Global system for mobile communication (GSM) monitoring in industries using arduino uno

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Abstract. The scope of our project is to notify the owner of the premises, the fire department and authority immediately after the detecting any fire and gas leakage by sensor. The notification is sent through Short Message Services (SMS). The issue we are trying to solve here is associated with the emergencies which can occur in any industry or large factories in this case fire. This can also help us to reduce the response time taken by the first responders. As soon as the sensors detect fire or smoke buzzer will go off and SMS will be sent to all the authorities. The path to the development of the automation system at home and in industry is almost the same these days. This paper will help us to understand the measures which we can take to create a fail safe system for fire or gas detection in large areas at low cost. Everyone wants to be safe as much as possible. The easy connection simple to understand will help every user to use the wireless system for security using the sensors-Gas, smoke, and temperature detector at industries.

Keywords: Gas, smoke, temperature detector

1. Introduction
Monitoring and industrial control the use of sensory technologies and computer to control each and every equipment in any factory or industry helps to reduce man power which is why it increases safety. On an industrials scale, monitoring and control is a step beyond the use of equipment. While the use of equipment provides human operators with equipment to assist them with their physical needs of work, monitoring and control greatly reduces human need sensory and psychological needs. Procedures and programs can also be monitored and controlled.

Nowadays, the number of industries and the number of risks in those industries has increased dramatically. To decrease consequences of accident and reduce indirect losses, we here introduce a “Global System for Mobile Communication (GSM) Monitoring System in Industries using Arduino UNO” that detects smoke, temperature and flammable and toxic Gas.

We use some detectors to detect smoke, temperature, and different types of flammable and toxic gases [1]
2. Literature Review
The GSM based system for industrial purpose can be used to provide a security system for residential using the GSM means. The basic automatic security system for home consists of component like detectors (motion, LPG and smoke), but the literature is also for the home not for the industries, and also using AT mega microcontroller. The work is focused to develop a smart automated system not only for industrial use but also for homes by introducing it with different voice recognition software.

This project aims to reduce the efforts of people, especially the elderly and challenged, by using voice commands as the installation of control over technical devices.

The hardware circuit design should be simple so as to enable user to utilize wireless home security system with the smoke sensor, and home temperature sensor but not industrial. The operation and control of modern industrial equipment and processes require multiple sensors to monitor multiple system parameters [2].

3. Equipments

3.1 LM35 (Temperature Sensor)
LM35 is a well-integrated heat-dissipating heating device. In this modern technology and advance machinery and its operation need as ever a L sensors just like LM35, its range is about -55°C to 150°C and is very precise [3].

3.2 MQ-2 (Gas Sensor)
This is a high sensitivity gas sensor which have a tendency to detect different types of gases i.e., methane, propane, hydrogen and also LPG. This sensor increases its output voltage when the concentration of the above-mentioned gases. It also can detect smoke quite effectively [4].
3.3 Arduino Uno Microcontroller

It is the small microcontroller board also known as Arduino development board. This uses AT mega 16 microcontroller and is easy to program due to onboard USB ports and Arduino IDE support. We used Arduino Uno here as an open-source microcontroller board on which microchip ATmega328P microcontroller is mounted [5]. Here in the board, there are different input and output pins are given for the expansion of board or connecting other circuits.

![Arduino Uno Controller](image)

Figure 3. Arduino Uno Controller

3.4 GSM Modem (SIM900)

This is a modem which uses GSM for wireless network connections, in our project this module is used to send SMS to stored contacts in case of emergency. AT commands are AT+CMGS (for sending message), AT+CMSS (sending message from storage), AT+CMGL(List of SMS).

![GSM Modem (SIM900)](image)

Figure 4. GSM Modem (SIM900)
3.5 Relay

Relay is simply an electric device used to switch the circuit on or off [6].

![Figure 5. Relay](image)

3.6 Mobile Phone

A communication channel is needed for transferring information between system and owner or authorized person. In this system we use mobile phone for receiving message. Received SMS from control system.

![Figure 6. Mobile Phone](image)

3.7 LCD (Liquid Crystal Display)

In this project we use LCD to display the emergency messages to the managers, owners and other safety officers of the factory during smoke or fire. When the fire occurs, the sensors ends signals to the Arduino which then shows emergency messages or codes in the LCD, it can also show some important information example-which part of the factory is affected by fire etc.
3.8 **Buzzer**

Buzzer is a signal device which is use to give an alert audio signal to Industry and members present in the Industry. At the time of fire buzzer get the command from the Arduino and start producing the alert signal.

4. **Design & Planning**

Device Connection
5. Working of the System
Since, the microcontroller is controlling the overall system, it can frequently monitor sensors, GSM module and detector. The system has preset mobile number as AT+CMGS "user's mobile number", so if the voltage of modem drops to zero the GSM modem will trigger a response to the microcontroller with the details of problem occurred and forward it to the user as SMS+CTRLZ to GSM modem[7].

![Figure 10. Working of the System](image)

6. Power supply
Our project uses 5v and 12v Dc. One way was to connect a dc battery of 12v directly in the input is the use of batteries of 9v connected in series for continuous power supply. A.C. voltage is used in this research for maintaining +/- 5V and +/- 12V D.C. from a 220V AC is required to be scaled down as almost all the components basically uses 5V DC for powering up. Hence to convert 220V to less we are using a step-down transformer and a full bridge rectifier for converting AC to DC. Also, to get a constant voltage we a reading some voltage regulator (7805 for 5V and 7812 for 12V)[8].

![Figure 11. Power Supply](image)
7. Microcontroller Embedded Language
The source code of this project is written and compiled in Arduino Uno. The hex file or the byte code is loaded into the microcontroller Flash memory, the byte code is generated after compilation of the source code. This byte code is a sequence of zeros and one which are set of executable instructions or command. Depending upon the design of microcontroller every word (bits) is taken as a command by CPU. In practical scenarios hexadecimal number system is used for the hex code. Hex code as of for Arduino microcontroller is a 14-bitword [9].

![Microcontroller Embedded Language](image)

**Figure 12.** Microcontroller Embedded Language

8. Result
This project work on sensors so that it can cover whole industry by implementing different sensors at the necessary places. This project is non-linear, its range depends on the sensors and connectivity. The project can be expanded by connecting different boards with the help of input and output pins present in the board, which help it to cover whole industry through it.

9. Conclusion
Global system for mobile communication for industrial safety is a cheap and easy to use system. After the research on all the literature topics of industrial safety we design this wireless system. An easy and effortless standard network is being developed. It is a synchronous monitoring network made up of simple hardware that simplify error less safety system. This is very reliable with high safety, low error and low cost. It is easy to implement and use than current safety system in industry.
10. Future Scope

- This system can only provide small amount of information on the emergency, so in future this issue can be overcome by adding GPRS technology which will also give us internet access and we can also use it to control some of the systems remotely.

- Also, a small system like this can only provide safety for small areas and by increasing area thenumber of sensors will also increase which will then increase the complexity of the system to overcome this issue different parts should be made like hardware parts i.e. (sensors, Arduino etc.)and the software parts with all other circuits which will be used for GPRS and web interface etc.

- Further in future we can build up voice announcement to show device status. If there is emergency then with the help of voice announcement and buzzer we can easily detects and acts accordingly.

- The extinguisher can be automatically switch off, which we were doing it manually.

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