guide Asst.Professor, **Mr. Praveen G.L**, and project coordinator, Asst.Professor, **Ms. Jesna Mohan,** Department of Computer Science and Engineering for their motivation, assistance and help for the seminar. I also thank all the staff members of the Computer Science Department for providing their assistance and support. Last, but not the least, I thank all my friends and family for their valuable feedback from time to time as well their help and encouragement.

Bhavya Nair

CONTENTS

LIST OF FIGURES

ABSTRACT

An Animal Health monitoring system, uses a wireless Ad-Hoc network called Zigbee that is a wireless protocol intended for small scale projects as it has low power and bandwidth needs. The increase in tech integration in various fields shows that animal husbandry can also benefit significantly, for example the "problem" most livestock owners face is monitoring the health of the lives they are responsible for; the health of cattle acts as a signal that helps to control and prevent the eruption of diseases at a large scale. Animal Health Monitoring System mainly focuses on various parameters for example the body temperature, surrounding temperature, heart rate, rumination and humidity with the help of Zigbee that has been created. This system can also identify the level of stress based on the term known as Thermal Humidity Index. Zigbee module communicates data through network which are paired with multiple sensing modules. Then the GUI PC displays all the behavioral and physiological parameters. The Animal Health Monitoring System model has proven to be a very helpful model for the non-expensive care of livestock. Accuracy results were also high after the model was developed and properly tested.

1. INTRODUCTION

In today's world, the sudden and continuous rise in temperature in the troposphere around the world is causing a lot of problems. Global warming, sunburn, skin infection etc. are the problems that humans go through dues to this increase in temperature. It has an adverse effect on animals as well. One of such problem is what we are discussing here, that is the problems faced by the livestock farmers. Livestock farmers face cattle health issues. Swine fever, web tear, foot and mouth, squamous cell carcinoma bovine spongiform encephalopathy (mad cow disease) etc. are the harmful diseases that animals face because of the variation in temperature. There are many animal diseases which actually spread very easily, one of such disease is severe acute respiratory syndrome corona virus which not only spreads to animals but has also directly affected human beings. Therefore, measures have to be taken so that such a situation doesn't arises. A proper system is needed so that the animal health is monitored throughout and to prevent and control the diseases before it gets worse.

Technology has always played its part in making everything simple and more useful. Here also, in modern farming also technology plays a vital role which mainly focuses on advancement of systems and tools. Livestock farming has seen a huge development in technology, also now termed as electronic livestock farming. The Animal Health Monitoring System (AHMS), is one such system that keeps track of the animal health and monitors it. This health monitoring system basically depends on 2 methods, direct contact(invasive) and indirect contact(non-invasive). This system also consists of 2 modules known as sink module and sensor module. It is considered to be an inexpensive health monitoring system which livestock farmers can use and would be even helpful. Here, the prototype monitoring system will be having a receiving unit and sensing unit. The receiving unit will receive all the data and signals send by the sensor module which belongs to the sensing unit. The core or main part of the system is the processor which over here is AMD186 placed over a microcontroller board.

There are prepositions from different researchers giving their ideas about how a proper Animal Health Monitoring System should work and what all factors it should monitor and control. Janzekovic et al. proposed that using a polar sport tester (PST), a heart monitoring method should be there for cattle. Wietrzyk and Radenkovic et al. proposed an animal health monitoring system

based on ad-hoc wireless sensor network, where using the data the spread of diseases can be limited and prevented.

Currently, there are a lot of issues faced by the livestock farmers in monitoring the health of the animals therefore modifications are still being done so that the system provides ease of implementation for the livestock farmers to take care of their cattle. The existing health monitoring system only focuses on measurement of heart rate to predict the health of the animal. There has been reviews that animal health monitoring for real time using wearable systems is the key to help the staff in veterinary hospitals to detect the health parameters faster and also providing accurate information about the health of the animal. Also as said earlier, it is an inexpensive method also which makes it all the better system to be used around.

The aim of this paper is that the Animal Health Monitoring System (AHMS) has the capability to monitor heart rate, body temperature, humidity as well as rumination with surrounding temperature. The other features it provides is miniaturization, high speed, intelligence, energy efficiency and also materials that are portable, less expensive and high performance.

2. TECHNOLOGY USED

2.1 ZIGBEE MODULE

Sensor and control networks for wireless personal area networks (WPANs) is the main area of focus of Zigbee communication which is a Zigbee alliance product [2]. Physical and Media Access Control (MAC) layers are defined by the communication standard to handle multiple devices at very low-data rates. Zigbee's WPANs operate at 2.4 GHz frequencies and 868 MHz, 902-928MHz. The date rate of 250 kbps is perfect for periodic as well as intermediate two-way transmission of data between controllers and sensors.

