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Multi-Storey Building Monitoring Using Energy Efficient Wireless Sensor Network

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ABSTRACT:

In recent years, Wireless Sensor Network is considered as a potential solution for home automation because of its reliability, low-cost, low-power consuming characteristics. Several researches have been carried out using WSN for home automation; however most studies have been experimented in small houses or in one storey of a building. There has been little discussion about design and implementation of WSN automation system in multi-storey buildings. This paper describes a practical design and implementation of WSN for controlling and monitoring system in multi-storey building. A building automation system using Microchip WSN was developed and set up in the International University (IU) building for system evaluation. The performance results confirm that Micochip WSN based home automation system is practically applicable in multi-storey building environment.

Index-terms: ***AT89S52 controller, sensors, loads, relay, Raspberry Pi processor, Serial communication.***

I. INTRODUCTION:

Industry plays a vital role in the global economy. The current estimated market capitalization of global mining companies is about $962 billion. A large portion of these operations are underground and involve specialized equipment and processes. Communication systems play an increasingly important role in ensuring personnel safety and optimizing the mining process. Although interest in deploying wireless communication systems in underground mines dates back to the 1920's, the first wide deployment didn't take place until the early 1970's when the mining industry began to deploy very-high frequency (VHF) radios and leaky feeder distribution systems. The modern era of underground communications began in the early 2000's as the mining industry sought to take advantage of considerable advances. Recent interest in deploying next generation wireless communications technology in underground mines has stemmed from: recent advances in short-range wireless communications technology and commercial-off-the-shelf WLAN, wireless personal area network (WPAN), UWB, RFID, radar devices, and the potential to increase mine efficiency and productivity through more effective voice communications, better access to management information systems and automated dispatch.

In our system, we are introducing wireless communication for maintaining communication between Controller and from the building. Similarly we are also involving web technology for viewing the environmental status in the building. These can be achieved by using High efficient processors with all system on chip. For this, we go with Arm architecture processor Raspberry Pi 32-bit ARM processor as its

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main controller, the performance and frequency of which are suitable for real-time video image capture and processing applications. This micro controller works for a voltage of +3.3V DC and at an operating frequency of 1 GHz. Later programming is done on this Board to make it act as an embedded web server.

II. SYSTEM ARCHITECTURE:

2.1 BLOCK DIAGRAM:

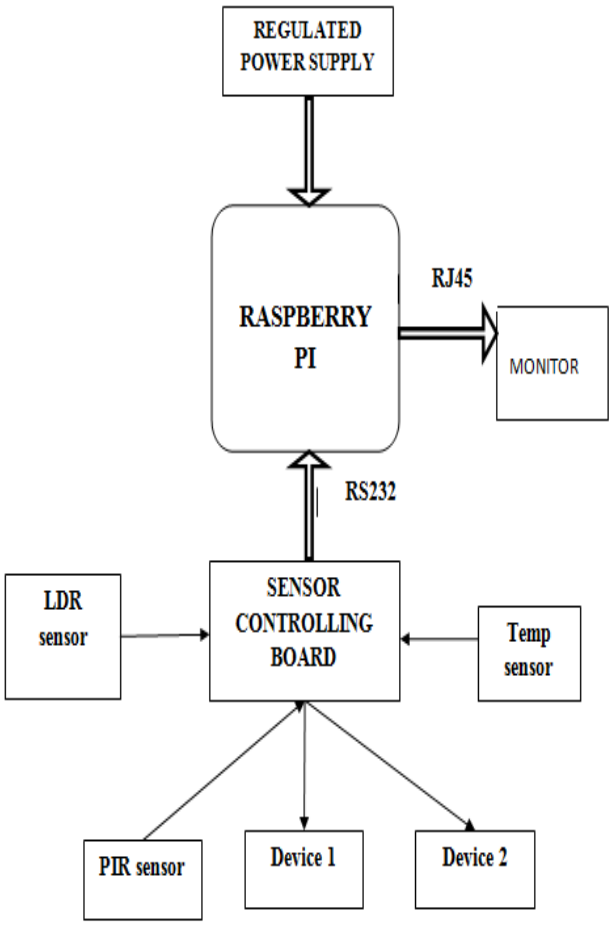

Figure-1: Block diagram

2.2 EXISTING METHOD:

In the existing method the atmospheric conditions inside the buildings are monitored inside the buildings by using sensors but the sensed data cannot be sent to the control room every time it monitors the conditions due this method there is no wireless control of the devices for the conditions inside the buildings will not be constant every time.

2.3 PROPOSED METHOD:

In the proposed method we are using serial communication as a wireless technology which is used to send the sensed data to the control room on web page in PC every time it measures the data so that they can also continuously monitor the conditions inside the buildings. The system uses a compact circuitry built around Raspberry Pi (ARM11) micro controller Programs are developed in C/C++. Proposed method is easy to implement and low power consumption and controlling is done by using web technology.

III. HARDWARE IMPLEMENTATION:

3.1 RASPBERRY PI PROCESSOR:

The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. It operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply. The Raspberry Pi board is a miniature marvel, packing considerable computing power into a footprint no larger than accredit card. It's capable of some amazing things, but there are a few things you're going to need to know before you plunge head-first into the bramble patch.

