

IoT based Advanced and Smart Home Security System using Arduino

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Abstract- In today's world, the crime of theft is increasing day by day in our society. Either an office, home or any building, none of them are secure. Not only theft but also fire has become a headache for us to cope up with. If we talk about theft, then simply putting a lock is not sufficient in order to safeguard any building. We, therefore, need a strong security system to prevent intrusions. Now, talking about fire in buildings, it has really become a very serious problem in the developing society. Oftentimes, we hear the cases of fire in buildings, factories, offices, industries, houses, etc. which causes a great loss of life and property. Continuously increasing cases of theft and fire in buildings have invoked us to take some major and essential steps towards the prevention of fire and theft. I, therefore, have presented a multilevel system which will safeguard the buildings from theft and fire. It is basically a four level system based on IoT. We have used various sensors in order to detect fire as well as theft. A password module is also used to detect intrusions. The password module and the sensors are connected to the arduino. GPS and GSM modules are also connected to the arduino which will detect the exact location and send an alert message respectively to the saved contacts according to the readings of the sensor and entry to the password module. A special feature that makes the device advanced is the use of manual switches. In case if the system fails to send the alert, the user can press the switch manually. We have used an IoT platform Thingspeak which stores data in cloud that can be monitored anytime by the user.

Keywords- IoT, GPS, GSM, Thingspeak, Arduino.

1. Introduction

Safety and security is the priority to all human beings. Especially in today's scenario, where crimes are increasing day by day, we need to be more secure. Therefore, the advanced four level system presented here will serve this purpose in a smart way using Arduino. We have various safety devices in our houses/buildings like CCTV camera, PIR sensor, etc. but these devices are limited to their usage. For example, if an intruder enters the home/building or the building catches fire when there is nobody inside, in that case, these sensors are of no use. Therefore, we need a smart system to deal with this problem. Therefore we have used GPS (Global Positioning System) and GSM (Global System for Mobile Communication) which will trace the exact location of the building and send the alert to the

saved contacts respectively. We can also store the data in cloud using an IoT platform Thingspeak. Here the data is uploaded every 30 seconds. Hence, we can check the status of building time to time. Along with the GPS and GSM module, temperature sensor, passive infrared sensor, glass break detector, smoke sensor, magnetic switch, keypad and two manual switches are also connected to the arduino. Whenever the reading of any of the sensor is above the set threshold or incorrect password is entered via keypad or any of the manual switch is pressed, the alarm blows and an alert is sent to all the saved contacts along with the exact location of the building. Out of the two manual switches, manual switch 1 can be pressed in case of theft and manual switch 2 can be pressed in case of fire. Manual switch is an additional option which can be used by the people inside the building in case of any emergency. They can be pressed in case the system fails to work during fire or intrusion.

2. Literature review

Vishwanatha V.¹ (2018) Home security is important concern in the world and therefore with the advancement in technology home security systems are developed.

Siddharth Wadhvani² (2018) Increasing dependency of people on mobile phone has increased the demand of solving daily life problems using IoT.

Ravi Kishore Kodali³ (2016) IoT allows us to control the things remotely. It is a smart and safe way to do the things automatically.

Mohammad Asadul Hoque⁴ (2019) Cost effective security system can be developed by the use of Internet of Thing.

Tanya⁵ (2018) Safety and security have become a major issue nowadays. Along with advancement in technology, it has gained a lot of progress.

3. Objective

The system aims at providing a better way to safeguard our houses/buildings from fire and theft. Whenever the system detects the fire or intrusion, it immediately sends an alert to the saved contacts along with the exact location of the building. Alerting the user at the very

initial stage can prevent the forthcoming losses and injuries. The system gives alert by sending alert messages to the users and blowing alarm inside the building. Besides working automatically, the system can also be controlled manually. Two manual switches are used for this purpose.

4. System Overview

In our system temperature sensor TMP36, smoke sensor MQ-6, passive infrared sensor ----, glass break detector--- , magnetic switch--- and a password module are connected to arduino. The main task of the system is to provide safety and security and security where safety includes safety from fire and security includes security from intrusions. Basically fire is detected using sensors only and intrusion is detected using sensors as well as password module. However, there is also an addition way to send an alert in case of fire or intrusion. Use of manual switches for this purpose is an extra feature of the system which makes the system advanced and more efficient. The complete overview of the system is shown below-



Fig – 1: Schematic design of the system

4.1 Temperature sensor

Temperature sensor is used to measure the temperature. We have used TMP 36 temperature sensor. Here it is used to detect fire in the building.