Fig: 2.1.1 Zigbee modem

Zigbee is deployed for monitoring and controlling applications with its low-powered and low-cost mesh network where it covers 10-100 meters within the range. This communication system is simpler and cost efficient than the other previously used short-range wireless sensor networks such as Wi-Fi and Bluetooth.

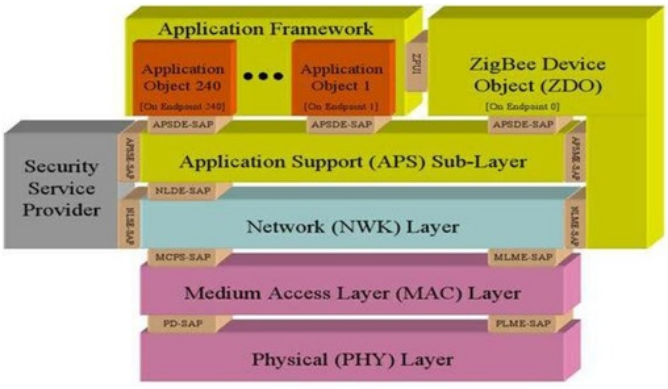

Fig: 2.1.2 A Zigbee module architecture

1. **MAC Layer**: Using the carrier sense multiple access collision avoidance (CSMA), this layer is responsible for reliable transmission of data by accessing various networks.
2. **Network Layer**: Most of the network related operations such as end device connection, network setup, and disconnection to network, device configurations, routing, etc are taken care of by this layer.
3. **Application Support Sub-Layer**: Services required for Zigbee device object and application objects to interface with the network layers for data managing services are enabled by this layer. This layer is also responsible for matching two devices according to their needs and services.
4. **Application Framework**: This layer provides two types of data services as generic message services and key value pairs.

2.2 THE ZIGBEE PROTOCOL

Member companies of the Zigbee Alliance have formulated and created the Zigbee protocol. The design goal of the Zigbee protocol was to provide an easy-to-use wireless data solution which is secure with reliable wireless network architectures. Zigbee protocol features include:

1. Approximately 65,000 nodes per network
2. Lower latency
3. Lower duty cycle – providing a longer battery life
4. Secure data connections using 128-bit AES encryption
5. Provide support for multiple network topologies such as point-to-multipoint point-to-point and mesh networks
6. Direct Sequence Spread Spectrum (DSSS)
7. Acknowledgements, collision avoidance and retries

Simpler and less expensive means are provided by the new Zigbee specification when compared to the other wireless personal area networks (WPANs), such as Wi-Fi or Bluetooth.

3. METHODOLOGY

Here, the Animal Health Monitoring System is used for detecting the health of the animal with the help of the physiological parameters like body temperature, rumination, heart rate and humidity in accordance with the environmental parameters like the surrounding humidity and temperature. Thermal Humidity Index (THI), which is calculated based on the surrounding environmental parameters (humidity and temperature) is basically used to know the stress level of an animal. Now in general what the AHMS dos is that the output signals of the sensor modules are sent to Zigbee module which in turn sends the data to the host computer. Various parameters that are measured with the help of sensor modules like body temperature, humidity, rumination, heart rate and TH index value are all recorded and displayed on the GUI PC. AHMS is considered to be an autonomous device.

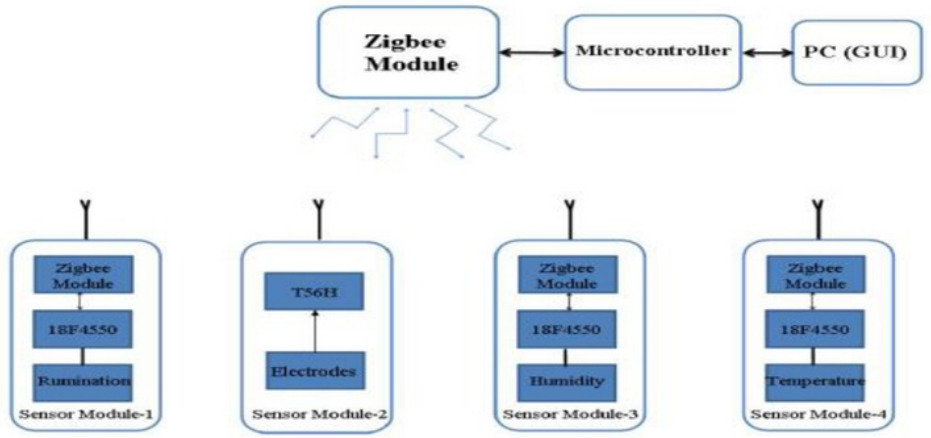

Fig: 3.1 Block Diagram of animal health monitoring System

As discussed before, there are 2 modules in this prototype used in animal health monitoring system.

1. Sensing module
2. Sink module

3.1. SENSING MODULE

The sensing unit is considered to be the main component of the Animal Health Monitoring System (AHMS). The chief components of the animal health monitoring system are the sensing module that consists of Zigbee module, processor and sensor. There are various parameters present through which we can detect the health of the animal but in this paper, we talk about only 4 of such parameters which are body temperature, rumination, humidity and heart rate.

