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TriEye

Smart Home Safety and Security System

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Submitted to: Dr.Manish Kumar

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In

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Acknowledgement

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Secondly, I would also like to extend my gratitude to my parents and friends who helped me a lot in finalizing this project within the limited time frame and all possible resources.

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Synopsis

Considering Home security an important factor in our day-to-day life, this project fulfills all the major needs such as prevention from gas leakages, fire occurrences and thefts. This project includes a wide range of sensors and other IoT systems. In the Anti-Theft system, all the sensors and devices are working in a way to sense a person (or any suspicious moving entity) for a certain time limit and then if the doubt still persists an alarm is triggered to alert the residents of the particular house. In the gas Leak detection system, similar way all the sensors work and an alarm is triggered when leakage is detected. In the fire-detection system, the sensors are working in such a way that it detects smoke and its intensity. If the intensity crosses a particular threshold an alarm is triggered to alert the house members.

Above all, the project revolves around making "home security" easily affordable. Currently, home security has become easy with the use of cameras (with pre-installed sensors) at the stake of money (viz expensive). Our project brings home security to a common pedestal where everyone can easily afford it, thus making the project highly economical.

Introduction

Home safety and security is an essential part of our lives. Break-ins are extremely common these days. No one should leave their house unprotected. Therefore, taking safety measures to arm up one's home security system is crucial. Home security can be improved with the Internet of Things. There are a ton of different IoT devices helpful in monitoring suspicious activity. Applications developed with the Internet of Things technology make human life easier. Technology has been developing for this purpose for years. The Internet of Things has emerged as one of the most promising technologies for the future. This field is actively researched, and different solutions have been proposed to address the challenges in this area, such as limited amount of energy and cost-efficiency. One of the most discussed topics in IoT is the Smart Home Safety and Security system, developing an inexpensive and safe system for indoor use has been a widely researched area which has brought advances in technology and availability of small, flexible, and smart systems.

Guided by the concepts of IoT we develop a cost-efficient electronic system that has the capability of ensuring safety from three most basic security concerns: Thieves/burglars, fire hazard and odorless gas leakage.

Literature Survey

We went through the following papers to learn more about the safety aspects and the methods which can be deployed to sense the data from IOT devices and make decisions accordingly.

- AN APPROACH TO SMART HOME SECURITY SYSTEM USING ARDUINO - Electrical Engineering: An International Journal (EEIJ), Vol. 4, No. 2/3, September 2017: an intelligent security system designed to give surveillance at all times.
- IoT Based Smart Security and Home Automation System - International Conference on Computing, Communication and Automation (ICCCA2016): This IoT project focuses on building a smart wireless home security system which sends alerts to the owner by using the Internet in case of any trespass and raises an alarm optionally. Besides, the same can also be utilized for home automation by making use of the same set of sensors.
- IOT Based Home Security and Automation System- VOL. 04: DECEMBER, 2016 ISSN 2222-1247
- IoT based smart home: Security challenges, security requirements and solutions- 2017 23rd International Conference on Automation and Computing (ICAC).
  Identified security requirements and solutions in the smart home environment. Suggestions based on several scenarios, to set security goals for the smart home environment and forecast security attacks (like malware, virus etc.) and estimate how many attacks are expected to be launched in coming years on the basis of historical data.

Proposed Model

As the name of the project (TriEye), the major focus is on three segments of safety and security:

Anti-theft system: In this segment, a PIR motion sensor and an ultrasonic distance sensor is used. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensor's range. They are small, inexpensive, low-power, easy to use and don't wear out. Ultrasonic distance sensor measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal.

These sensors are placed around the doors and windows and if any motion is detected or if someone is close enough, the alert LED will turn on intimating the neighbors about the suspicious movement in an empty house.