Fig – 2: Temperature Sensor

4.2 Passive infrared sensor

PIR sensor detects the motion of warm bodies on the basis of infrared radiations emitted by them. Here, PIR sensor is used to detect any kind of human intrusion. Here we have used HC-SR501 PIR sensor.



Fig – 3: PIR Sensor

4.3 Glass break detector

In this system, glass break detectors sense the breaking of glass based on the frequency of glass breaking sound.



Fig – 4: Glass Break Sensor

4.4 Magnetic switch

Magnetic switch works according to the motion of the magnet. Whenever a magnet comes closer to the switch, the circuit completes and the switch turns ON. When magnet goes away from the switch, the circuit breaks and the switch turns OFF. It is basically used in the doors. When the door is opened, the circuit breaks and the system give alert to the user.



Fig – 5: Magnetic Switch

4.5 Smoke sensor

Smoke sensor detects fire on the basis of smoke concentration. Whenever the quantity of smoke is above than a set limit, alarm starts blowing and alert is sent to the saved contacts. Here we have used MQ 135 smoke sensor.



Fig – 6: Smoke Sensor

4.6 Keypad

A keypad is connected to the arduino. Whenever the password entered through keypad is incorrect the will give alert.



Fig – 7: Keypad

4.7 Manual switch-1

Besides being automatic, the system can also be controlled manually with the help of these manual switches. Manual switch 1 is pressed in case of theft in the house/building. An alert will be sent to the police and the other saved contacts.

4.8 Manual switch-2

Manual switch 2 can be pressed by the user in case of fire in the building. When this switch is pressed, alert is sent to fire brigade and other saved contacts.

4.9 GPS Module

Global positioning system is a navigation system based on satellite. It will tell the exact location of the building to the police/fire brigade and other saved contacts.

4.10 GSM Module

The global system for mobile communication will send the alert messages to the relative authorities.

4.11 Arduino UNO

Arduino UNO is a microcontroller board. It contains various input and output pins. Many circuits can be connected to it according to our requirement.

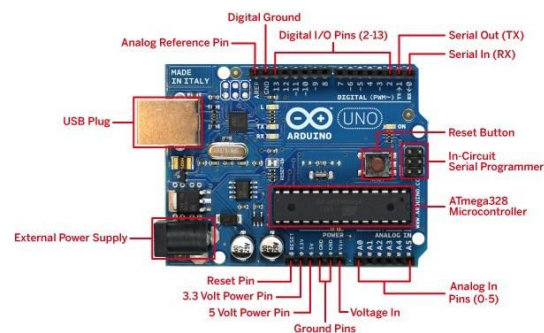


Fig – 8: Arduino UNO

5. Working

The four level home security system works according to the readings of the sensor and operation of manual switch.

First of all we upload the desired code in the arduino. Here, we need to save the contact numbers of the user/owner, authorities like police, fire brigade and other desired people. Alert message will be sent only to the saved contacts according to the uploaded code.

Now, all the sensors used for safety and security purpose along with keypad, magnetic switch, manual switches, GPS module and GSM module are connected to Arduino. Alert message will be sent in case-

1. Reading of any of the sensor is above the set threshold.
2. Wrong passwords entered.
3. Manual switch 1 is pressed.
4. Manual switch 2 is pressed.

We send alert messages in two patterns-

1. If fire is detected- Message is sent to the fire brigade and other saved contacts.
2. If theft is detected- Message is sent to the police and other saved contacts.

If the intrusion or fire is detected, an alert will be sent along with the location. The exact location is determined by global positioning system. Earth latitude and longitude along with the position coordinates are detected by global positioning system (GPS) and the alert message is sent by global system for mobile communication (GSM).