The analog to digital converter (ADC) which is a part of the microcontroller gets the analog outputs from the sensors.

To detect the body parameters of the animals the following sensors have been included in the sensing module.

3.1.1. TEMPERATURE SENSOR

Every animal has a specific range of temperature known as the core body temperature in which the body temperature should lie, so that metabolism occurs without any modification. This is known as the Thermo-Neutral Zone. Normally, the core body temperature is always a bit higher than the ambient temperature, this is because to make sure that the heat generated by the body flows out to the environment as heat always moves from higher temperature to lower temperature. If the sample range of the temperature measured is not within the scope of the ideal range then it will lead to increase in resting metabolism and changes in biochemistry, cellular physiology and animal behaviour. The ideal range of temperature for a healthy adult cow is approximately between 38.5°C (101.5°F) to 39.5°C (103°F) for it to be classified as healthy; if not within this range then it is not in its healthy state. In South Africa, the ambient temperature has been recorded till date as 33.7°C to 4.8°C being the lowest temperature. Therefore, -15°C to +40°C can be considered as an ideal ambient temperature.

Temperature sensor used over here is a thermistor. Thermistor is a highly sensitive resistor that varies resistance according to temperature. That is the change in electrical resistance accordance with the change in temperature is the main function. The characteristic of thermistor which makes it useful is its very high sensitivity to even minute change in temperature. Therefore, they can be used in the sensing module. As temperature increases the negative temperature coefficient's (NTC) resistance also decreases. It is less complex circuitry and has small mass and also lower cost

compared to the other temperature sensing modules. A negative temperature coefficient thermistor increases current flow by decreasing the resistance due to increase in temperature.

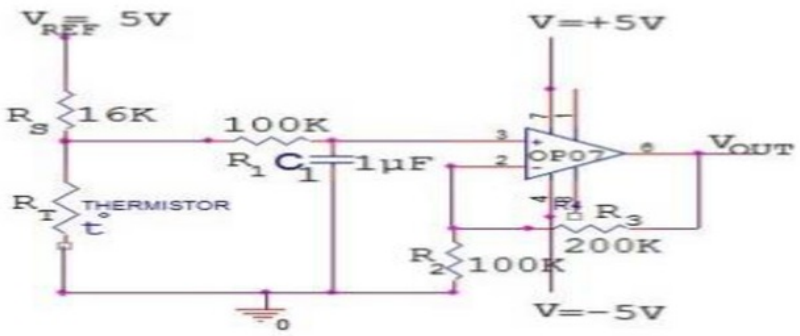

Fig: 3.1.1 Schematic diagram of temperature sensor module

The schematic diagram of the thermistor sensor is shown in Fig. 3.1.1. Now the circuit of the thermistor is divided into two parts that is the Voltage Divider and Voltage Follower. Voltage divider and Voltage Follower are the two main divisions of the signal processing circuit. OP07 is the operational amplifier used in the voltage follower circuit with the gain as three. The voltage divider network over here is mainly dependent on the reference voltage VREF and series resistor RS.

The low pass filter is formed by the combination of C1 and R1 which is used to remove the noise from the circuit. According to eq1. RS was selected. With the thermistor sensor modules fixed at -15°C to +45°C, for three reference temperature, the thermistor resistance value (RT) was obtained, like the upper point (RT3=0.450K), lower point (RT1=6.5K) and mid-point (RT2=3K).

$$RS = (RT1RT2 + RT2RT3 - 2RT1RT3) / (RT1 + RT3 - 2RT2) \quad \text{equation (1)}$$

Where, RT1=thermistor resistance at the lower limit

RT2=thermistor resistance at the mid limit

RT3=thermistor resistance at the upper limit.

Also, $Vout = (RT / (RS+RT)) \cdot VREF$

Here, the Steinhart equation has been used for the calculation of temperature. Steinhart equation is as follows:

$$1/T^{I} = 1.5*10^{-3} + 0.286*10^{-3}(\ln RT) + 3.558*10^{-8}(\ln RT)^{3}$$

$$T^{I}(°C) = T^{I} - 273.15$$

Where, T^{I}: body temperature in kelvin(K), T: body temperature in Celsius(°C), RS: series resistor belonging to the voltage divider circuit, Vout: thermistor sensor's output voltage, VREF: reference voltage belonging to the voltage divider circuit.

3.1.2. HUMIDITY SENSOR

There are environmental parameters that affects the health and performance of the animal in many ways which can be direct or indirect. These environmental parameters include air movement, radiation heat, humidity and air temperature. But in this paper, we are discussing about humidity and air temperature only.

