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A Survey on Various Animal Health Monitoring and Tracking Techniques

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Abstract-*There are increasing number of issues regarding various animal health condition and movements. And hence, an animal health monitoring and tracking system using ZigBee module is developed. ZigBee Technology is more and more adopted in a wide range of applicative scenarios. To track the health of an animal, sensors such as the temperature sensor, heart rate sensor, pulse rate sensor and the respiratory sensor are used. The ZigBee module would be connected to a Graphical User Interface (GUI) to show the digital data. However, the data from the sensors are converted using the analog to digital convertor. The contribution of this system would lie in the novelty and feasibility of both animal tracking as well as monitoring along.*

Keywords-***ZigBee, RFID, monitoring, animal health, Detecting etc.***

1. INTRODUCTION

With the increase in population, the needs of people have also increased. Many rural populations depend 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 monitoring their movement becomes necessary. Advancement in technology has greatly improved the scope of monitoring health in humans and animals to an extent. This animal health monitoring and tracking system can be very useful in terms of detecting any diseases at a very early stage and it can be stopped from spreading it to other animal. Over the years, there has been number of researches done in this field to monitor animal health but the methods adapted cause either an animal's fur to be removed or small chip are inserted into animal body. There are proven health monitoring devices used of human health monitoring such wearable hand gears or BP monitoring device, but the same system cannot be used to monitor any animal. And due to the increase in number of pet owners, the need for the same system becomes a necessary item in daily life. The system design would include four sensors namely, respiratory sensor, pulse rate sensor, temperature sensor, and heart beat sensor along with a GPS tracker. Sensors will detect variations in animal health and software can be developed to analyze their health with the data. An added advantage to this system is that the cattle health can be monitored. Even if the animal is lost it is easy to track the animal using the GPS tracker inbuilt in a wearable device. And to transmit the data, ZigBee can be used. ZigBee has very low power consumption range of 10-3000 meters and it can support up to 64000 devices having a distance of 50 meters.

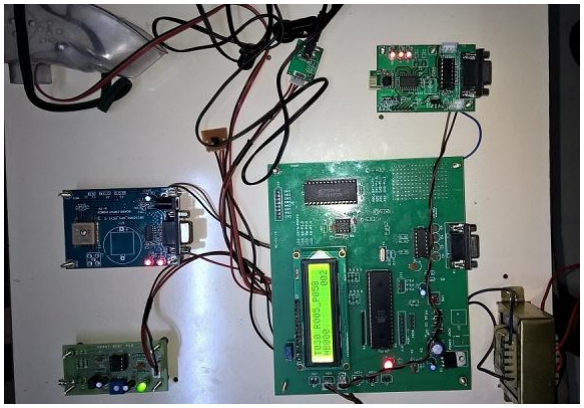

Figure 1 Hardware Structure

The energy consumption of the sensors and the system may be high and due to which recharging the batteries is required and hence wireless charging can also be introduced. However, this system uses rechargeable batteries only.

2. LITERATURE SURVEY

In this paper they have interpreted the emotional state underlying canine behavior is essential in human-canine interactions, to achieve effective training, and to improve

canine welfare. A non-invasive wearable sensor system combining electrocardiogram (ECG), photoplethysmogram (PPG), and inertial measurement units (IMU) to remotely and continuously monitor the vital signs of dogs is developed by researchers. To overcome the limitations imposed by the efficiently insulated skin and dense hair layers of dogs, they have investigated the use of various styles of ECG electrodes and the enhancements of these by conductive polymer coatings. They also studied the incorporation of light guides and optical fibers for an efficient optical coupling of PPG sensors to the skin. Combined with parallel efforts to use IMUs to identify dog behaviors, 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' behavioral responses to environmental stimuli that may yield measurable benefits to handlers' interactions with their dogs. Using these methods the heart rate (HR), heart variability (HRV) and respiratory rate was measured successfully. The animal's skin or fur does not need to be shaved and the developed system is superior to the traditional system. But it is applicable only in certain conditions. And can be used for only one animal i.e. dog. And, this system can be used only for certain conditions such as while the dog is sitting or running [1]. 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 animal's feeding and drinking behaviors. Electronic radio frequency identification (EID) tags on the feedlot animal to record and study the cattle feeding and drinking behaviors. IEEE 802.15.4(LW-WPANs) based ear tags are used for each animal. A directional antenna is used to allow one router to monitor multiple animals simultaneously, and an energy efficient mesh routing strategy is proposed to aggregate the monitoring data. The performance of the proposed system has been evaluated through numerical analysis and simulations [2].

