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DEVELOPMENT OF DATA TRANSMISSION USING SMART SENSING TECHNOLOGY FOR STRUCTURAL HEALTH MONITORING

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I. ABSTRACT - *Lossy transmission is a common problem suffered from monitoring systems based on wireless sensors. Though extensive works have been done to enhance the reliability of data communication in computer networks, few of the existing methods are well tailored for the wireless sensors for structural health monitoring (SHM). These methods are generally unsuitable for resource-limited wireless sensor nodes and intensive data SHM applications. In this paper, a new data coding and transmission method is proposed that is specifically targeted at the wireless SHM systems deployed on large civil infrastructures. The proposed method includes two coding stages: 1) a source coding stage to compress the natural redundant information inherent in SHM signals and 2) a redundant coding stage to inject artificial redundancy into wireless transmission to enhance the transmission reliability. Methods with light memory and computational overheads are adopted in the coding process to meet the resource constraints of wireless sensor nodes. In particular, the lossless entropy compression method is implemented for data compression, and a simple random matrix projection is proposed for redundant transformation. After coding, a wireless sensor node transmits the same payload of coded data instead of the original sensor data to the base station. Some data loss may occur during the transmission of the coded data. However, the complete original data can be reconstructed losslessly on the base station from the incomplete coded data given that the data loss ratio is reasonably low. The proposed method is implemented into the Imote2 smart sensor platform and tested in a series of communication experiments on a cable-stayed bridge. Examples and statistics show that the proposed method is very robust against the data loss. The method is able to withstand the data loss up to 30% and still provides lossless reconstruction of the original sensor data with overwhelming probability. This result represents a significant improvement of data transmission reliability of wireless SHM systems.*

Index Terms—*Data loss recovery, wireless sensor network, structural health monitoring, lossless entropy compression, redundant coding, Imote2.*

II. INTRODUCTION

Through numerous technology advances, society is moving towards an “always connected” paradigm. Networks (both wired and wireless) are everywhere, open standards are defined and rolled out allowing for unique addressing schemes. Concepts associated with the “Future Internet” are being researched and applied one new concept associated with the “Future Internet” is that of the so-called “Internet of Things” (IoT). The “Internet of Things” describes a vision where objects become part of the Internet: where every object is uniquely identified, and accessible to the network, its position and status known, where services and intelligence are added to this expanded Internet, fusing the digital and physical world, ultimately impacting on our professional, personal and social environments. Section 2 presents the reasoning for and the evolution of Internet of Things. Section 3 presents important application areas for the Internet of Things

In this paper, a wearable system for vital signs and environmental variables monitoring is presented. The system allows monitoring the physiological condition of people working at high latitude. The variables directly measured by the proposed device are: the electrical activity of the heart, deter health monitoring by electrocardiogram (ECG), respiratory activity, body temperature (BT), ambient temperature (AT) and relative humidity (RH). , the monitoring system has to be as unobtrusive as possible. This work presents the implementation of a healthcare monitoring system (hardware and software) and the experimental results. When the sensors get abnormal conditions then automatically we hear the intimation signal as sound through the buzzer.

2.1 EXISTING SYSTEM:

There are numerous works carried out regarding embedded health assessment. For example passive infrared (PIR) motion sensors have been used to capture activity in a particular location in the home. The pattern of room to room activity has been studied as a means of investigating health changes. Motion density from PIR motion sensors can capture overall activity level that may be linked to health condition. In addition, sleep patterns have been studied using motion sensors, bed mats or load cells. Other work has focused on the detection of cognitive changes, using a combination of motion, bed and door sensing, medication tracking. Although these works look to be efficient they are not easy to realize practically. The construction and installation of these sensing equipments require sophisticated means and high care should be taken to maintain these installations.

2.2 PROPOSED SYSTEM:

The proposed method includes a source coding stage to compress the natural redundant information inherent in SHM signals and a redundant coding stage to inject artificial redundancy into wireless transmission to enhance the transmission reliability. Methods with light memory and computational overheads are adopted in the coding process to meet the resource constraints of wireless sensor nodes. A wireless sensor node transmits the same payload of coded data instead of the original sensor data to the base station. Some data loss may occur during the transmission of the coded data. However, the complete original data can be reconstructed lossless on the base station from the incomplete coded data given that the data loss ratio is reasonably low

The IR sensors are employed in numerous traffic systems

[3-7]. The IR transmitter and the IR receiver are mounted on

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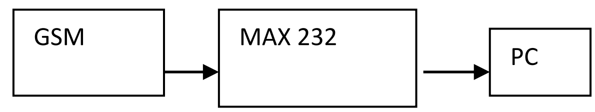
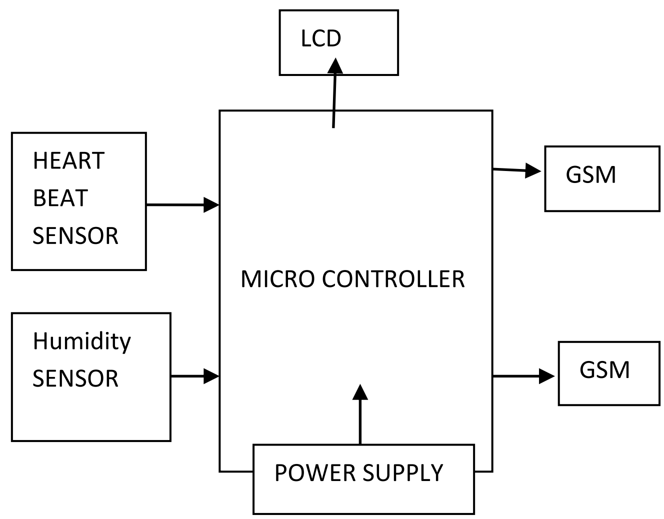
Our world is consisted of various ''things''. As one of the enablers of smart world, internet of things (IoT)