Thermal Humidity Index (THI) will be calculated based on the above discussed environmental parameters. Thermal Humidity Index (THI) is basically used over here to analyse the stress level of an animal. A DHT11 sensor relays the values of factors affecting humidity to the microcontroller.

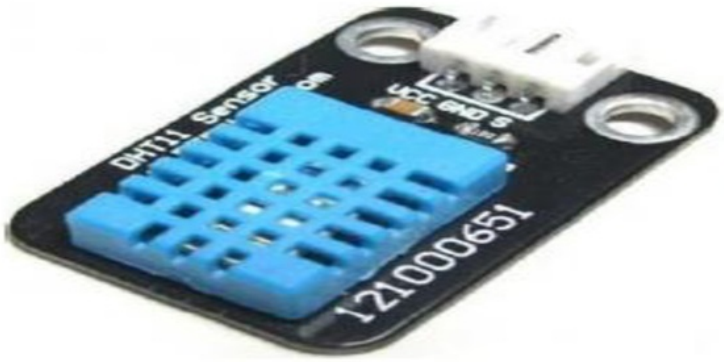

Fig: 3.1.2.a Humidity sensor (DHT11 sensor).

The microprocessor and DHT11 has a circuit connection which can be seen in figure 3.1.2.a.
The data sending format of the sensor output has 5 segments, each having 8 bits. The first 2 segments storing humidity percentage integral and decimal parts for higher accuracy. The next 2 segments are to store the temperature in degrees Celsius. And the final segment stores a checksum value for the message. The sum of the first four segment is the checksum, if the sum of the first four segment is not equal to the checksum value, then the data that has been received is not correct, otherwise correct. The data that is received is very well shown in fig 3.1.2b.
Operating voltage is fixed of 3.3V for the developed module. And the temperature and humidity sensing range of the surrounding are fixed at 0°C to 50°C and 20% to 90% respectively.

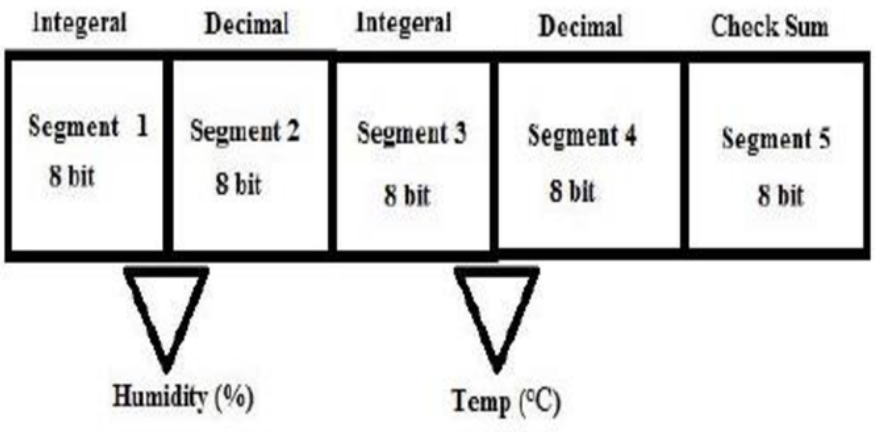

Fig:3.1.2.b Format of received data structure

3.1.3. HEART RATE SENSOR

The important parameter of all the health assessment is the heart rate. The heart rate of a healthy adult cow will be between 8 to 84 beats per minute. Stress, movement, anticipation, exertion and various other diseases usually directs or attributes directly to fluctuation in heart rate. Polar spot tester is basically used by researchers, to know the heart rate measurement. Now the transmitter chosen over here is polar equine transmitter T56H, which is an electrode-based heart monitoring device. Here, the electrode is made of fibre, which are flexible fibre that can adjust according to the heart beat. The device is also built in such a way that it is comfortable and easy for animals to wear. Polar equinine is also shown in figure 3.1.3a.

Fig: 3.1.3a Polar equinine

The electrode fibre does include a permeable material that makes sure that it has a stable contact with the skin of the animal through which it communicates the heart rate signal. Small electrical impulses emitted by the heart is picked up by the transmitter T56H and it properly reads the heart rate. The transmitter T56H supports a frequency of 2.4GHz. real time data is sent to the host computer by the transmitter. The heart rate sensor is shown in figure 3.1.3.b. In this system, approximately 75 beats per minute heart rate of the dairy cow is received by the transmitter.

