BLUETOOTH MODULE BASED WIRELESS SENSOR NETWORK FOR BUILDING MONITORING SYSTEM

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Abstract: *Development in the technology of sensor such as wireless communications, embedded systems, distributed processing and wireless sensor applications have contributed a large transformation in Wireless Sensor Network (WSN) recently. It assists and improves work performance both in the field of industry and our daily life. Wireless Sensor Network has been widely used in many areas especially for surveillance and monitoring in agriculture and habitat monitoring. In this paper, we discuss and review wireless sensor network applications for building monitoring. In order to implement a good monitoring system, there are several requirements to be followed. From the studies, it has been proved to be an alternative way to replace the conventional method that uses men force to monitor the building. It is also proven that these approaches can improve the system performance, provide a convenient and efficient method and can also fulfill functional requirements.*

Key Words: *Atmega328p; Bluetooth Module; Smoke Sensor; Temperature Sensor; Vibration Sensor; Accelerometer Sensor; LCD Display;*

1. INTRODUCTION:

Recent technologies in wireless communications and electronics have brought the vision of Wireless Sensor N etwork (WSN) into reality which have increased the growth of low cost, low power and multi-functional sensors that a re small in size and can communicate in short range. Each node consists of microcontrollers, memory and transceiver. The microcontrollers are used to execute task, data processing and assist the functionality of other components in the s ensor node. For the memory, it is mainly used for data storage while the transceiver acts from the combination of trans mitter and receiver functions [1].

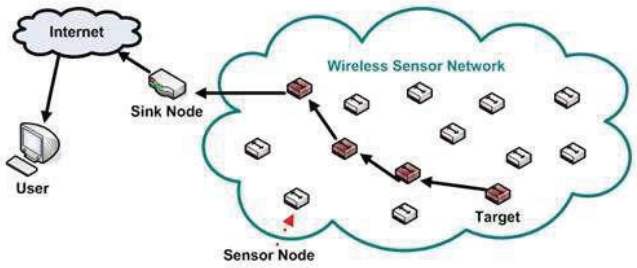

Fig-1: Wireless Sensor Network Architecture

The home; therefore, home computers are of marginal utility Natural phenomena data such as temperature, light, soun d and pressure are collected by sensors and then transmitted to a server. These battery powered nodes are used to moni tor and control the physical environment from remote locations. In the past few years, the applications of Wireless Sen sor Network have been widely used and applied in medical, military, industrial, agricultural and environmental monito ring.

2. PRODUCT PERSPECTIVE

The major functionalities of the system are:

There are four sensors for Smoke measurement, temperature measurement, Accelerometer measurement and vi bration measurement. If the values which are given by the sensors increases beyond the reference values then alert will be given to the operator by using communication module (BluetoothModule).

3. HARDWARE INTERFACES

3.1 Atmega328p

The Atmega328p is a microcontroller based on the Atmel 8bit AVR RISC microcontroller with 23 general purp ose input/output pins, 32 General Purpose Registers, Serial Programmable USART, 20MHz Operating Frequency,32kb flash memory,1kb EEPROM,2kb SRAM, 3 Flexible Timers/Counters,10 bit A/D converter, Internal and External Interr upt.

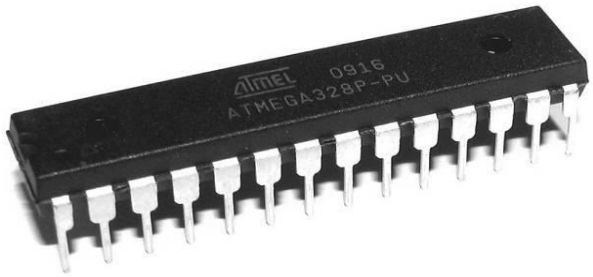

Fig -2: Atmega328p

3.2 Memory

There are three types of memory systems.

- SRAM: This is called as Static Random Access Memory where the sketch creates and implemented when it runs. It is a volatile memory and 2KB SRAM is available in the microcontroller.
- EEPROM: It is non-volatile memory and long-term information can be stored in this memory space. 1KB of EEPROM is available on microcontroller.
- Flash memory: This memory stores non-volatile memory. Microcontroller has of 32KB flash memory for storing code.

3.3 Bluetooth Module(hc05)

The Bluetooth module operates on voltage 3.3V. It's adjustable baud rate is 9600. The Bluetooth module oper ates on frequency is 2.4GHz. It's operating current is 40mA and transmission speed is 2.1Mbps/160kbps(Asynchrono us)1Mbps/1Mbps(synchronous) as well as operates on temperature is -20 to 55 degree Celsius.

