

Smart Home Automation and Home Security using Internet of Things

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ABSTRACT

This paper presents the smart home automation system with the additional security using Internet of Things (IoT) and GSM. A 'Home Automation System' is a technology that enables the automation of bulk of electronic, electrical and technology-based functions within a home. It uses a combination of hardware and software technologies that enable the control and management of devices within a home. Home automation is also known as Domotics, this system is easy to use and provides control and management of home appliances such as light, fan, TV and air conditioner etc. from anywhere in the world with the help of user's smart phones for this purpose this system uses Arduino Uno microcontroller, ESP 8266 for Wi-Fi connectivity, GSM module and PIR sensor-based surveillance camera to provide security alerts.

Keywords: *Arduino Uno, Internet of Things (IoT), ESP 8266, GSM module, Home automation and security system*

1. INTRODUCTION

The term 'Home Automation' is generally used in the increasing application of automation in home appliances and residential areas and is especially about automation by electronic means. This term is also used for building automation for the automation of all the devices of whole building. It includes traffic vision and operation on air conditioning, lighting, surveillance, security, doors and windows. This types of equipments and systems are called home automation devices and a home is equipped with these devices is known as a smart home. Smart Homes is a house where most things are tech-driven. There are many tasks simultaneously occur when pressing the button. The whole house runs on the signal of a Smart Home Controller. This controller works like a remote, which also arranges the home temperature, humidity etc.

2. SMART SECURITY SYSTEM

Safety conditions means a fear-free situation. Everybody in our recent world has dreamed of a beautiful home, it can be controlled in the simplest way. Apart from this, they also think what the security of the house will be and the cost of the security system? According to this objective, we introduced low cost and impenetrable security system with our Smart Home. This system provides two types of security via SMS alert with the help of GSM module these are - fire alert, theft alert. For theft security we have used PIR sensor that detects any kind of unauthorized movement and immediately activate the surveillance camera to take live images and sent it to the user's smartphones via email or android app and also sent the SMS alert to the authorized user and for fire security we have used DHT 11 sensor that detects the humidity and temperature of room atmosphere.

3. BENEFITS OF A SMART HOME

Automatic homes are constructed to run the home smoothly. This saves the time and money of the people of the home. A good home automation system offers many types of facilities. Such as delivering water in a garden as needed or to fix the room temperature according to the needs of the family member. There are alarm systems in the automation system to protect the homes where there are small children and the elderly. Even if the family members are not present in the house, the house remains stationed in their work. The electricity system of the home can be easily controlled by this type of home automation system. You can control all the electrical appliances while staying in one place. By the use of the motion sensor that recognizes the motion, the light itself opens or closes when someone is at home or not. They also have biometric locking systems and buzzer alarms with close-circuit camera. These alarms start playing with a loud voice when the stranger arrives at the house safe or on the special rooms of the house. These systems also sent SMS alert on the user's phone with the help of GSM module.

4. INTERNET OF THINGS

Kevin Ashton is called "the inventor of IOT" because for the first time in 1999 this word was used to describe a system where the Internet is connected to the physical world through the sensor. Internet of Things (IOT) is a network of physical equipment, vehicles, buildings and other things. It allows remote control in existing network infrastructure. An IOT system consists of sensors / devices that communicate with the cloud through some kind of connectivity. Once the data reaches the cloud, the software processes it and then decides to perform an action, such as sending an alert or adjusting the sensor / devices according to the user's need.

5. PROPOSED DESIGN

The main objective of this project is to build a smart home device that can be used to control home appliances through internet. The home automation device you create can be integrated with almost all home appliances and can be used to control them from any part of the world.

To facilitate wireless connectivity with the system, Arduino Uno will be embedded with a Wi-Fi module. It establishes an Internet connection from the system and all home appliances can be connected to and controlled from the Internet. The device can also be linked to the Android app, which you can develop on your own using some applications like MIT App Inventors. By using this app, you will be able to easily monitor and control the home appliances from any part of the world.

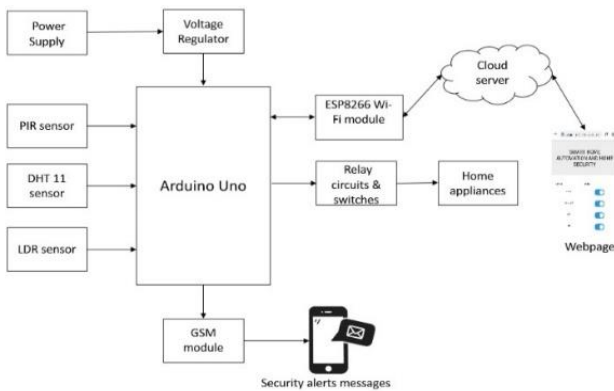


Fig.(a) Block Diagram of Home Automation system

5. COMPONENT DETAILS

5.1. ARDUINO UNO

It is a microcontroller based physical computing platform. Digital and analog input / output are available in pins in this circuit boards which can be interfered in various extension boards and other circuits. This board has a feature called serial communication interface, which includes USB.