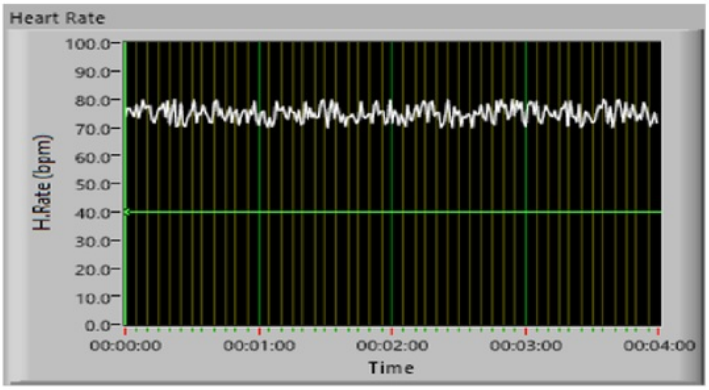

FIG: 3.1.3.b Heart rate sensor output

3.1.4. RUMINATION SENSOR

A direct indicator of animal health and its well-being is rumination and also rumination is an important part to know the proper digestion of animal. Rumination is a process of how well an animal has been able to eat and also how well the food has been able to rest.

Usually, an animal spends one third of their day that is 9 to 10 hours ruminating the food it has eaten. Mastitis, food digestion, metabolic calving disease etc. are all the diseases that are indicated by the changes of rumination. An excellent sign of treatment success is rumination. It is now a need for veterinarians to monitor the rumination of animals because a very accurate condition of an animal can be determined by monitoring the rumination. An accelerometer is used for rumination monitoring system. This rumination sensor module provides 3 axis response of the animal health. The rumination sensor module's block diagrams are shown in figure 3.1.4.a and 3.1.4.b respectively.

The accelerometer used over here is ADXL335 which is connected to PICI8F4550 microcontroller, that is basically used for detection of rumination.

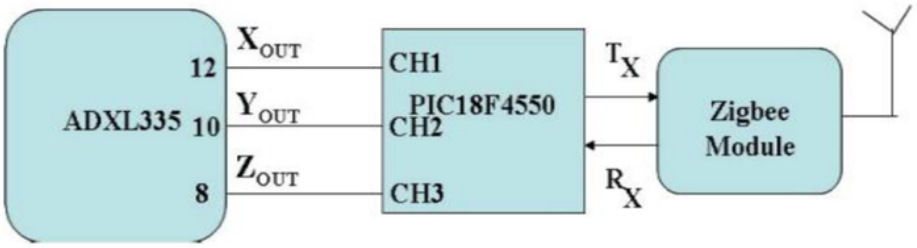

Fig: 3.1.4.a Block Diagram of rumination sensor module

The output signals sent by the ADXL335 accelerometer are analog voltage proportional to the acceleration. Zigbee module sends the output signal to a graphical user interface that is running on the host computer, which has the ability to save the real time data into the host computer's database. The accelerometer ADXL335 is considered to be an energy efficient, inexpensive, compact and is also used to measure the 3-axis acceleration with a range ±3g.

The accelerometer basically works in dynamic and static measurement of the acceleration, so it depends on the various other application like motion, vibration, shock etc. Here, the rumination

time of the animal is obtained by monitoring the mouth movement and it is usually fixed at the left side of the mouth.

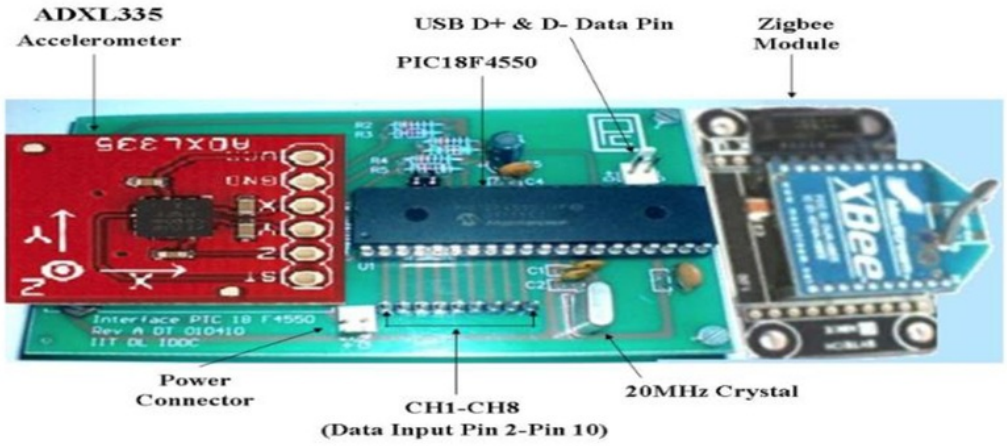

Fig: 3.1.4.b Photograph of rumination sensor module

The range of the operating voltage of ADXL335 module is between 1.8V to 3.6V, which is operated at a fixed voltage that is 3.3V. The accelerometer can have a maximum output voltage of -560mV for X-axis, +960mV for Z-axis and +560mV for Y-axis. The output signals Xout, Yout and Zout of the accelerometer are connected to the capacitors CX=CY=CZ=0.1µF respectively. To remove the errors in the acceleration measurement, the 0.1µF has been removed to low frequency noise.

