

WIFI SECURED HOME AUTOMATION

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ABSTRACT

Now a day's technology has become ever more invasive, the design challenges in home automation with security are increasingly apparent. Seamless controlling home, monitoring and programming by the end user have yet to enter the mainstream. This could be legitimate to the challenge of developing a fully independent and extensible home system that can support devices, secure devices from other user and technologies of differing functionalities and protocols. This paper describes how to control and monitor home appliances using web page & fingerprint sensor over internet. There are number of commercial home automation systems available in market. However, these are designed for limited use. Therefore, home appliances can individually be controlled both from within the home and remotely. This is very helpful to people with locomotive disabilities The practical goal of this paper has been to create a virtual, but practically usable, web page home automation system. Webpage is used to send the commands to the Arduino to control all the home appliances. The main feature of this system is to control the voltage levels of home appliance in home like speed of fan based on temperature, intensity of light based on light intensity etc. and another feature is we may get the status of our home appliances from our web page. In this system we use different sensors like temperature, fire sensor ,Rain sensor, fingerprint sensor and LDR for different applications.

Keyword: IOT, Arduino Mega, Fire ESP8266, Sensor, Temperature Sensor

1. Overview

Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. Due to the advancement of wireless technology, there are several different technologies that were introduced such as WIFI, GSM. Considering the advantages of Wi-Fi, an advanced automation system is developed to control the appliances in the house. In this paper we described about controlling all the home appliances using web page and also the many different kinds of sensor to check the home temperature, light sensitivity, humidity sensors etc. All the appliances are controlled by Arduino Mega, Wi-Fi (ESP8266) Module and by using web page. The main advantage of project is that anyone can operate all home appliances, security which are held in house and it will tell us about the activities that take place in the house. In this we are using Wi-Fi Module to receive the commands from web page from any remote location which will be processed by Arduino. In this design web page has developed by using HTML, CSS, and J Query language. Thus the proposed system can monitor and control all the home appliances and keep the home secured.

1.1 Literature Review

“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it” was Mark Weiser’s central statement in his seminal paper in Scientific American in 1991. There is a sea change in human’s daily life as well as in working conditions in organizations after the arrival of IT and ITeS technologies. This is becoming well-known concept across many horizontal and vertical markets including a common man’s everyday life in the society, as it has several applications. The development of the Internet of Things has been primarily driven by needs of large corporations that stand to benefit greatly from the foresight and predictability afforded by the ability to follow all objects through the commodity chains in which they are embedded.

The ability to code and track objects has allowed companies to become more efficient, speed up processes, reduce error, prevent theft, and incorporate complex and flexible organizational systems through IoT. The IoT is a technological revolution that represents the future of computing and communications, and its development depends on dynamic technical innovation in a number of important fields, from wireless sensors to nanotechnology. Many Authors designed home automation systems by using different technologies. Technologies such as android ,GSM and other technologies are most prominent. In this project we used webpage to communicate with the Arduino and its output relay. We feel that using webpage to control the security system and other home appliances would make it more secure and free from any hacks.By using Bluetooth home automation system also we can control all the home appliances. But the main disadvantage is Range[9,12].Some authors designed home automation usingWi-Fi. and android but the android phone is rooted then the hacker can misutilise the systems and its operation. Moreover it can compromise the security of the house.In our design we implemented ON/OFF functionality in our webpage which seems more user friendly. The home appliances are controlled by clicking on the buttons on webpage.This will make the project more secured and flexible.This project demonstrates a good combination of networks combined with embeded system and web technology.

2.Introduction

2.1 Existing System

This device is used to synchronize between different home appliances.Different home appliances can be controlled from remote locations. It involves the control and automation of lighting and heating (smart thermostats) etc. This is achieved using wifi. Wifi is used for remote monitoring and controlling. This is used to control and monitor home appliances using android application over internet.The system is a combination of embedded system,web technology and networks. The system allows the user to control the appliances of daily use in their house.The system is equipped with all the relays sufficient to allow working of normal home appliance that can work on low voltage.An android application is built to control the home appliances in the house.The android device is first connected to the ip address of the wifi module.The wifi module is connected to the Arduino board which has relays containing both input and output.The output relays are connected to the different home appliances.Thus the user who has the android application can easily control all the home appliances through the application by connecting to ip address of the wifi module.

