

Home Security based on GSM using Arduino

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Abstract- The Internet of Things (IoT) is a new platform for technology. It is joining one's daily contents information wisely to the internet to make communication between objects and people. Although, its protection and security is a serious challenge in IOT because threats are increasing every next day due to the vulnerable and defenceless security systems in homes, commercial world and industries. Several common technologies and procedures are available to keep one's home safe from intruders, but commonly smart home security systems work on wireless GSM(Global System for Mobile) communication. This technology provides security from natural, intended, unintended, incidental, accidental and human-made problems by monitoring homes with distinct sensory systems such as smoke, motion, gas, temperature, door break or glass break detectors along with fire alarm. This paper identifies the utilization of varied types of sensors which consists of PIR(Passive Infrared Sensor), motion, Fire and Gas Leakage Sensor to detect any changes in or around the home and alert the owner of the house by notifying him/her with an SMS via GSM module SIM800L.

Keywords- Home Security, Internet of Things, Arduino project, GSM security project, Passive Infrared Sensor, Gas sensor, LM35 Temperature Sensor

I. INTRODUCTION

Home security can be achieved by implementing several central controllers to control home devices or appliances. These controllers can easily detect different variables using their suitable sensors. The main point of developing such a system is to collect the parameter information such as human presence, fire, temperature, gas, etc., and sends the resulting data to the microcontroller or processor. It is developed and programmed in such a way that when these variables cross their prescribed limits, the security system sends the command signals to various decision taking machines such as relays, motors, buzzer devices and GSM(*Global System for Mobile*) module. Through this, the user can achieve the SMS(Short Message Service) into his or her communication device. IoT means to connect different devices through the internet and make them communicate with each other. An advanced network of IoT is being created, when the public wants to associate with different objects. IoT terminology is applied to enhance intelligent houses with increased surviving methods of life. It uniquely identifies not only attached computing system but also internally handle existing internet architecture. IoT (Internet of Things) platforms act as the way over between the devices, sensors and the data networks. IoT (Internet of Things) safety and privacy have rocketed as a major issue among local public and businesses.

II. FEATURES

- Detect gas leakage, raise in temperature and motion of a human in the home, organization or in the factory.
- On the basis of the detection, to set up an SMS (Short Message Service) alert mechanism to get notified to the user.
- Display the status using LCD (Liquid Crystal Display) and Led lights.
- Provide security to the infrastructure on the basis of this project.

III. SENSORY SYSTEM

This system consists of various sensors like IR (Infrared) sensors for detecting human presence to open or close the doors; LPG (Liquified Petroleum Gas) sensor to detect the gas leakage in kitchens and a smoke detector for detecting the presence of fire. For improving security, addition of temperature sensor, camera and other sensing device is possible. These sensing values are sent to the microcontroller with intermediate circuit like Analog to Digital Converter.

1) Requirements

a) GSM(Global System for Mobile) module

GSM modem allows the computer system to communicate over the mobile network through calls, SMS(Short Message Service) and MMS (Multimedia Messaging Service). It consists of a SIM card which operates over a subscription through a mobile network. It is highly flexible plug-and-play device capable of connecting to a computer system or any microcontroller serial port through MAX232IC. This IC (Integrated Circuit) is used to convert the TTL (Transistor-Transistor Logic) levels of the microcontroller to a RS232 logic level for enabling serial communication. Fig.3.1.1 shows GSM module SIM800L.

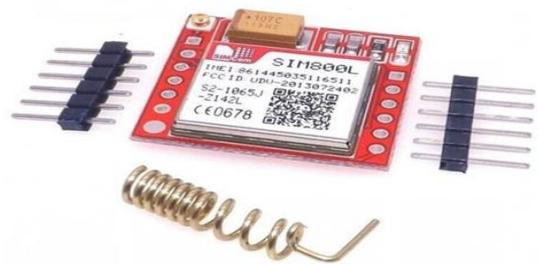


Fig.1: GSM(Global System for Mobile) module SIM800L⁵

b) PIR(Passive Infra-red) Motion Sensor

The PIR motion sensor is an electronic sensor it is abbreviated as a passive infrared sensor. The function of this sensor is to detect the human body motion with a certain range of frequency. This sensor can be used for the living organism and other objects in motion. This type of sensor is mostly used in the theft alarm and automatic lighting system. PIR sensors are made of a Pyro-electric material, which can detect different levels of infrared and thermal radiations[1][2][3]. Fig.3.1.2 shows PIR motion sensor.