The accelerometer is interfaced with the microcontroller PICI8F4550 through Zigbee module. Zigbee module sends the output signals or data to a graphical user interface (GUI) that is running on the host computer. The output signals now derived are displayed on GUI in a waveform. In figure 3.1.4.c, ruminant sensor's output has been shown.

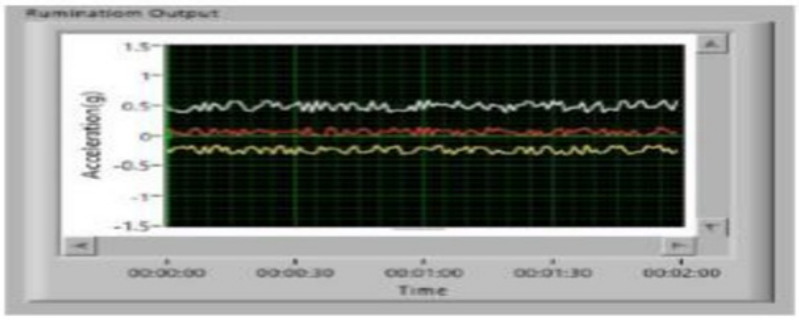

Fig: 3.1.4.c Rumination sensor 3-axix output

If these signals corresponding to the x, y and z direction are up and down then that means the animal is doing rumination properly and it is in good health. If the signals or the waveforms are not in an up and down motion then that implies some issue is there and the animal is not in good health. These results are obtained while the cow is resting during afternoon.

3.2 SINK MODULE

Here, the sink module is basically used to collect data from different sensor modules. Graphical user interface (GUI) that is running on the PC and Zigbee co-ordinator are the main 2 components of the sink module. In the Zigbee co-ordinator, the main component is the transceiver unit. The transceiver unit is interfaced with the microcontroller serially. The microcontroller is then interfaced with the PC serially via USB. In figure 10, sink module is shown.

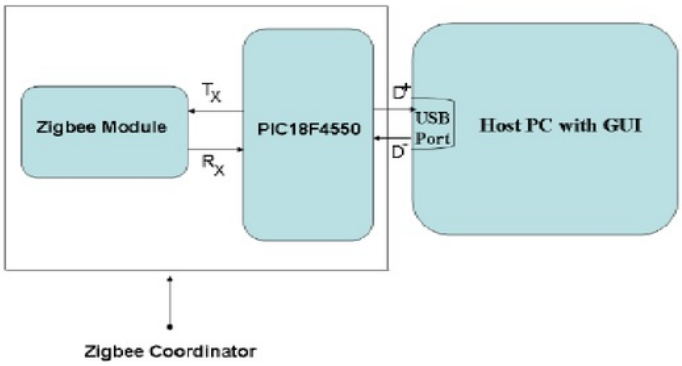

Fig: 3.2 Sink module

3.2.1. Graphical User Interface (GUI)

Graphical user interface was developed with the help of The LabVIEW 9.0. GUI is basically used for communication with Zigbee co-ordinator, the GUI runs on the host computer or PC. The two main sub programs of graphical user interface are the front panel and the other is the block diagram. The communication between Zigbee co-ordinator and GUI PC via USB is done for the development purpose of Animal Health Monitoring System. There are many advantages like reliability, hot pluggable, cost, energy efficient etc. in the usage of USB based interface system.

One of the most important factors behind using USB based interface is that it supports 100mA at 5V for external usages and it also has sufficient power for Zigbee co-ordinator. Interrupt driven transfer protocol is also used in AHMS. I/O communication software is required along with which we have used VISA communication system in the LabVIEW based instrumentation. In figure 3.2.1, the front panel of the developed animal health monitoring system is shown.

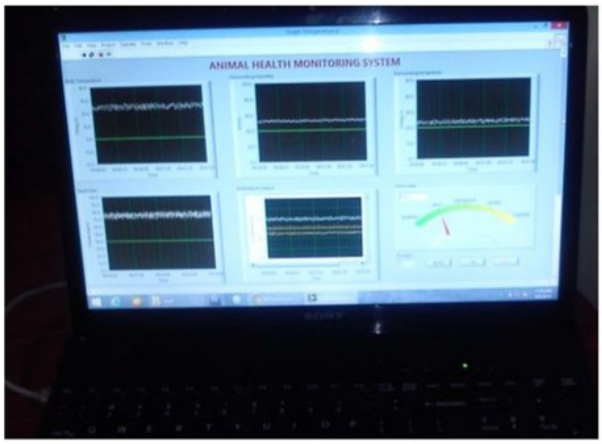

Fig: 3.2.1 The front panel of the AHMS

3.3. WIRELESS COMMUNICATION

Zigbee communication has been used primarily in the Animal Health Monitoring System (AHMS). The advantages or benefits of using Zigbee device is that it has high accuracy, low cost, energy efficient and self-configuring device. Applications of Zigbee communication are smart building, military, smart farms, environment monitoring, telemedicine services and other industrial applications.