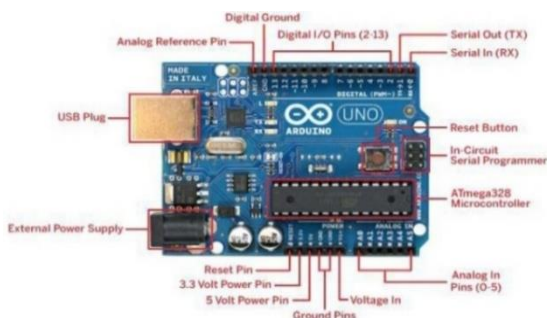


Fig. (b) Arduino Uno

5.2. GSM MODULE

This module can be used for making call, realized voice call and SMS. Performed in DC voltage, having auto power ON, controlled via TTL or RS232. GSM is a standard developed by the European Telecommunications standard Institute to describe the protocols for second generation digital cellular networks used by the mobile devices. It was first developed in Finland in December 1991.



Fig. (c) GSM Module

5.3. VOLTAGE REGULATOR

It is used to maintain continuous voltage levels and is also used to regulate AC or DC voltage. The voltage regulator has a negative feed-forward design or may have negative feedback control loops.



Fig. (d) Voltage regulator

5.4. Wi-Fi MODULE:

It is a Wi-Fi connectivity module that allows microcontroller to access a Wi-Fi network. ESP8266 Wi-Fi module is usually used but this module is not capable of 5-3V logic shifting and will require an external logic level converter.



Fig.(e) Wi-Fi Module

5.5. PIR SENSOR

It is capable of understanding the speed of the human and therefore it is also called motion sensor. Every time a person passes through this sensor this will automatically realize the speed through IR radiation and send the data to the microcontroller.



Fig.(f) PIR sensor

5.6. LDR SENSOR

Light dependent resistor or simply LDR produced output through the intensity of light. It is a variable resistor that changes with the intensity of light when light fall upon it. A photo resistor is a light controlled variable resistor.



Fig.(g) LDR sensor

5.7. DHT11 SENSOR

DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and gives the digital signal on the data pin (no analog input pin is required). It is quite simple to use, but requires careful time to grab the data.

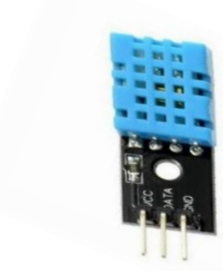


Fig.(h) DHT 11 sensor

5.8. LCD 16x2 DISPLAY:

This LCD has green light, required 5V DC supply, high contrast with wide viewing angle, can display 2-lines. It is used to all the data show in the 16x2 LCD display.

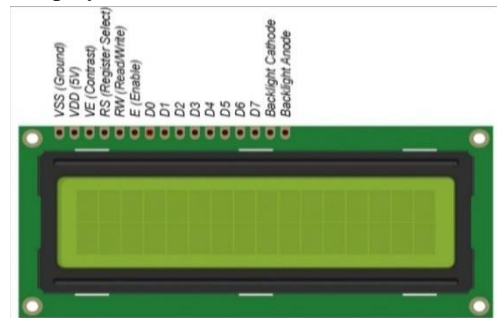


Fig.(i) LCD 16x2 display

5.9. RELAY DRIVER (IC ULN2803 APG):

The relay driver IC you use will have the following features, 500-mA rated collector current, high voltage output - 50V, output clamp diode, different types of logic input.



Fig.(j) Relay Driver

6. STEPS OF PROJECT IMPLEMENTATION

Step 1: To establish a connection between the client and the server, the Wi-Fi option is enabled in the smartphone.

Step 2: It is connected to the system's Wi-Fi module.

Step 3: Each electronic / electrical device in the system is connected to the digital pin on the Arduino Uno board.

Step 4: A relay is used to connect each device with Arduino, which helps to convert high voltage supply to low voltage.

Step 5: A C-program is loaded on the microprocessor chip on the Arduino Uno board, which explains what action to take on receiving special input.

Step 6: An Android application has been developed which enables the end user to monitor and control devices from any remote location.

Step 7: Socket programming is used to achieve client-server communication.

Step 8: Successful control and monitoring of equipment.

We need to use USB in the serial converter which allows system operation at 3.3V. We can connect the PIN of the ESP8266 module through wires for the related pin on the USB. Arduino Uno connected to the ESP8266 Wi-Fi module is used to implement the micro-web server for the home gateway. A traditional light switch will be integrated with Arduino by using the relay driver module to display the switching capability. This hardware architecture is very flexible and allows other home appliances and devices to integrate seamlessly with minimal change.

7. PROGRAMMING LANGUAGE

Arduino Programming (C++)

8. ACKNOWLEDGEMENT

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9. CONCLUSION

We have successfully completed this project. This paper gives basic ideas about the controlling of home appliances and provides Security using smartphones. In the future, it can be

extended for many other applications. Users can observe and control the activities of the devices. This system can detect any kind of unauthorized movement and informs the user through the security alerts.

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