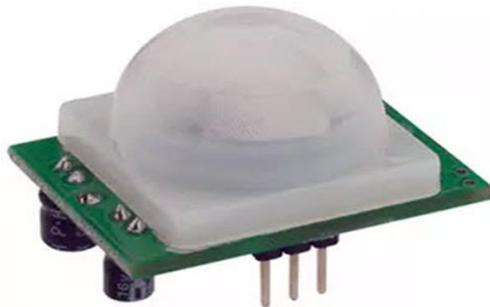


Fig.2: PIR(Passive Infra-red) Motion Sensor⁶

c) Gas Sensor

Gas sensor is used for detecting LPG gas. It is appropriate for sensing LPG concentrations in the air or the surrounding atmosphere in a specified range. It can detect gas in a range from 200 to 10000 ppm(parts per million). It has a very high sensitivity rate and quick response time. The output of the sensor is in the analog resistance format. To drive the circuit, one needs to provide power supply to the heater coil of 5V, add a load resistance, and connect the output to an Analog to Digital converter.

Fig.3.1.3 shows the view of a Gas Sensor.



Fig.3: Gas Sensor⁷

d) LM35 Temperature Sensor

The LM35 is a temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature (in Celcius). The LM35 has an output voltage that is proportional to the Celsius temperature. It also possess low self heating and does not cause more than 0.1 Celcius temperature rise in still air. Fig.3.1.4 shows the temperature sensor.

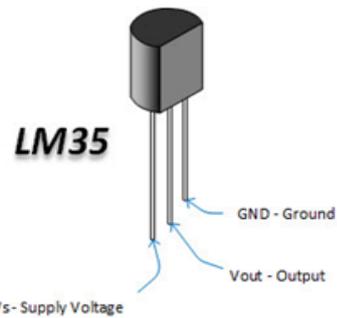


Fig.4: LM35 Temperature Sensor⁸

e) Arduino Board

Arduino is an open-source platform, based on hardware and software. It consists of a microcontroller, which can be programmed through Arduino IDE (Integrated Development Environment), which is used to compile and upload the computer code to the physical board. Fig.3.1.5 shows the Arduino board.



Fig.5: Arduino Nano Board⁹

2) Implementation

Fig.2.0 will show the circuit diagram of the system by which the one can implement the model for security of home, organization or huge factory.

Circuit Diagram

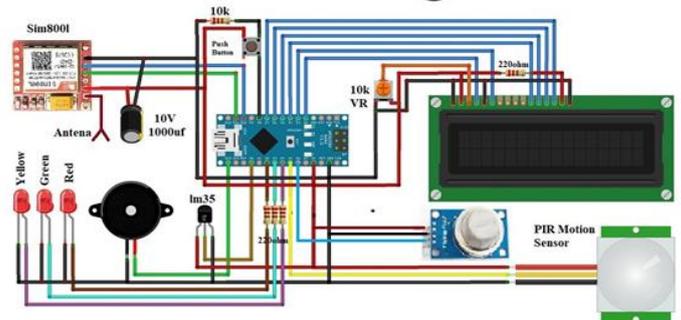


Fig.6: Home Security Based on GSM using Arduino circuit diagram¹⁰

3) Advantages

- User can control the devices even when they are not near to that device.
- Project can be implemented easily at homes.
- User need to have just a basic knowledge of the SMS text.
- Low power consumption.
- Simple and easy to access.

4) Future Enhancements

- As the system is totally dependent on network we can replace some other technology to make it network independent and thus make it more reliable
- Battery can also be attached so that the system gets backup and doesn't turn off when the power supply is cut.
- Some special devices can be made only for receiving the alert messages of the system as we cannot completely rely on mobile devices
- Advanced Wiring techniques and wireless techniques should be implemented on the system as to overcome or avoid the disadvantage. In other words, highlighting the problem of physical wire cutting or wire damage.

IV. ACKNOWLEDGMENTS

We would like to express our deep gratitude to Professor Sneha Ambhore for her patient guidance, enthusiastic encouragement and useful critiques of this research work. We also like to thank our parents for their complete support and encouragement throughout the making of this research paper and also our study.

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