Besides the system being fully automatic, it can also be controlled manually. Manual switches i.e. manual switch 1 and manual switch 2 can be pressed by the user in case of intrusion and fire respectively. A clear image of this four level system is described below-

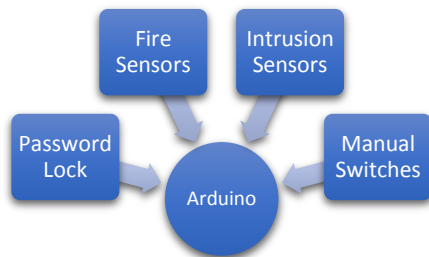


Fig - 9: Four Level Safety and Security System

In order to store the data time to time, an IOT platform 'Thingspeak' is used in the system. It stores data to cloud every 30 seconds. This saved data can be further checked by the user anytime. The proper working of the system can be understood by the following flowchart-

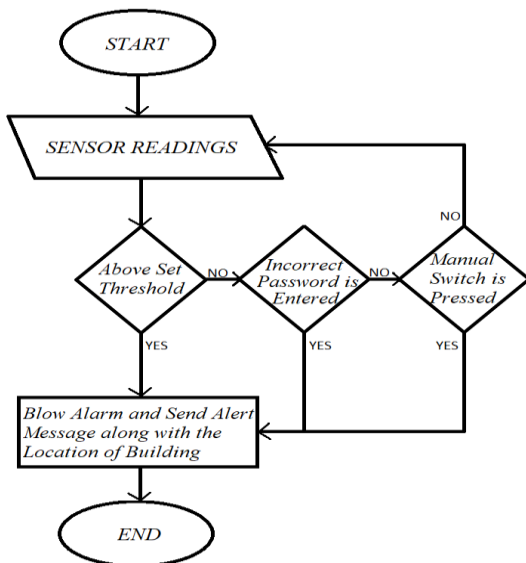


Fig - 10: Flowchart of the System

6. Result and discussion

The system when installed in the building, not only detects fire but also intrusion. In order to check our system, if we enter any wrong password or if we burn coal or any combustible material for testing purpose or we try to intrude inside the house or we press any of the manual switches then the alarm will start blowing and an alert message will be sent to the users in the format given below:

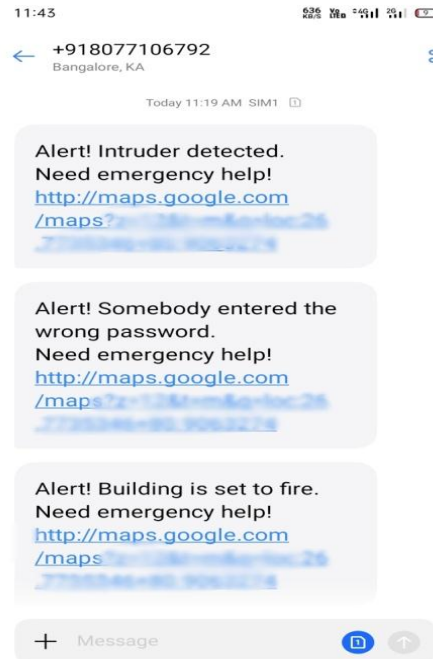


Fig - 11: Message Format

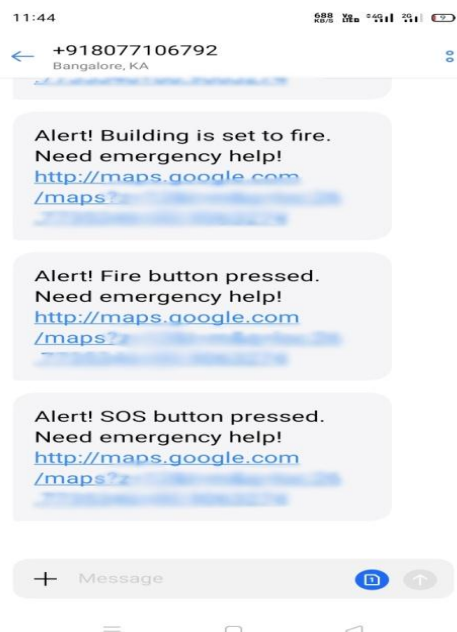


Fig - 12: Message Format

7. Future scope

The system can not only be used in houses but also in offices, complexes as well as industries. We can make the system more précised by reducing false alarms. Further, many advanced technologies can be connected to the system in order to use it at any big or small place like banks, malls, hotels, etc.

8. Conclusion

The system can not only be used for safety purpose but also for security purpose. It is an automatic wireless system and therefore it is easy to use. The system can be easily installed and also not very expensive. The system works precisely and the manual switches facilitate better use of the system whenever required.

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