Zigbee module is used to build a wireless communication between sensor module and sink module. XBee-PRO S2 module has been used over here. The Zigbee module that is working on 2.4 GHz transmits and receives data serially through Universal Asynchronous Receiver Transmitter (UART). Data transmission is also done serially between graphical user interface PC and Zigbee coordinator. The four sensor modules transmit the data to a single sink module that is coupled to a PC in this system. So here the sink module and sensor module will be having the same private area network ID. The network connection will be built automatically established if the working of the setup is correct and both sink and sensor module have same private area network ID. The Zigbee coordinator receives data every 4s from sensor module.

3.4. HEAT AND STRESS INDICATOR

One of the adverse effects on animal health is heat stress. It reduces the weight gain, feed intake, milk production, reproductive efficiency, and increases susceptibility to various diseases. The measurement of heat stress can be calculated through Thermal Humidity Index (THI) and is a non-invasive method and. Temperature and relative humidity are some of the animal surrounding environmental parameters that are calculated from THI in real time monitoring.

Fig: 3.4.a THI and Heat Stress Output

The formula below calculates the Thermal Humidity Index:

$$THI = (1.80 \times T + 32.0) - [(0.550 - 0.00550 \times RH) \times (1.80 \times T - 26.80)]$$

Where RH is the surrounding relative humidity in % and T is the surrounding temperature in °C. The principle of THI is that it becomes increasingly more difficult for the animal to cool itself as the relative humidity at any temperature increases. If the THI value is greater than 70 then the animal will feel uneasy.

THI	Stress Level	Comments
<70	None	
70-79	Mild	Increasing respiration rate
80-89	Moderate	Increasing respiration rate and saliva production. And also increased the body temperature.
90-98	Severe	Increased the respiration, body temperature and excessive saliva
>98	Danger	Animal death can occur

Table 3.4.b Animal Stress vs THI Index

The table shows that the stress level and TH of the animal during the experiment. The interpretation from the table is as follows:

1. The animal is in a healthy state when the THI value is less than 70, here the stress level is nil.
2. The animal has an increasing respiration rate when the THI value is between 70 to 79, here the stress level is mild.
3. The animal has an increasing respiration rate, saliva production and an increased body temperature when the THI value is between 80 to 89, here the stress level is moderate.
4. The animal has an increased body temperature, increasing respiration rate and excessive saliva production when the THI value is between 90 to 98, her the stress level is severe.
5. Risk of animal dying when the THI value is greater than 98, here the stress level is at its maximum.

4. APPLICATIONS

1. **Home Automation:** Lighting system control, heating and cooling system control, appliance control, safety equipment operations and control, surveillance, and so on can be perfectly controlled by using Zigbee.
2. **Smart Metering:** Energy consumption response, security over power theft, pricing support, etc are some of the application of Zigbee remote operations in smart metering.
3. **Smart Grid monitoring:** Remote temperature monitoring, reactive power management, fault locating and so on are some applications of Zigbee operations in smart grid.
4. **Industrial Automation:** Zigbee greatly reduces the communication cost and it also optimizes the control process for greater efficiency and reliability in the manufacturing and production industries where a communication link continuously monitors certain parameters and other important equipment.

By introducing devices like medical and scientific equipment's, smoke and heat sensor, control units of industry and home and wireless communication devices has made the Zigbee technology to prevail in markets.

5. FUTURE ENHANCEMENTS

FUTURE SCOPE OF ZIGBEE

The future of Zigbee is extremely promising. Researchers have envisioned Zigbee to provide revolutionizing statistics in the coming years which would completely change the wireless world due to the drastic increase in home networking

1. Revenue: In the next four years, Zigbee revenues will have increased by an astonishing 3400%.
2. Sales: Zigbee sales would have touched an astounding figure of 700m$.
3 Cost: It only costs $5 to make a chip but the smaller memory size of protocol chip will again lower Zigbee pricing to about $2 per chip.
4. Zigbee would be incorporated in most homes within the next two years with a minimum of 100-150 Zigbee in every home.

It is certain that Zigbee will not remain like this for a long time. An increasing rise of the protocol in new markets will develop new capabilities for it quickly. A new protocol that is being developed in cooperation with the Home Plug Alliance: Zigbee Smart Energy 2.0, is one of the most interesting ventures from the Zigbee Alliance. The proposed standard is envisaged to be an application and networking integration platform for conveying messages between energy service providers and customers. The goal of the Zigbee+HomePlug collaboration is to "Develop a common system architecture and application profile interfaces for home energy devices, supported by a comprehensive certification process that delivers robust, reliable, secure, plug and play interoperability with Smart Grid applications and AMI."

Innovations made in the Smart Energy 2.0 specification will change other application profiles and, therefore, it is reasonable to expect that the path of Zigbee moving forward will have changes as well. Some interesting features are discussed below:

1. Plans to attach support for more networking protocols, including Home Plug power line and Wi-Fi (802.11). Moreover, this will be in addition to the existing wireless 802.15.4. Support.

