IN SITU DIAGNOSTICS AND PROGNOSTICS OF LIVESTOCK MONITORING SYSTEM

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ABSTRACT

This paper proposes an adaptation of Wireless Sensor Networks (WSNs) to cattle health monitoring from a prototype telemonitoring system that utilizes wearable technology to provide continuous animal health data. The proposed solution facilitates the requirement for continuously assessing the condition of individual animals, aggregating and reporting this data to the farm manager. Clinical techniques for monitoring livestock health are insufficient, as they provide only sporadic information and require too much resource investment in terms of time and veterinary expertise. A sophisticated system capable of continuously assessing the health of individual animals, aggregating these data, and reporting the results to owners and regional authorities could provide tremendous benefit to the livestock industry. Such a system would not only improve individual animal health, but it would help to identify and pre vent widespread disease, whether it originated from natural causes or from biological attacks.

Keywords: Gait Sensor (ADLX330), PIC Microcontroller, Tarang, Temperature Sensor (LM335).

I. INTRODUCTION

Livestock are domesticated animals raised in an agricultural setting to produce commodities such as food, fiber and labor. In the industrial model of livestock production, animals are housed in close quarters inside massive climate-controlled buildings or on feedlots. Each confined animal feeding operation, may house tens or even hundreds of thousands of animals. There has always been a need for livestock producers to “observe” their animals as often as possible. Inattention to the wellbeing of the animals, whether its health or welfare issue can lead to reduced productivity and the death of valuable stock. Animal health condition and monitoring is now becoming even more crucial to the wider farming industry as both known and new diseases pose a risk of the global spread of diseases. It is thus important to develop monitoring systems that report a range of animal health conditions back to the farm manager or stockman in a timely manner. Current animal monitoring systems only allow data to the farm manager once at a fixed point.

This paper therefore reports on the health assessment by providing continuous data based on the biometric characteristics and the body temperature to the tarang transceiver which is then transmitted to the hyper terminal (central monitoring system).

II. RELATED WORKS

In [1] Wireless sensor network for cattle health monitoring by Ivan Andonovic,Craig Michie,Michael Gilroy,Hock Guan Goh,Kae Hsiang Kwong,Konstanios Sasloglou and Tsungta Wu investigates an adaptation

of Wireless sensor networks to cattle health monitoring. The proposed solution facilitates the requirement for continuously assessing the condition of individual animals, aggregating and reporting this data to the farm manager. There are several existing approaches to achieving animal monitoring, ranging from using a store and forward mechanism to employing GSM-based techniques; these approaches only provide sporadic information and introduce a considerable cost in staffing and physical hardware. The core of this solution overcomes the aforementioned drawbacks by using alternative cheap, low power consumption sensor nodes capable of providing real-time communication at a reasonable hardware cost. In this paper, both the hardware and software have been designed to provide real-time data from dairy cattle whilst conforming to the limitations associated with WSNs implementations.

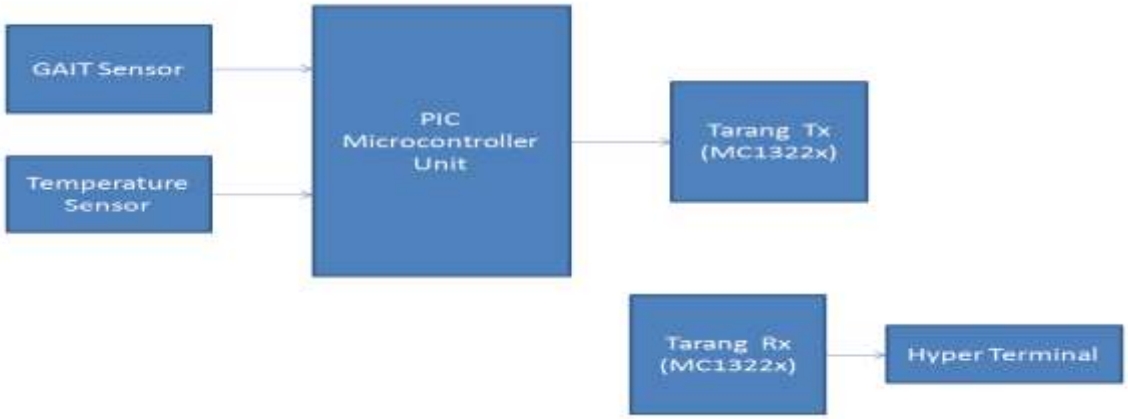
In [2] Monitoring Health and Looking for Sick Cows by Carlos Risco1, DVM, Billy Smith2, DVM, Mauricio Benzaquen1, DVM, Pedro Melendez1, DVM discusses the solution that facilitates a desired requirement of continuously assessing the condition of individual animal, aggregating and reporting these data to the farm manager. Although they are several strides in postpartum cow management by implementing postpartum health monitoring strategies, quite often we fail to find a sick cow early in the disease course, which leads to a delay in treatment. Further, there are different opinions on health monitoring strategies, which parameters to use and how to interpret them. This paper reviews parameters that can be used to monitor postpartum health and discusses clinical signs to look for in sick cows. A postpartum health monitoring program assures; that all cows are examined during the time when they are most susceptible to disease, allowing the opportunity for early identification of cows that are sick