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 according to the IEEE802.15.4, IEEE1451.2, and IEEE1451.1 standards. It has a variety of features such as high speed, energy efficient, miniaturization, and intelligence, new materials at lower cost, portability, and high performance. The surrounding temperature and relative humidity based real time calculation of temperature humidity index (THI) and also has been classify the stress level of the animal. 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. But, The transmission for heart rate data is only up to 5 meter. The heart rate sensor module's transmission range requires modification [3]. 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. Dairy cows are typically identified by visible ear tags. Although tags with embedded RFID devices have been available allowing them to be scanned electronically because of cost, most tags use low-frequency (LF) RFID, so 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 long-range RFID allows unmanned scans of multiple tags, and the wireless network provides scalable data collection without costly infrastructure However, the load sensor, RFID reader, and the ZigBee communication has not been consolidated into a single processor causing overhead of being separate devices [4]. 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, and able to rigorously identify the NF RFID tags implanted in laboratory animals. 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 and, then, to validate the integration with software modules developed for management, controlling, storing, and reporting. Each reader antenna should be able to generate a rather uniform magnetic field in a well-defined and confined region representing the generic elementary cell of the system. 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, the position of the associated animal is promptly individuated. In particular, the system is thought for small-sized laboratory animals, usually mice, free to move within a cage. Consequently, a resolution of the order of the animal size is satisfactory. But the 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 [5]. The aim of the paper is to propose the first telemetry system based on Bio-Nano-Sensors and reliable for remote and continuous single-metabolite monitoring of glucose, lactate, glutamate, and ATP in mouse models. A wireless electrochemical monitoring system has been realized to assess the sensor .The embedded system responds to the constraints linked to implants in animals. The materials used to build the

packaging are biocompatible and support chemical sterilization process such as ethylene oxide gas or chlorine bleach. The wireless link allows perform measurements at distance with a laptop computer that can be easily brought into the operation room. The telemetry system is based on an implantable Body Sensor Node (BSN) for rheology monitoring. Bio-Nano-Sensors with electrochemical frontend for the detection, a proper transceiver, battery for the powering, and a novel antenna. The Bio-Nano-Sensors are suitable for continuous monitoring of glucose, lactate, glutamate, and ATP. The electrochemical front-end has been built by using out of-the-shelf components. The low-power transceiver and the antenna were especially designed for prolongation of the implantation. The tests for continuous monitoring, wireless communications, and biocompatibility demonstrated the feasibility of this technology for translational research in biomedical field with mouse models. The bio-sensors are implanted into animal body which causes inflammations and irritation [6]. In this paper the light weighted, battery powered small tracking devices called collars are attached to animal's neck to collect and save patio-temporal data without disrupting animal movement. Delay-Tolerant Networks (DTN's) can experience long data transmission delays and frequent disconnection and that consists of access-point and a set of mobile nodes that can freely move in an open area. The coverage ratio is relatively low when the area is large, so the feasibility is less. [7]. This paper traces the movement of free- ranging cattle in an open field using GPS equipped collar. The connectivity availability, and the connection duration are noted. A novel collar with two antennas on the left side and the right side to avoid shadowing from other animals. Once the sensor nodes are deployed, frequent recharges and replacement of batteries is not practical [8]. In this paper, A two electrode, miniaturized subcutaneous oxygen sensor was developed as a tool for detection of shock due to haemorrhage. The sensors were placed in the subcutaneous tissue of the flank through a 21 gauge needle, which was then removed leaving the sensor in place, and allowed to stabilize for a period of two hours prior to the initiation of haemorrhage. The reduction of oxygen in animal was measured with this sensor. The calibration of the sensor fabrication is needed in the future as better manufacturing practices [9]. A microcontroller based animal locomotion and standing measurement system based on a touch-panel and an infrared module. Animal movement within the box exerted pressure change on the touch panel, which can be measured via the voltaic values of the corresponding positions. The 2cm pacing of infrared transmitter and receiver modules on two sides of the experiment cage enables standing data to be gathered. Rats would sometimes lift one foot causing a shift of weight the system missed these changes [10]. When in comparison with human health system, it is reviewed the state-of-the-art in research and development of wearable sensor-based systems for health monitoring. As it is shown by the current technology status, WHMS have the potential to revolutionize healthcare by providing low-cost solutions for ubiquitous, all-day, unobtrusive personal health monitoring and are expected to enable early detection and better treatment of various medical conditions as well as disease prevention and better understanding and self-management of chronic diseases. However, the current study highlights the fact that there are still a lot of challenges and issues that need to be resolved for wearable systems to become more applicable to real-life situations and also to become accepted by patients and other users as a reliable, multifunctional, easy-to-use, and minimally obtrusive technology that can increase their quality of living [11].

