

PREVENTION MEASURES FOR FIRE ACCIDENT AND ENERGY MANAGEMENT IN SMART HOMES

D.SHRAVYA

M.Tech Embedded Systems Student
Jayamukhi Institute of Technological Sciences,
Warangal, India

M.SRIDHAR

Assistant Professor, Dept. of ECE
Jayamukhi Institute of Technological Sciences,
Warangal, India

Abstract - This paper presents a new type of early warning systems which use a wireless sensor network to collect the information of building fire-prone sections for building fire, wireless sensor nodes constitute a "smart" monitoring and control network through the self-organization and transmits the messages to the control center through the network, thus we can achieve the remote control of the building fire. In consideration of the current issues on building security, the design applies the important part, the wireless sensor network technology to building fire safety monitoring system and establishes the wireless sensor network by using Wi-Fi technology. In addition, taking advantage of the Wi-Fi wireless sensor network locates a fire place so that the fire information is uploaded to the handheld terminal and the building security personnel work out the retreat and rescue plan in time. This paper provides a new solution for building fire monitoring system. The intention of this project is to design a system to realize a intelligent fire accident prevention by using the sensors. In this project I am using temperature sensor and gas sensor to identify the change in temperature and gas levels. Based on the changes in the values of sensors with respect to threshold level, the corresponding motor will turn on. IR sensors has been placed to detect the incoming and outgoing person from and into the home. Wi-Fi technology has been used to monitor the values on PC or on mobile and buzzer will turn ON based on the changes in sensor values with respect to threshold level. In this project we are using LPC2148 is micro controller. It belongs to ARM7 architecture. Two IR sensors are connected to controller through I/O lines. Also three relays are connected to controller with loads. IR sensors are continuously calculating number of persons inside the room

Keywords: ARM7; Wireless sensor networks; Wi-Fi; building fire; monitoring system; Fire localization

I. INTRODUCTION

The wireless communication technology is widely used in building automation, changing the traditional wired communication way. For the complex environment in building, the application of wireless sensor networks to a comprehensive building monitoring has become a new trend. Modern building fire safety system mainly focuses on the fire alarm. However, the monitoring center can't take effective evacuation and guidance in time. When the fire occurs, it is particularly important for people in danger to escape quickly. Therefore, this paper designs a long-distance transmission mode of fire information within the entire building by Wi-Fi network, and then the signals detected by sensors are transmitted to the monitoring center by Wi-Fi

network, which connects with personal terminal easily. In this section, we have used it to count the people who are entering into the building, when the count is increased then appliances Bulb; Fan can be turns ON to save the energy.

This count is useful when fire occurs in the building to know to which floor we serve first, Decision-making controllers need analyze the critical situation and the development trend of fire quickly and effectively. Then the investigation should be carried out on the fire place in order to accurate the scope and range of the accident, and determine the number of people trapped and ascertain their location, choose the most rapid rescue plan. And the system can real-time monitor the corners where fire disasters most frequently take place. The design can ensure the safety of buildings and people

comprehensively and effectively System. In this project this can be used to find the vibration which comes before tsunami occurs. And it can be used for building integrity when fire occurs.

II. LITERATURE SURVEY

Wireless Sensors Network (WSN) has wide spectrum of applications in various sectors. In these applications, it is necessary to monitor & control physical environments remotely with great accuracy. A wireless sensor network is a system combination of radio frequency (RF) transceivers, microcontrollers, sensors and power supply source. Wireless sensor networks with self-configuring, self-organizing, self-diagnosing and self-healing capabilities have been developed to omit problems or to enable applications that traditional technologies could not fix. Wireless sensor network consists of various sensors and controller. Wireless communication is the transfer of information over a distance without the use of electrical conductors or wires.

In the WSN Network, for fire monitoring temperature sensor has been placed. And for smoke detecting in smart homes, Smoke sensor is placed. This is used to measure the amount of smoke releases when fire accident occurs. So that persons inside the building will be protected by taking the necessary actions. For getting the earthquake information, and for monitoring the building integrity, MEMS Sensor/Accelerometer has been used.

IR Communication has been implemented by placing the IR Transmitter and IR Receiver for counting the no. of visitor entering into the Shopping mall/Home. At that particular time Home Appliances will be controlled. It's a part of effective energy saving/energy management method.

III. EXISTED AND PROPOSED SYSTEMS

Existing systems defines the solutions for energy consumption in building, fire monitoring in building, tsunami alerts in individual basis. In proposed system I have taken all different solutions for various difficulties and implemented. Existing systems have not used any modern technologies. Hence I am using it in proposed system.

The proposed system contains a ARM based Temperature monitoring and Energy saving. In proposed design, I am implementing following designs:

- ✓ Energy saving in buildings
- ✓ Fire monitoring & prevention in buildings
- ✓ Providing the indication regarding the no. of people getting suffered in fire
- ✓ Providing the emergency notification regarding the earth quake
- ✓ Alerting the people inside the building when smoke releases

By implementing this design following benefits will be offered:

- ✓ Improve Security
- ✓ Save Energy
- ✓ Dynamic control of industry and daily life
- ✓ Quick response for earthquake
- ✓ Quick saving of people in fire accidents
- ✓ Building health can be monitored

IV. OVERVIEW OF SYSTEM DESIGNED

This section presents main features and the design requirements of the system.