In [3] Near-Field Wireless Magnetic Link for an Ingestible Cattle Health Monitoring Pill by Seth Hoskins1, Timothy Sobering discusses the Cattle health assessment is receiving increased attention due to threats that disease and bioterrorism pose to producer profits and to the safety of the food supply. Ingestible pill technology offers a promising means to obtain these physiologic data, since a bovine reticulum is an environment sheltered from outside elements that offers direct access to feed intake and heart/lung data. Traditional radio-frequency links are not well-suited for this application, as water absorption severely limits transmission ranges through tissue. This paper presents the initial design of a communications link that utilizes magnetic induction for signal transport and should be well suited for a tissue medium. The link consists of a transmitter/receiver pair that employs loop antennae frequency matched at 125 kHz. Optimization of the link design offers the potential to achieve transmission distances of several feet through tissue.

III. OVERVIEW OF PROPOSED SYSTEM

The livestock industry is an integral part of the world's economy. More benefits can be realized from this class of technology, such as the ability to identify the presence of disease early and thereby prevent its spread. An important element of health assessment is the ability to monitor vital data such as core body temperature and pattern of living. A wearable Health Sensors like temperature sensor, gait sensors are used to record and monitored using wireless monitoring system. Tarang module is used to transfer the collected data to the base station.

IV. BLOCK DIAGRAM

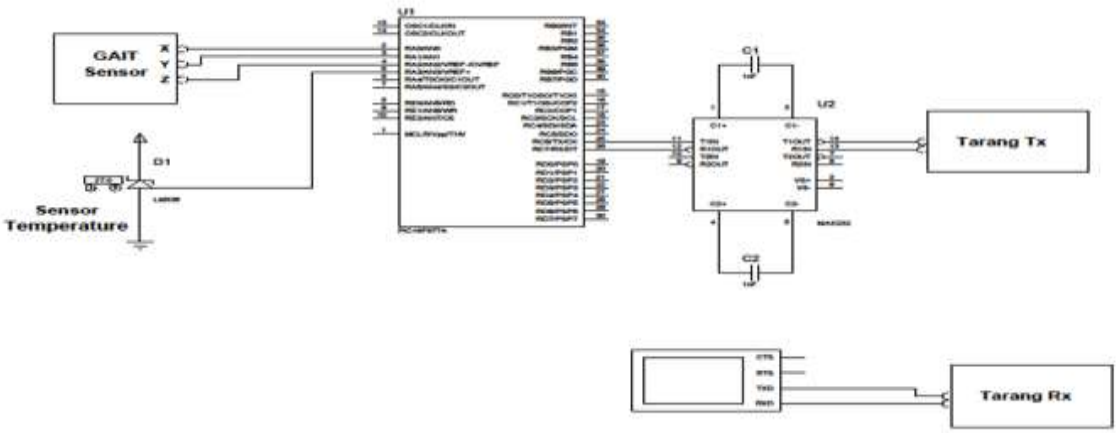


From the above diagram, temperature sensor LM335 is used to measure the body temperature which gives the normal and abnormal values. The LM335 is precision temperature sensor which can be easily calibrated. They operate as a 2-terminal Zener and the breakdown voltage is directly proportional to the absolute temperature at 10mV/^{o} K. The circuit has a dynamic impedance of less than 1Ω and operates within a range of current from 450µA to 5mA without alteration of its characteristics. Calibrated at +25^{o} C, the LM335 have a typical error of less than 1^{0}C over a 100 ^{0}C temperature range. Unlike other sensors,LM335 have a linear output and gait sensor is used to measure the biometric characteristics of the livestock.