3.4 Smoke sensor

The Smoke Sensor(MQ3) module is useful for gas leakage detection (home and industry). It is suitable for detecti ng H2, LPG, CH4, CO, Alcohol, Smoke or Propane. High sensitivity fast response time .Sensitivity can be adjusted by potentiometer. It has also stable and long lifetime. Fast response and high sensitivity

3.5 Temperature Sensor

LM35 is used as the temperature sensor which gives output gives output voltage which is linearly proportional to Celsius temperature. It gives low output impedance as well as low self heating.

3.6 Vibration sensor

The Vibration module based on the vibration sensor SW-420 and comparator lM393 to detect if there is any vibrat ion that beyond the threshold. The threshold can be adjusted by the on-board potentiometer, when this no vibration an d this module output logic low the signal indicate LED light and vice versa.

3.7 Accelerometer sensor

On-board MMA7361(replace MMA7260),low cost, micro capacitive acceleration sensor. Support 5V/3.3V voltag e input, on-board RT9161, has much lower pressure drop and much faster load corresponding speed than 1117,very su itable for high noise power environment. Range is chosen by MCU IO, or resistance. Common pins have been drawn f orth, inserted pins are standard 100mil(2.54mm),convenient for dot matrix board. Dormancy enable can be controlled by MCU IO.

3.8 Breadboard

The breadboard has many holes into which circuit components like ICs and resistors can be inserted for constructi ng and testing circuits quickly before finalizing any circuit design. The holes which are on top and bottom side are con nected horizontally while remaining holes are connected vertically. Board has strips of metal which run underneath by connecting the holes on the top of the board.

3.9 LCD Display

LCD (Liquid Crystal Display) is an image displaying technology used in many electronic devices. It has built in c ontroller which works on 5V supply.

3.10 Jumper Wires

These wires are used to transmit electricity between two points in a circuit. Mainly jumper wires are used to a nalyze defects within the circuit or used to updating the circuits.

4. SOFTWARE INTERFACES:

4.1 Bluetooth Module(hc05)

HC05 module is an easy to use Bluetooth SPP(serial port protocol)module designed for transparent wireless serial conn ection setup.
Software Features:

- Default Baud rate is 38400, Date bit:8, Stop bit:1,Parity :No parity, Data control: supported baud rate 9600,19200,38400,57600.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected.
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led links 1itmes/2s in intervals, while disconnected only blue led blinks 2times/s.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:"0000" as default.
- Auto-reconnect in 30min when disconnect as a result of beyond the range of connection.

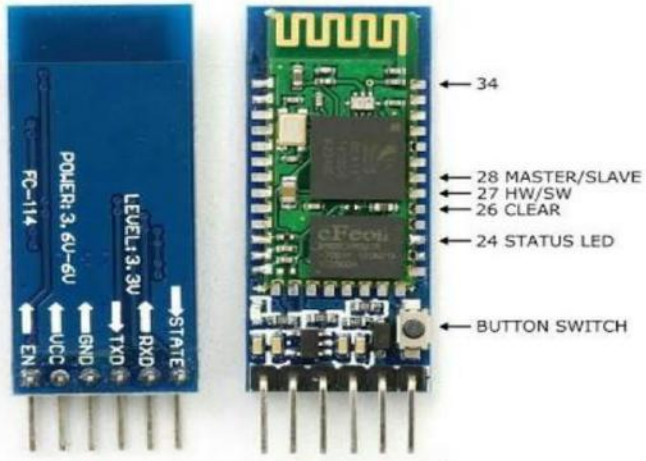

Fig -3: Bluetooth Module(hc05)

5. PROPOSED SYSTEM DESIGN:

The block diagram of proposed system is given below:

The building monitoring system consists of four types of sensor modules smoke sensor, fire sensor, vibration se nsor and acceleration sensing modules. They placed in the building as shown in Figure.4. The vibration sensor are mou nted the lowest level of the building, to estimate the vertical column loads and Measure the settlement and plastic hinge activation of the building after an earth quake communication signals and transmit or receive the required information. In the transmitting unit mainly consist of Atmega328p microcontroller, Bluetooth module, vibration sensor, acceleratio n sensor, buzzers, power supply lcd display are used. Accelerometer sensor which have placed each floor of the buildin g to measure the seismic response of the movement during the earthquake. Here the smoke and fire sensor which is plac ed in each floor to measure of the building to show the warning message. Here the vibration and temperature sensor als o place in the building to measure the smoke and fire that affecting the building roof. If smoke and fire which is rises th en through the LCD module which kept top seismic vibration and temperature that effecting the building roof. Here the se sensor readings are wirelessly transmit to the base station through Bluetooth communication module. One of the mai n advantage by using Bluetooth module is the communication path which is wide by using this method more detailed in formation could be obtained from the structural behaviour as well as the actual condition of the building structure. This will enable engineers use more precisely information for the structure analysis and repair as well as life time prediction.