The system consists of Wi-Fi Based ARM7 Technology. Wireless sensor network containing the ARM7 as master controller along with the various sensors such as Smoke, Temperature and Accelerometer. The ARM hardware is built on single chip module. There are various slots to the ARM7 processor for connecting the various external devices using relay. A regulated power supply is provided to the overall system as shown in fig.1

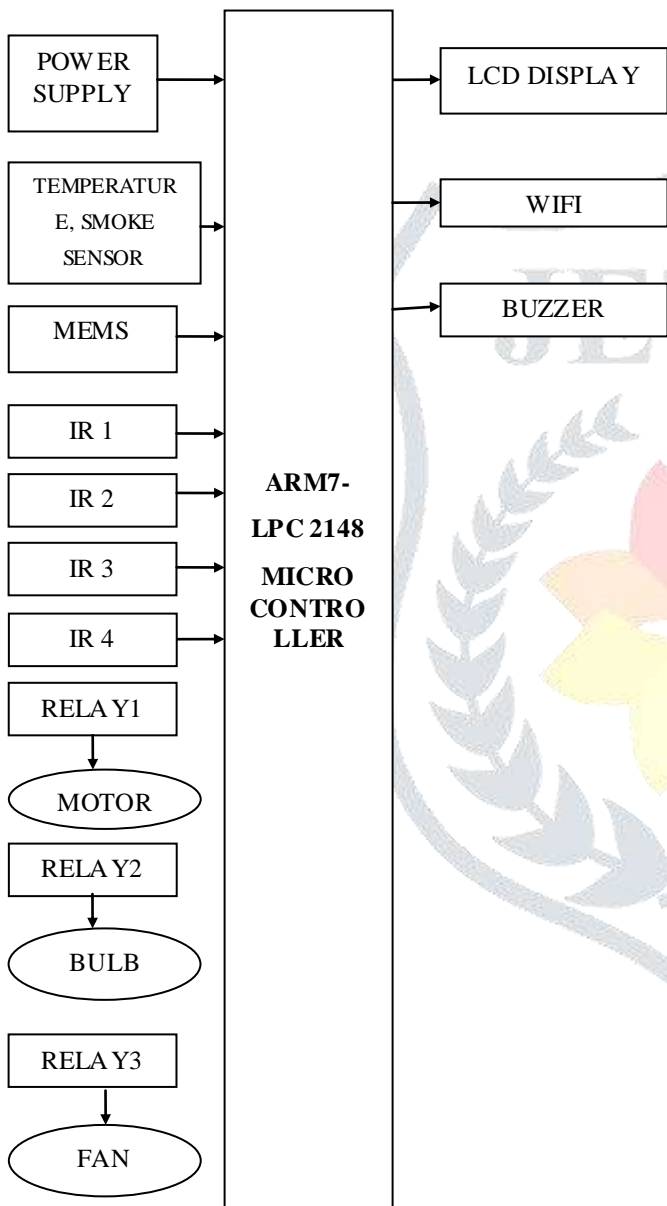
All the sensors sense the respective data about patient and send this data towards the controlling unit. Thus all the data is collected by the ARM7 and is maintained at this location.

Here, the data is stored in the memory. At this stage signal conditioning is done and only required amount of data is sent forward. Thus a successful communication is achieved between a server and client side by using this type of system. Thus personal computer & a Smartphone will continuously monitor all the data from remote

processing unit and compare with the value preloaded process structure.

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.

Fig1:Block diagram of implemented system



Explanation 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

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.

MEMS:

Accelerometers are acceleration sensors. An inertial mass suspended by springs is acted upon by acceleration forces that cause the mass to be deflected from its initial position. This deflection is converted to an electrical signal, which appears at the sensor output. The application of MEMS technology to accelerometers is a relatively new development

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Temperature Sensor (LM35):

Temperature sensor senses the temperature in environment, in this project it is used to find the temperature levels. A threshold value has been assigned to this sensor. When it reaches the threshold value, Buzzer will turns ON, DC Motor will turns ON. Updates from this sensor will be displayed on LCD as well as on TELNET Mobile App on Android phone.

Smoke Sensor (MQ 2):

Smoke sensor is used to sense the smoke level in the building when the value is reaches the higher than normal environmental quantity values. Then Buzzer will turns ON, and updates can be sent to LCD and to mobile

At Entry Point: (2 Pairs of IRs)

IR Transmitter:

In this section, we have used it to count the people who are entering into the building, when the count is increased then appliances Bulb; Fan can be turns ON to save the energy.

This count is useful when fire occurs in the building to know to which floor we serve first.