This can be done by using ADXL330 which is a small, thin, low power, complete 3-axis gait sensor with signal conditioned voltage outputs, all on a single monolithic IC. The product measures acceleration with a minimum full-scale range of ±3g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

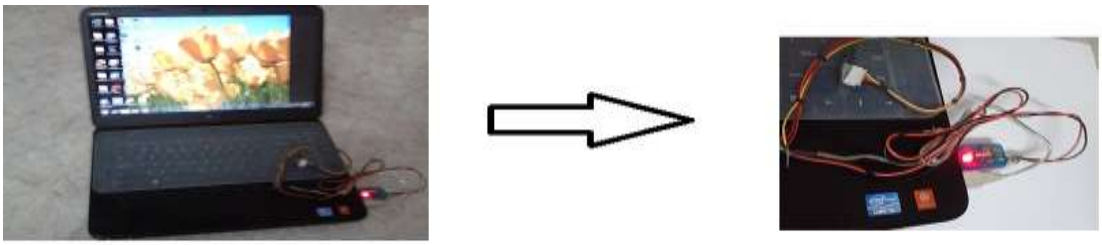
These two values are given as an input to the PIC microcontroller at IO ports. It is then processed and reported to the hyper terminal.

V. CIRCUIT DIAGRAM



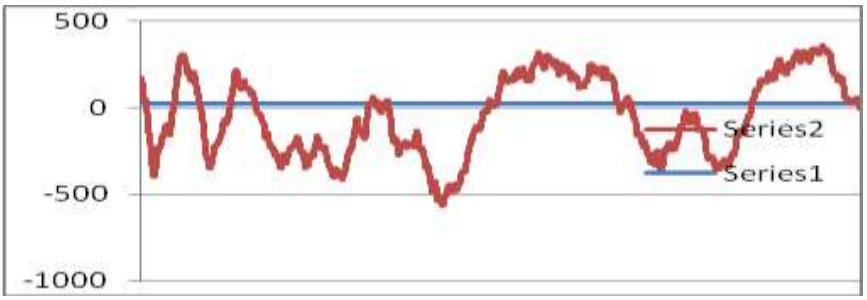
VI. RESULTS AND DISCUSSION

Animal walking and Running signal measured by MEMS accelerometer with help of Sigview software. MEMS sensor need 5V supply it is taken by pc USB port. Sigview measured the signal by using external sound card.

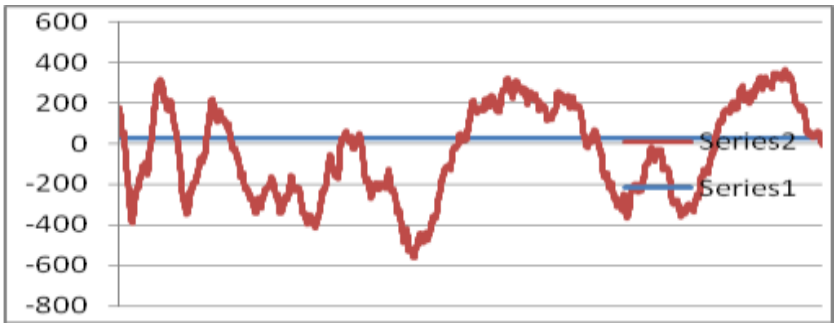


6.1 Waveform

6.1.1 Gait signal while animal walking



6.1.2 Gait signal while its running



VII. CONCLUSION

A design for a concept cattle health monitoring systems using gait sensor has been presented inorder to provide timely detection of any health issues and to achieve increased effectiveness and profit in an easy manner. It is very cheap and low power consumption that provides better health condition monitoring of the livestock.

REFERENCES

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