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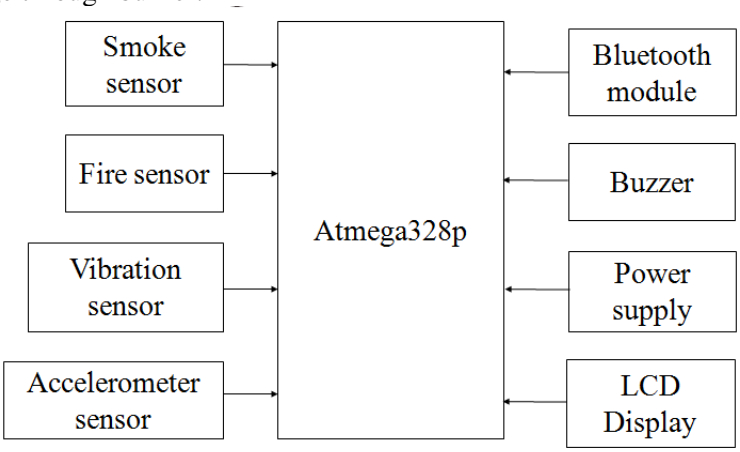

Fig -4: Block diagram of proposed system

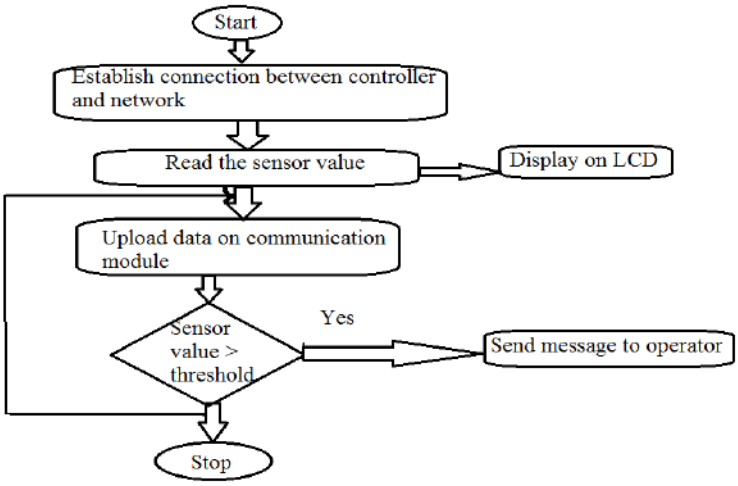

Fig -5: Flowchart for the System

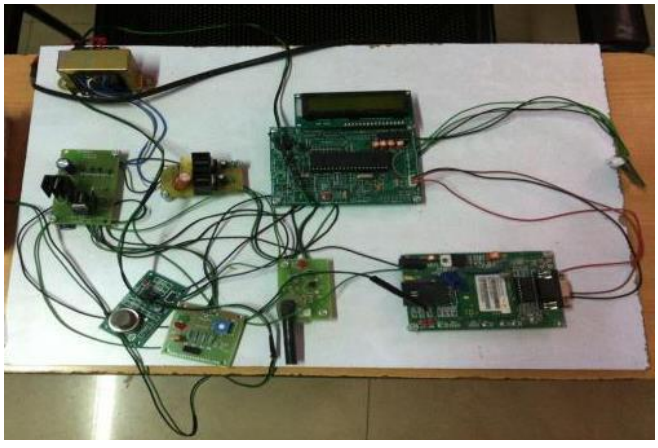

Fig -6: Prototype of Wireless Sensors Network for Building Monitoring System

6. CONCLUSION:

This paper reviews the wireless sensor network applications which focus mainly on the building monitoring sy stem. These systems has low power consumption, low cost and is a convenient way to control real-time monitoring for Moreover, it can also be applied to bridge monitoring and climate monitoring. These approaches have been proved to be an alternative way to replace the conventional method that use men force to monitor the environment and improves the performance, robustness, and provides efficiency in the monitoring system.

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