IR Receiver: In this section we are using this to receive the updates from IR transmitter and send it to LCD and to mobile.

At Exit Point: (2 Pairs of IRs)

IR Transmitter:

In this section, we have used it to count the people who are leaving from the building, when the count is decreased then appliances Bulb, Fan can be turns OFF to save the energy.

This count is useful when fire occurs in the building to know to which floor we serve first.

IR Receiver: In this section we are using this to receive the updates from IR transmitter and send it to LCD and to mobile

Relay: it is used to drive the appliances connected externally.

Wi-Fi: By the wifi module, we can able to monitor the sensor values and status of project on mobile.

Buzzer: it is used to indicate the threshold value of sensors.

V. IMPLEMENTATION OF THE SYSTEM

The design and implementation consists of two sections as

5.1. Hardware design

5.2. Software design

The hardware design consists of various sensors, ARM processor package, WSN Network, a far off computer & an android Smartphone. All these hardware's are interfaced with each other. We're developed a coding in Embedded C in IDE of Keil Compiler. Additionally we're making use of RTOS to manage the whole project and to provide a outcome in actual time.

HARDWARE DESIGN:

To implement the overall system we used different hardwares.

5.1.1. ARM7 Processor:

The ARM7 is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex

Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory

5.1.2 Wi-Fi:

Wi-Fi modem used to interface with design for getting the sensors updates and display the temperature sensor value, smoke sensor and Earth quake level will be displayed. Along with these it can also displays the status of loads whether in the on state or off state. We can control these devices based on IR sensors given.

SOFTWARE DESIGN:

A. Embedded C:

Embedded C is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C. It supports multiple programming paradigms, including object-oriented, imperative and functional programming or procedural styles. It is a scripting Language and it's executing the code line by line.

B. Keil Compiler:

In this Kiel software, program is written in the embedded 'c' language and execute it., after completion of execution hex file program is dumped into the controller using flash magic. Keil provides a broad range of development tools like ANSI C compiler, macroassemblers, debuggers and simulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for Intel 8051, Intel MCS-251, ARM families.

VI. RESULTS & DISCUSSIONS

This system design applicable for building health monitoring and energy saving within the building & to provide the quick services to the people strucked in fire accident is implemented successfully. By taking the individual achievements

into consideration this design got implemented with all solutions.

These system parameters can't be monitored when you are very far away from the building as we are using WIFI. Applications of the proposed Design is

- Buildings / Apartments
- Health
- Security
- Transport and Logistics
- Daily life and domotics



Fig 3: Login in to Telnet App after activating Wi-Fi

Procedure for monitoring the values:

- i. Activate the Kit and Download the Telnet APP from Play store in your Android mobile. And Activate Wi-Fi on mobile. Login in to Telnet App after activating Wi-Fi.
- ii. When persons entered into the building then LCD Starts displaying the sensor values and Floor 1 & 2 count is started.
- iii. If Temperature & MEMS(Earthquake) and Smoke sensor values Exceeded, LCD shows the notification
- iv. We can also Get updates in Telnet App when Temperature & MEMS sensor value exceeded
- v. Appliances such as Motor, Bulb, Fan is Activated after the count increased in both floors
- vi. We can Get updates in Telnet App when Smoke, MEMS has high value after the count is started in Floor 1 &2.

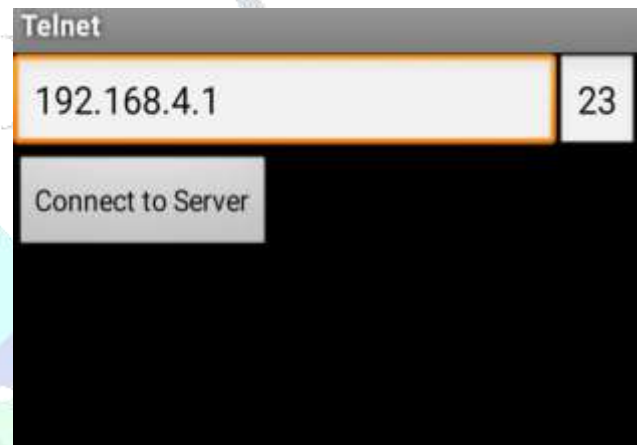


Fig 4: Monitoring the sensor values and Floor 1 & 2 count is started



Fig 5: Getting updates in Telnet App when Temperature & MEMS sensor value exceeded

Values Monitoring:

Fig 2: Prototype of proposed system

More Temp:0047Earth Quake
 More Temp:0047Earth Quake
 More Temp:0048Earth Quake

Appliance control:

Fig 6: Appliances Motor, Bulb, Fan is Activated after the count increased in both floors



VII. CONCLUSION

The design and the development of an interactive monitoring and controlling system will have WI-FI communication and Wifi-based measurement and control systems. The Web based monitor and automatic control of equipment is forming a automation field. Proposed design ensures that efficient energy management in buildings and getting notification regarding earthquake. People will be protected against the fire accident in building with the help of WSN network.

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