



## Microcontroller Based Monitoring and Alert System

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**Abstract—** The objective of this paper is to design and implement microcontroller based monitoring and alert system. It monitors the surrounding temperature and smoke level employing LM35 for monitoring the temperature, MQ2 as a smoke sensor and the value of which are displayed the LCD screen. It focuses mainly on our homes. It also automatically controls the fan connected to the motor driver depending upon the temperature sensed by the microcontroller thus also working as an automated control system. When the sensor value exceeds the threshold limit causing fire, the owner of the house will be alerted by SMS through SIM900 GSM module. Hence, it discusses about a low cost microcontroller based alert system.

**Keywords –** ATMEGA Microcontroller, GSM, LM35 temperature sensor, MQ2 Smoke Sensor, PWM (Pulse Width modulation), SIM 900j Module.

## I. INTRODUCTION

Home automation is building automation for home called a smart home or smart house. It controls and monitors the heat, lighting, ventilation, security etc. PLC is one of the major tools in automation whereas it is used in industrial automation not in home automation. Home or residential automation includes interfacing of sensors and microcontrollers and programmed to perform a specific function.

Home automation plays an important role to control the devices at our home through a mobile from anywhere around the world. It more accurately describes home in which nearly everything- lights, appliances, electrical outlets, cooling systems etc. are hooked up to a remotely controllable network.

Fire accidents tend to happen frequently due to various causes and hence require advanced techniques to prevent such mis-happenings. This technique is called home automation which is used to implement an alert system that monitors the temperature and smoke of our surroundings and more precisely our homes or where the device is installed. Fires usually occur suddenly and can cause a

huge amount of destruction of property and life. Thus, it is very important to inform the fire department or fire brigade at time of any such incident which is impossible if nobody is home. This project idea mainly aims at preventing such incidents when nobody is home.

Temperature, smoke and humidity are parameters which should be continuously monitored at our homes. The rise in temperature in summers or the rise in moisture levels in winters both causes discomfort and can be a reason for health issues. Hence both the temperature and smoke level should be monitored and maintained below their threshold values. This is done by LM35 and MQ2 temperature and smoke sensors respectively. These sensors work when are interfaced with the microcontroller. The electric fan minimizes the temperature by the air flow and is controlled by the variations in the temperature. In this paper, the idea describes about how the temperature and humidity are monitored using respective sensors which are interfaced with the ATMEGA microcontroller. When the parameter value exceeds the threshold value the electric fan automatically starts to minimize the temperature and in addition, an alert SMS is sent to the owner of the house and the fire department using GSM module to control the fire before everything is destroyed. The use of dehumidifier to automatically control the humidity is also proposed in the paper.

## II. LITERATURE REVIEW

Nowadays, temperature and humidity systems are installed in temperature-controlled rooms that are used to store and preserve time and temperature sensitive pharmaceutical products and food items. Temperature and humidity alert system should be linked with monitoring system with high and low alarm set points. There should be visual or audible alarm together with SMS text warning. Some of these are mentioned below for reference:

### A. Manual Temperature Monitoring System

In many fields people still work using the old methods of temperature and humidity measurement [1] they deploy multiple instrument such as thermometer for temperature, rain gauge for precipitation etc. Majority of these instruments are based on analog technology and the records of these instruments are manually stored and analyzed for various applications. The main aim of this paper was to continuously monitor the environmental factors and broadcast them through various channels.

#### Limitations

1. Such monitoring systems consists of obsolete technology which are not in use today. Also usage heavy machinery consisting of various moving parts that demand regular maintenance and need to be replaced frequently.

2. Power consumption is another issue that poses a limitation as instrument are usually installed far from the main power supply, further adding to its cost.

3. Usage of thermometer for temperature measurement; however, is inaccurate and not precised as per our requirement.

4. There was no work in the dimension of warning and alert in case of any threat, leading to loss of lives and property.

### B. Smart Sensory System for Environmental Monitoring

The purpose of this paper was to develop a system [2] which monitors environmental parameters like temperature, humidity, flammable gases, smoke. This system uses an open source hardware and software at low cost, it also helps us in applications such as creating smart buildings. SD cards stores the data obtained from the sensors with operating system that contain a web server and a database.

#### Limitations

1. As the data are stored in SD cards, the possibility of data loss increases.

2. There is no redundancy of data which results in faulty system.

3. As the sensor is exposed to gas once, it takes several minutes to take the next reading.

### III. PROPOSED SYSTEM

In this project, we have implemented the low cost digital meter using PIC which acts as monitoring and alert system to prevent fire accidents. We have used temperature sensor LM35 and humidity sensor DHT11 for monitoring temperature and humidity of environment. Home security system offer an early warning system, instead of smoke alarms in which many home owners rely upon to warn them of fire outbreak. This warning is given through SMS using GSM module. The advantage of this system is as follows:

- Easy and affordable
- Low maintenance
- 24/7 monitoring
- Placement flexibility

- Send alert via SMS and alarm

### IV. SYSTEM ARCHITECTURE

The main processing unit in this system is ATMEGA Microcontroller. It is based on RISC architecture and is a low power, high performance 8-bit microchip. It operates on 1.8-5.5 volts. Temperature and humidity sensor are interfaced with ATMEGA microcontroller. LM35 temperature sensor is an integrated circuit whose output is proportional to Celsius temperature. DHT11 humidity sensor protects the infrastructure of house from damage. When the certain parameter value exceeds the threshold value of fan, an alert message is send to the concerned person using GSM. And if there is any emergency, the fire department will receive an SMS alert containing the address of the specified location. LCD is also connected to the ports of microcontroller which display the measured values.