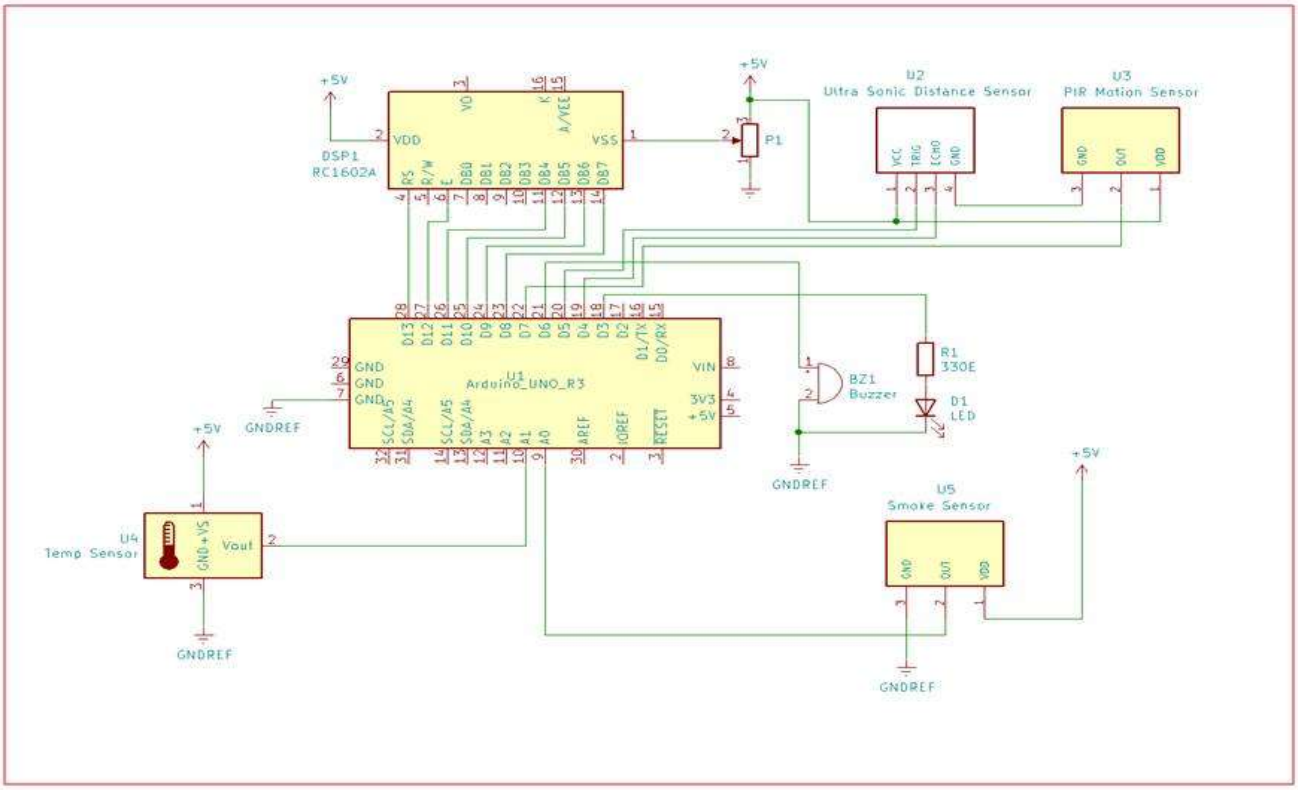
LPG gas leakage safety system: The MQ2 gas sensor is capable of identifying or sensing multiple gases which includes both LPG gas as well as carbon monoxide. It is useful for gas leakage detecting (in home and industry). It can detect LPG, i-butane, methane, alcohol, Hydrogen, smoke and so on. Based on its fast response time. measurements can be taken as soon as possible. Also, the sensitivity can be adjusted by the potentiometer. It can detect gas concentrations anywhere from 200 to 10000ppm and is very sensitive to Propane, Hydrogen, methane and LPG.

Fire Safety System: The LM 35 temperature sensor is a precession Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C. We have fixed the threshold as 50°C and as the temperature crosses the threshold, a message will be sent to the user that there are chances of fire as a sudden increase in temperature is sensed. Again, the MQ2 smoke sensor also plays a vital role in the fire safety system as it will also help in detection of smoke and can give alert to the user as soon as the smoke intensity crosses the threshold of smoke.

Whenever there is an alert or any of the three systems is activated, a message will be sent to the user stating the current situation of the sensor and if all the sensors of that segment work together, a call will be sent to the user. For this purpose and to make the system mobile, a GSM module is used. GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. It allows us to add location-tracking, voice, text, SMS, and data to your application. In the implementation of our model, we are using a LED to denote the message sent and the buzzer as an indication of callas well as the alarm system. For the demo purpose, we are using a GPIO (General purpose Input Output board) as it contains buzzer and LM 35 sensor together in one board.