2. Communications over both wired and wireless networks.

3. A large addressable space is created by using the Internet Protocol addressing, including the new IPv6 standard which allows for 128-bit addresses.

6. CONCLUSION

Physiological parameters which include rumination, body temperature and heart rate are tested by the animal health monitoring system. The proposed system also monitors the surrounding temperature and humidity. TH index and stress levels are analyzed based on these environmental factors. Low power electronic components have been used to minimize the power consumption for the development of the sensing device so that the device can run continually maximum times. The sensor module developed operates with a lower power consumption and is miniaturized. It is easy to operate, highly portable, incorporates new materials at lower costs, highly intelligent and higher performance is achieved.

References :

[1] W. D. Jones, "Taking body temperature, inside out [body temperature monitoring]," IEEE Spectr., vol. 43, no. 1, pp. 13–15, Jan. 2006

[2] K. Smith, A. Martinez, R. Craddolph, H. Erickson, D. Andersen, and S. Warren, "An integrated cattle health monitoring system," in Proc. IEEE Annu. Int. Conf. EMBS, New York, NY, USA, Aug./Sep. 2006, pp. 4659–4662.

[3] H. Hopster and H. J. Blokhuis, "Validation of a heart-rate monitor for measuring a stress response in dairy cows," Can. J. Animal Sci., no. 74, no. 3, pp. 465–474, 1994.

[4] E. S. Nadimi, R. N. Jørgensen, V. Blanes-Vidal, and S. Christensen, "Monitoring and classifying animal behavior using ZigBee-based mobile ad hoc wireless sensor networks and artificial neural networks," Comput. Electron. Agricult., vol. 82, pp. 44–54, Mar. 2012.

[5] R. N. Handcock et al., "Monitoring animal behaviour and environmental interactions using wireless sensor networks, GPS collars and satellite remote sensing," Sensors, vol. 9, no. 5, pp. 3586–3603, 2009.

Seminar Report

ORIGINALITY REPORT

26%	21%	19%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.sooxma.com Internet Source	12%
2	www.elprocus.com Internet Source	3%
3	www.safaribooksonline.com Internet Source	2%
4	Anuj Kumar, Gerhard P. Hancke. "A Zigbee-Based Animal Health Monitoring System", IEEE Sensors Journal, 2015 Publication	2%
5	www.blm.gov Internet Source	1%
6	Anushka Patil, Chetana Pawar, Neha Patil, Rohini Tambe. "Smart health monitoring system for animals", 2015 International Conference on Green Computing and Internet of Things (ICGCIoT), 2015 Publication	1%
7	www.ijfrcsce.org	

Internet Source

1%

---

8 Cai Li, Dai Nina. "The Home Security System Based on ZigBee Technology", 2010 International Conference on Computational Intelligence and Software Engineering, 2010
Publication

<1%

---

9 ethesis.nitrkl.ac.in
Internet Source

<1%

---

10 Bhisham Sharma, Deepika Koundal. "Cattle health monitoring system using wireless sensor network: a survey from innovation perspective", IET Wireless Sensor Systems, 2018
Publication

<1%

---

11 www.slideshare.net
Internet Source

<1%

---

12 Wang Dong, Dai Xunjiang. "New Digital Thermostat Development", 2015 14th International Symposium on Distributed Computing and Applications for Business Engineering and Science (DCABES), 2015
Publication

<1%

---

13 Umme Zakia, Muntasir Wahid Turza, Enamul Karim, Tasnim Zaman Moumita, Tasir Aquib Khan. "A Navigation system for rescue operation during disaster management using LTE

<1%

	advanced network and WPAN", 2016 IEEE 7th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2016 Publication	
14	Susan Rose, Binu Sara Mathew, Kuncheria P. Isaac, A. S. Abhaya. "Risk based probabilistic pavement deterioration prediction models for low volume roads", International Journal of Pavement Engineering, 2016 Publication	<1%
15	Gerard O'Driscoll. "Next Generation IPTV Services and Technologies", Wiley, 2007 Publication	<1%
16	www.irjet.net Internet Source	<1%
17	hdl.handle.net Internet Source	<1%
18	www.ijert.org Internet Source	<1%
19	www.123seminarsonly.com Internet Source	<1%
20	eprints.aston.ac.uk Internet Source	<1%
21	diva-portal.org Internet Source	<1%

22	www.ijritcc.org Internet Source	<1%
23	www.alliedtelesis.co.nz Internet Source	<1%
24	www.cs.sunysb.edu Internet Source	<1%
25	S Deepa, Anitha Sandeep. "ROI lossless colored medical image watermarking scheme with secure embedding of patient data", 2016 International Conference on Communication Systems and Networks (ComNet), 2016 Publication	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		