3.2 AT89S52 CONTROLLER:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the indus-try-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory pro-grammer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data

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pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

3.3 TEMPERATURE SENSOR (LM35):

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in ºC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With **LM35**, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 ºC temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every ºC rise/fall in ambient temperature, *i.e.*, its scale factor is 0.01V/ºC.

Figure-2: temperature sensor

3.4 LIGHT SENSOR (LDR):

A light-dependent resistor,alternatively called an LDR, photoresistor, photoconductor, or photocell, is a variable resistor whose value decreases with increasing incident light intensity. An LDR is made of a high-resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

Figure-3: LDR sensor

3.5 PIR SENSOR:

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation.

IV. RESULTS:

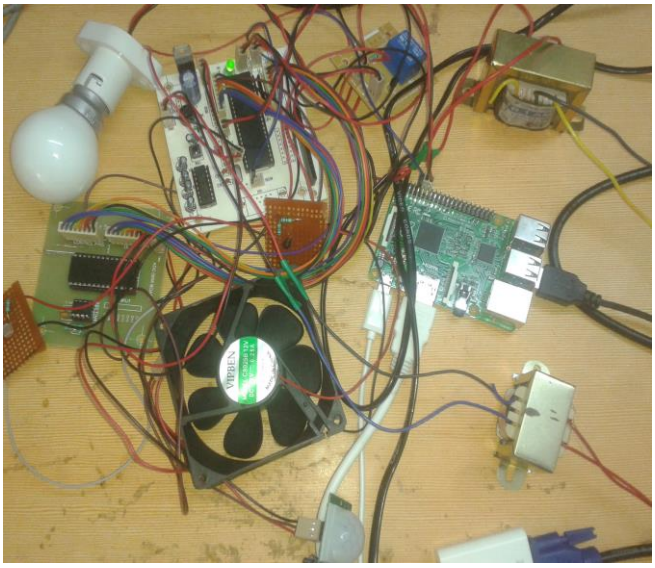

Figure-4: Hardware Implementation

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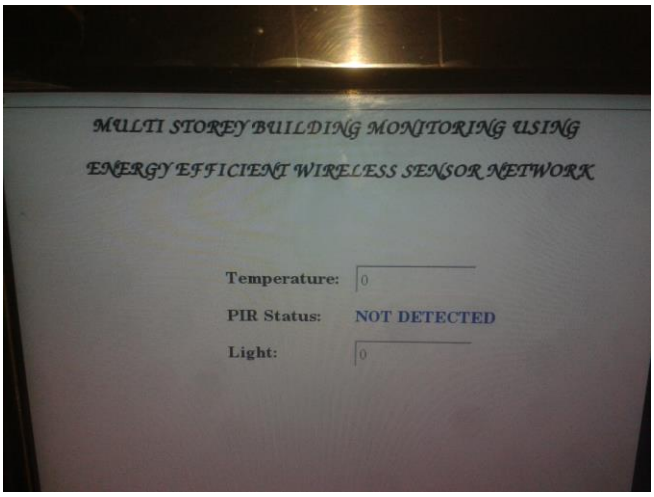

Figure-5: Simulation Results

V. CONCLUSION

The system will act to reduce risk in rescue operations following an emergency as well as generating early warning of possible emergencies. The Wireless Sensor Network is designed using raspberry Pi for monitoring the multi-storey building. Serial communication makes the system easy to install and in addition, the nodes in the system can easily be expanded to cover more space. The Serial module operated at 2.4GHz ISM band really help for secure data transmission. The temp, LDR and PIR sensor can continuously observed and the monitor of the sensor node. So that people can live with comfort and secure life with this automation system. However, there are still many challenges that need to be solved in sensor networks.

VI. REFERENCES:

[1] Minh-Thanh Vo, Van-Su Tran, Tuan-Duc Nguyen, Huu-Tue Huynh, "Wireless Sensor Network For Multi-Storey Building:Design and Implementation," IEEE 2013,978-1-4673-2088-7/13/ 2013.

[2] Rajesh Banala, D.Upender, "Remote Home Security System Based on Wireless Sensor Network Using NS2," International Journal of Computer Science and Electronics EngineeringISSN.0975- 5664, Vol. 2 Issue 2, December 2012.

[3] Mircea Ionel Strutu, Dan Popescu, "Indoor Monitoring Applications Using Fixed and Mobile Wireless Sensors" International Journal of Computing, Vol. 10, Issue 4, 373-382, 2011.

[4] Renjan Raj V.C, "Vision Wireless Sensor Network for Building Monitoring", The International Journal Of Engineering And Science, Volume 3 ,Issue 3,Pages 13-18,2014.

[5] D. Culler, D. Estrin, and M. Srivastava, "Overview of sensor networks," IEEE Computer Magazine, pp. 41–49, 2004.

[6] J. Lee, Y. Su, and C. Shen, "A comparative study of wireless protocols: Bluetooth, uwb, zigbee, and wi-fi," in Industrial Electronics Society, IECON 2007. 33rd Annual Conference of the IEEE., pp.46– 51, 2007.