Circuit Diagram

Schematic Diagram: Home Security System



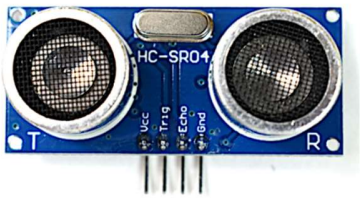
Experimental Setup

- **Components**

PIR motion sensor

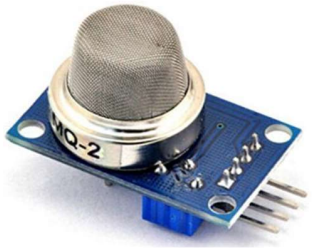
This sensor is a part of anti-theft system and is used to detect the motion near it. It can be placed near the doors and windows to detect intrusion.

Ultrasonic distance sensor



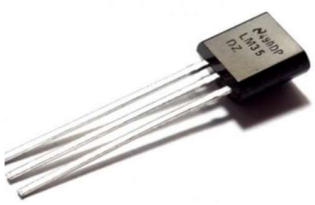
It is also a part of anti-theft system and is used measure the distance of an obstacle. A threshold value is set for this and as soon as an object comes within the threshold range of this sensor, it calculates the distance and gives an alert. This combined with motion sensor makes the anti-theft system to detect intrusion.

MQ2 gas sensor



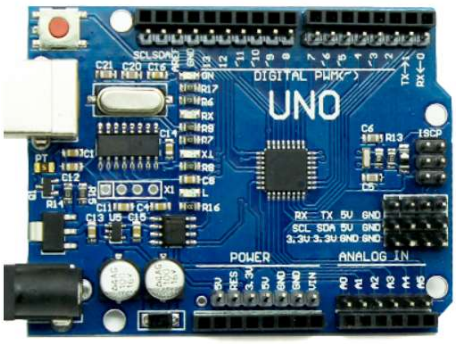
Due to the versatility of MQ2 sensor, it is a part of both LPG gas detection system and fire safety system. It can detect both LPG gas as well as carbon monoxide with a concentration of 200 to 10000ppm from anywhere nearby. So, a threshold is fixed and as soon as the intensity of smoke or LPG crosses that threshold, it will sense it and will give the alarm as well as the reading of concentration.

LM 35 temperature sensor



It is a part of fire safety system and has -55°C to 150°C temperature range. So here as soon as the temperature crosses the threshold, it will notify the user that there is a chance of fire as there was a sudden increase in temperature. This together with smoke detector (MQ2 sensor) will help in detection of fire.

Arduino Uno



Arduino Uno is a microcontroller board based on the ATmega328P. This is the master board which will take the input from various sensors of the model and will give the output according to the conditions written in the code. The code is written in Arduino IDE and then it is uploaded in the chip to make the microcontroller work.

LCD display

An LCD display is used to monitor the output and the notification that will be sent to the user. This LCD is used for demo purpose only to verify the output.

LED (Action LED)

The action LED is the normal LED light which is used in this project as an indication of the message. Whenever there is a situation created when a message is sent to the user, it is denoted with the LED blink in the model.