III. BLOCKDIAGRAM



node1 diagrams



node2 diagram

Fig-3.1: System block diagram

3.1 System Overview

3.1.1 Power Supply:

This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

3.1.2 Microcontroller:

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Fig-3.2: LPC2148 IC

3.1.3 LCD Display

This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information.

Fig-3.3: LCD display

3.1.4 Internet Of Things (IoT):

Fig-3.4 IoT web page

This figure can show IoT values of the sensor. IoT provides continues monitoring of the workers. If any abnormal conditions are occurred at that time it provides buzzer and also alert message to the worker.

3.1.5 Pulse sensor:

Pulse sensor is also called as Heart Beat Sensor. This heart beat sensor is designed to give digital output of heat beat when a finger is placed inside it. When the heart detector is working, the top-most LED flashes in unison with each heartbeat. 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- 3.5 pulse sensor

3.1.6 Buzzer

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave ovens, & game shows.

The "Piezoelectric sound components" introduced herein operate on an innovative principle utilizing natural oscillation of piezoelectric ceramics. These buzzers are offered in lightweight compact sizes from the smallest diameter of 12mm to large Piezo electric sounders. Today, piezoelectric sound components are used in many ways such as home appliances, OA equipment, audio equipment telephones, etc. And they are applied widely, for example, in alarms, speakers, telephone ringers, receivers, transmitters, beep sounds, etc.

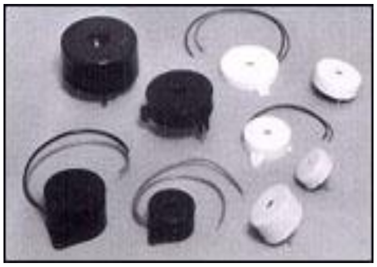


Fig-3.6 buzzer

3.1.7 Humidity

A hygrometer is a device used for measuring the humidity of the air There are various devices used to measure and regulate humidity. A device used to measure humidity is called a psycho meter or hygrometer. A humidistat is used to regulate the humidity of a building with a de-humidifier. These can be analogous to a thermometer and thermostat for temperature control.

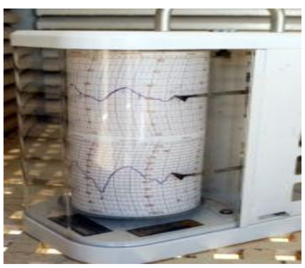


Fig-3.7 hygrometer

3.1.8 Humidity Sensor

A digital humidity sensor works via two micro sensors that are calibrated to the relative humidity of the given area. These are then converted into the digital format via an analog to digital conversion process which is done by a chip located in the same circuit. A machine made electrode based system made out of polymer is what makes up the capacitance for the sensor. This protects the sensor from user front panel (interface).

Fig-3.8 humidity sensor

3.1.9 7GSM/GPRS:

Fig-3.9 GSM/GPRS module

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking).

IV.CONCLUSION

The project “DEVELOPMENT OF DATA TRANSMISSION USING SMART SENSING TECHNOLOGY FOR STRUCTURAL HEALTH MONITORING” has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC’s and with the help of growing technology the project has been successfully implemented. The variables directly measured by the proposed device are: the electrical activity of the heart, deter health monitoring by electrocardiogram (ECG), respiratory activity, body temperature (BT), ambient temperature (AT) and relative humidity (RH). , the monitoring system has to be as unobtrusive as possible. This work presents the implementation of a healthcare monitoring system (hardware and software) and the experimental results.

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V. REFERENCES

Books

[1]. ARM7TDMI datasheet ARM

[2]. LPC2119/2129/2194/2292/2294 User Manual Philips

[3]. ARM System on chip architecture Steve Furber

[4]. Architecture Reference Manual David Seal

[5]. ARM System developers guide Andrew N. Sloss, Domonic Symes,

[6]. Chris Wright

[7]. Micro C/OS-II Jean J. Labrosse

GCC The complete reference Arthur Griffith

Websites

[1]. http://www.arm.com

[2]. http://www.philips.com

[3]. http://www.lpc2000.com

[4]. http://www.semiconductors.philips.com/

[5]. http://ieeexplore.ieee.org

[6]. http://ww.hitex.co.uk

[7]. http://www.keil.co.uk

[8]. http://www.ucos-ii.com

[9]. http://www.ristancase.com

[10]. http://gcc.gnu.org/onlinedocs/gcc/Evaluation Boards And Modules

[11]. http://www.knox.com

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