#### Block Diagram

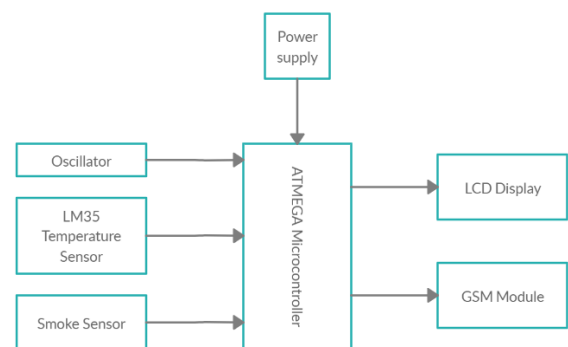


Fig.1. Block Diagram Representation

### V. WORKING COMPONENTS

#### A. TEMPERATURE SENSOR

LM35 is a temperature sensor used to monitor the temperature. It is an integrated circuit whose output and Celsius temperature is directly proportional tp. It is easy to connect to the readout circuitry due to its linear output and low output impedance characteristics. The operating range of LM35 is -55 to 150 degree Celsius and having a scale factor of 0.01/degree Celsius. It has three pins +v, ground and Vout.

#### B. MQ2 SENSOR

(MQ2) module is useful for gas leakage detection in home and industries. It is helpful in detecting CH<sub>4</sub>, H<sub>2</sub>, CO, LPG Alcohol, and Smoke. It is also possible to take measurements as soon as possible due to its high sensitivity and fast response time. Wide detecting scope, Fast response and High sensitivity makes it useful for a wide range of applications.

#### C. ATMEGA MICROCONTROLLER

It is a low power, high performance 8-bit microchip. It is based on RISC architecture. It has flash memory with read while write capabilities. It operates on 1.8-5.5 volts. It has 1KB EEPROM, 2KB SRAM, 54/69 general purpose I/O lines, 32 general purpose working registers. It has five software selectable power saving mode, an 8-channel 10-bit A/D converter, SPI serial port, and programmable watchdog timer with internal oscillator.

#### D. GSM MODULE

GSM stands for Global System for Mobile Communication. It is one of the most popular network for mobile communication. GSM works with a wireless network. It enables the users to communicate or connect with whomsoever they want. It is basically a hardware component with capabilities of sending and receiving messages over a network. It uses RS232 serial port for communication and SIM900A as GSM module. Short Message Service (SMS) is a text messaging service component of telephone, World Wide Web, and mobile telephony systems.

#### E. LCD Display

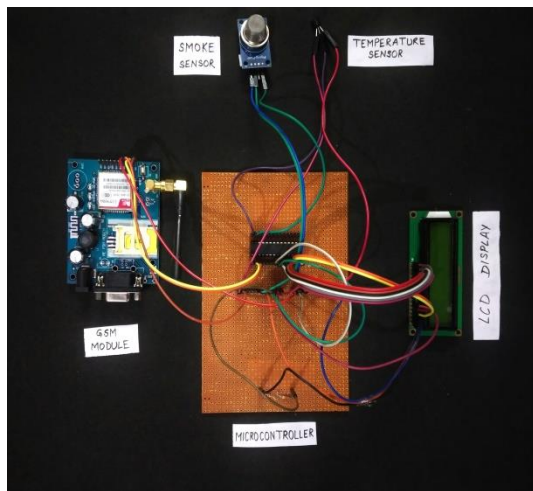
As one of the purpose is to display the measured values of temperature and humidity through a display device just like values appear on digital meter.

So, here we use a LCD (Liquid Crystal Display) screen and connected a 16X2 LCD module to the ports of microcontroller which display the measured values.

#### F. Alert SMS

As here one of our main objective is to use GSM in order to send a SMS to particular mobile number or to the concerned authority whenever the temperature or humidity exceeds above a certain limit. Also the police or the fire department will get an SMS alert. GSM receives the mobile number either of a person or fire department via UART communication protocol which are given with the help of AT commands from the microcontroller.

#### Working Model



#### FUTURE WORK

In this paper, the automated control of temperature is proposed which is extended to humidity control. Humidity is controlled by the implication of Dehumidifiers, which reduces the humidity level by increasing the home temperature. In order to ensure the 220V dehumidifier which is controlled by microcontroller, the 5V-220V relay module is used and is connected between them. In place of fan, air conditioner can also be used.

#### CONCLUSION

It has been concluded that microcontroller based monitoring and alert system using GSM module works as a low cost easily usable system and, within reach of each and every house or any work places. There are various other advantages of using this low cost digital microcontroller alert system as it is available in much reduced size which can be placed anywhere without facing any difficulty. Also, it can be easily manufactured at a very reasonable cost and consumes less power.

The main objective of this research paper is to design and implement a low cost system which is simple, efficient and wireless home automation system for fire detection and other disastrous threat by controlling excess temperature and humidity. The readings will continuously display on LCD screen and when it exceed above comfort limit, the concerned authority will automatically receive an alert signal via GSM. GSM also allows us to communicate in any faraway isolated remote places and to access across all over the world. Therefore, the main idea behind this research is to ensure and overcome the efficient operation of controlling fire accidents so that we can protect many lives whether it is human or flora and fauna.

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