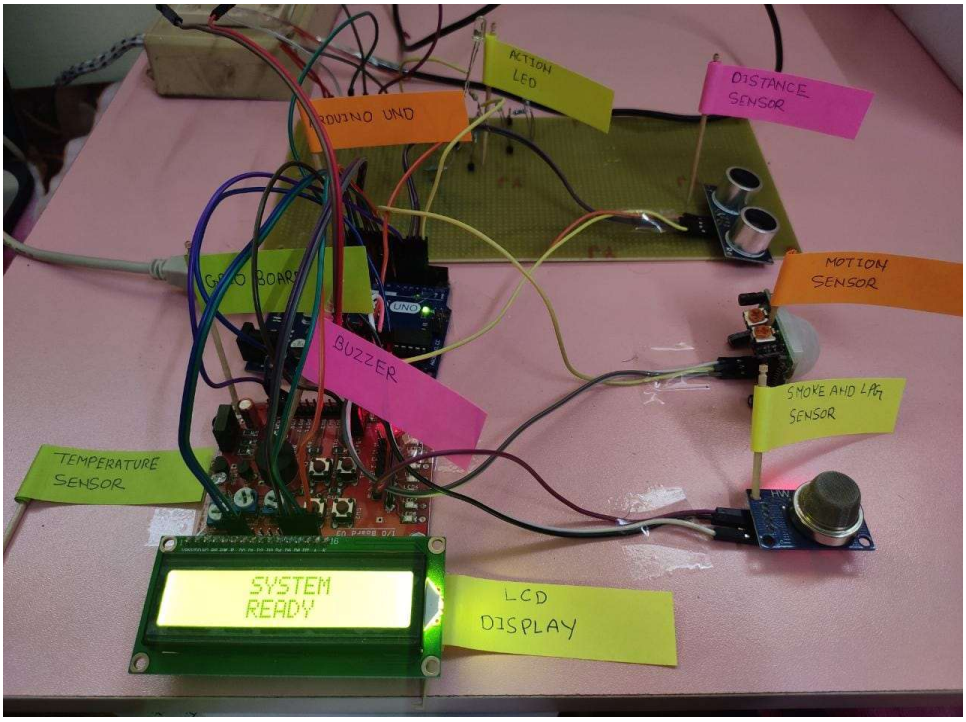
Buzzer

The piezo electric buzzer is used to indicate the call and alarm as well. As this is a home safety and security system, it is important to alert the neighbors also about the theft, fir or the gas leakage situation. So, whenever any one of the three system is activated, then the buzzer turns to HIGH and indicates that a call has been sent to the user and an alarm alert is also given.

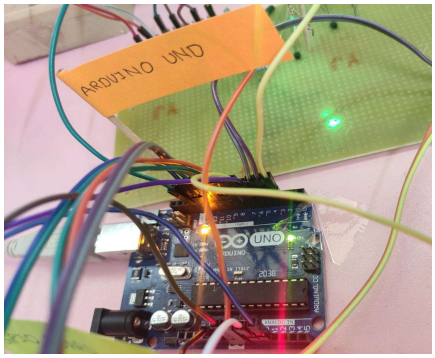
For simulation purpose, we checked the working of all the sensors. Obstacles are used for checking ultrasonic distance sensor, movement is detected by the motion sensor. For checking the smoke sensor, we used the incense stick and for raising the temperature (for checking LM35 temperature sensor), we used a hair dryer.

Hardware setup

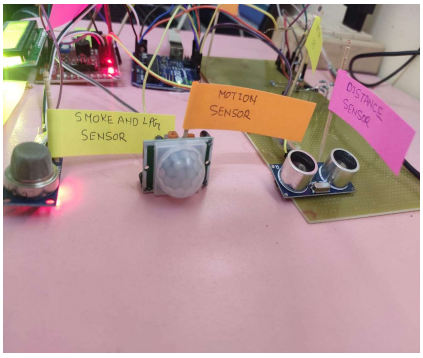
Project



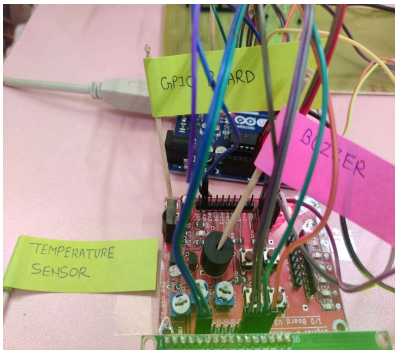
Arduino Board



Sensors



GPI/O board



Experimental Results

System in ready state

Anti-theft system

PIR motion sensor

Ultrasonic distance sensor

Fire Safety system

MQ2 smoke and gas sensor

LM35 temperature sensor

LPG gas leakage detection system

MQ2 smoke and gas sensor

Conclusion

As IoT these days is on a boom and many other multinational companies are trying to excel in technical aspects. This project can be a future need and a major leap towards the enhancement of home security and safety. Hence, it was an immense pleasure to grab this opportunity and successfully develop the project on the same. It was a great experience working and exploring various IoT devices and applications of IoT. While implementing this project we have learnt about various sensors and a number of concepts related to IoT. As we come towards the end of this project, we can ensure a proper security system guarding our houses and keeping us away from any sort of mis happenings.

References

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