3. CONCLUSION

As per the literature survey done, there is need for a novel system that combines both animal health tracking and movement monitoring which has not been implemented so far. And, hence it is best to integrate two existing modules developed in different platform and technology to a single module and platform. This model will work as a strong backbone in case of analyzing any health related issues for an animal.

4. FUTURE WORK

The future of proposed work will lie in reducing the overhead of connecting the hardware to adapter and by using the concept of wireless power transmission instead of rechargeable batteries. The proposed work aims at reducing the power dissipation. But apart from the wireless power transmission to charge the module, the sensors will be incorporated into a wearable device and will have waterproof design. The wearable device would be easy for an animal to carry around and move with rather than developing a device similar to a BP machine for humans.

5. REFERENCES

[1] Rita Brugarolas, Tahmid Latif, James Dieffenderfer, Katherine Walker, Sherrie Yuschak, Barbara L. Sherman,

David L. Roberts, and Alper Bozkurt, "Wearable Heart Rate Sensor System for Wireless Canine Health Monitoring", IEEE Sensor Journal, May 2016.

[2] Hai Wang, Abraham O. Fapojuwo, and Robert J. Davies, "A Wireless Sensor Network for Feedlot Animal Health Monitoring", IEEE Sensor Journal, August 2016.

[3] Anuj Kumar and Gerhard P. Hancke, "A ZigBee-Based Animal Health Monitoring System", IEEE Senor Journal, January 2015.

[4] Greg Byrd, North Carolina State University, "Tracking Cows Wirelessly", IEEE Journals, June 2015.

[5] Luca Catarinucci, Riccardo Colella, Luca Mainetti, Luigi Patrono, and, Stefano Pieretti, "Smart RFID Antenna System for Indoor Tracking and Behavior Analysis of Small Animals in Colony Cages", IEEE Senor Journal, April 2014.

[6] Sando Carrara, Leandre Bolomey, Cristina Boero and Fabio Grassi, 'Remote System for Monitoring Animal Models With Single-Metabolite Bio-Nano-Sensors' , IEEE Journals, March 2013.

[7] Samina Ehsan, Kyle Bradford, Max Brugger, Bechir Hamdaoui, Yevgeniy Kovchegov, Douglas Johnson, and Mounir Louhaichi," Design and Analysis of Delay-Tolerant Sensor Networks for Monitoring and Tracking Free-Roaming Animals", IEEE Transactions on Wireless Communications, March 2012.

[8] K.H. Kwong, T.T Wu, H.G Goh, K. Sasloglou, B. Stephen, I. Glover, C. Shen, W. Du, C. Michie, and I. Andonvoic, "Implementation of herd management systems with wireless sensor networks", IEEE Journals, January 2011.

[9] W. Kenneth Ward, Stephen Van Albert, Michael Bodo, Frederick Pearce, Rachael Gray, Shane Harlson, and Mihailo V. Rebec, " Design and Assessment of a Miniaturized Amperometric Oxygen Sensor in Rats and Pigs", IEEE Sensors Journals, July 2010.

[10] Yuan-Hsing Shih, Ting-Chen Ke, Mao-Tsun Lin, and Ming-Shing Young, "Sensor System for Enhanced Detection of Locomotion and Standing Behavior in Rats", IEEE Sensors Journals, April 2008.

[11] Alexandros Pantelopoulos,Nikolaos G. Bourbakis, "A Survey on Wearable Sensor-Based Systems for Health Monitoring and Prognosis", IEEE Transactions on Systems, Man and Cyberrnetics, October 2009.