2.3 Issues in existing system

The existing system is not efficient in saving energy because it uses a lot of input power in order to work.The existing system is not secured against security breaches.It doesn't notify the user when there is a breach in the home security or someone forcibly enters into the house.The system doesn't notify the user on their phone when a fire is caught in the house or some stranger enters into the house.The existing system also does not sense the lights of the outside of the house.This could lead to consumption and wastage of a lot of electricity which in turn can be a huge economic default for the person using this system.The existing system does not use smart Aol for mail services.The user will not be knowing about the mails that he receives from his office ,relatives or some stranger.The existing system is not secured against fire accidents caught by any short circuits or other phenomenon. The existing system controls the devices using android application.The main drawback of using an android application is that android applications are full of bugs which makes it less secured against the hackers.Thus the application is hacked by a hacker can misuse the application and can cause a havoc.Another disadvantage of using an android application is that if the phone is rooted then the security of the whole house will be compromised.The application could be used in any way possible by the hacker or the person who roots the device.A device when rooted can be easily hacked by a hacker which is overcome in the proposed system by creating a webpage using java script, html and css.

3. Specifications And Design Analysis

3.1 The Proposed System

This Arduino based Wifi Automated Home automation system board is interfaced with the temperature sensor, LDR and smart AOL card for accessing mails that has received and internet enabled lights in order to control the fan speed, light intensity and for detecting security breaches. We can vary the speed of fan depending on the temperature at our home. Temperature is measured by using LM35 sensor. Similarly the intensity of light is varied depending on the necessity by using LDR. The status of light and fan are also displayed on the LCD display. The Wi-Fi module and the Arduino board are connected through ESP8266. The light fans and finger sensors are connected to Arduino board through relay which acts as switch. All these appliances are controlled using a webpage that could be controlled using our smartphone and pc browser. The home automation system built using the combination of embedded system, networks and web technology is more secured and stable than most of the existing system. Many of the disadvantages of the existing systems have been removed in the proposed system. Eg It has been made more secured by the use of web technology and the considered bugs are removed in order to make it as secure as possible.

3.2 Advantages of the proposed system

In recent years, wireless systems like Remote Control have become more popular in home networking. Also in automation systems, the use of wireless technologies provide several advantages that could not be achieved with the use of a wired network only. Reduced Installation costs Installation costs are significantly reduced since no cabling is necessary. The cost of installation of wifi is much less than cabling and also wifi provides a better and more secured way of internet connectivity because it reduces the risk of wire being cut during storm or unforeseen conditions. Internet Connectivity Control devices from anywhere in the world with use mobile phones to control smart home. This improves the connectivity of the user with his home. This also reduces the risk of any unforeseen condition that might take place. People can keep their house safe and secured from remote distance. Scalable and Expandable With the Compare of Wireless network is especially useful when, due to New or changed requirements, an extension of the network is necessary.

Security Easily add devices to create an integrated smart home security system and built-in security ensures integrity of smart home. The existing system is very efficient in saving energy. The existing system is secured against security breaches. The existing system does uses smart AOL for mail services. The existing system is secured against fire accidents caught by any short circuits or other phenomenon. It responds to the heat sensed by the heat sensor immediately and takes appropriate action to be done. For eg it may sprinkle water where its necessary otherwise it would notify the user on their cellphone and a buzzer will be activated. The existing system can be controlled even from the remote locations. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web based application. If server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser

3.3 The Proposed System Architecture

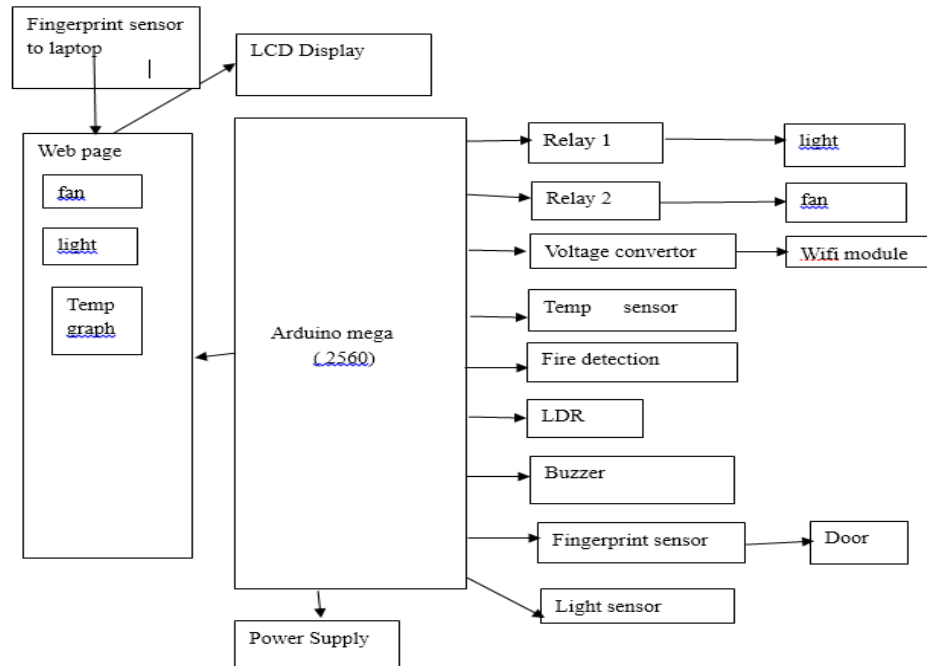


Figure.3.1

The proposed system architecture describes the structure of the wifi secured home automation. The architecture describes how the Arduino Mega 2560 connects to various relays and in turn the relays are connected to home appliances. A fingerprint sensor is connected to the laptop and the webpage which consists of toggle buttons for fan, light, and temperature graph is connected to the LCD which will display the information digitally. The power supply is given to the Arduino Mega and the Arduino Mega is connected to the relays and in turn the relays are connected to the outputs of the home appliances.

3.4 System Requirements

- Arduino Mega
- Rain Sensor
- Temperature Sensor
- LDR
- Wi-Fi module
- Relays
- Servo Motor
- L293D motor
- Driver IC
- MAX 232
- Led bulb.
- Esp8266 wifi Module.
- R305 Optical Fingerprint Sensor-Scanner
- 16x2 LCD
- 10k potentiometer
- 220ohms resistor
- Red LED Green LED

- Bread board
- Jumper wire
- Buzzer
- Flame sensor
- 220 Ω , 560 Ω , 2.2 k Ω and 10 k Ω resistors.
- LM35 temperature sensor

4. Module Description

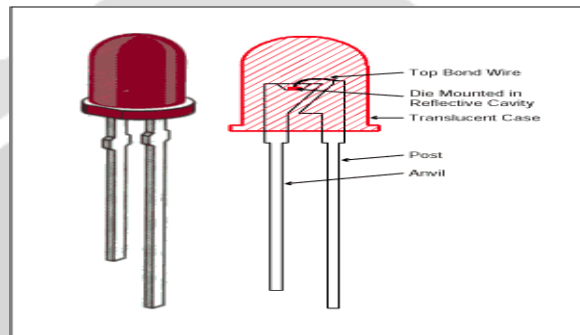


Figure 4.1

4.1 LED:

A light emitting diode works on the principle of photon emission. When light fall on the LDR, the resistance decrease. Resistance is inversely proportional to the light.

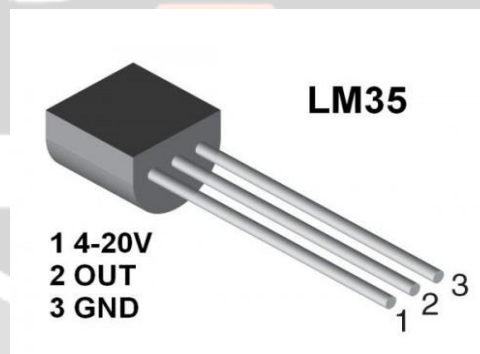


Figure 4.2

4.2 LM35:

The LM35 temperature sensor is used to detect the temperature levels in our home. The advantage of LM35 sensor is its low cost and highest sensitivity between $+2^{\circ}\text{C}$ and $+250^{\circ}\text{C}$ and a low power consumption at only $+5\text{V DC}$.



Figure 4.3

4.3 Flame Sensor: General Description: Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface can and single chip can be directly connected to the microcomputer IO port. The sensor and flame should keep a certain distance to avoid high temperature damage to the sensor. The shortest test distance is 80 cm, if the flame is bigger, test it with farther distance. The detection angle is 60 degrees so the flame spectrum is especially sensitive. The detection angle is 60 degrees so the flame spectrum is especially sensitive.



Figure 4.5

4.5 ARDUINO

Arduino is an open-source electronics prototyping platform based on flexible, simple to use hardware and software[5]. It's proposed for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. In simple terms, the Arduino is a small computer system that can be programmed with instructions to interact with different forms of input and output. The current Arduino board model, the Mega, is small in size compared to the average human hand. It has many analog and digital IO pins. It operates with 5v power supply, which is connected from either USB port or External power supply. It can function between 5V – 20V. It has ATmega1280 micro controller. This microcontroller has many features. It has 128KB of flash memory, 4 KB of which are used for the Boot loader, 8 KB SRAM and 4 KB EEPROM. Arduino has 54 digital IO pins. To select the input or output pin, we use the `pinMode()`, `digitalWrite()`, and `digitalRead()` functions. All these pins work at a maximum current of 40mA. These digital pins have some special functions. They are Serial 0: pin 0(RX), pin 1(TX), Serial 1: pin 19(RX), pin 18(TX), Serial 2: pin 17(RX), pin 16(TX), Serial 3: pin 15(RX), pin 14(TX). The TX is used to transmit the data and the RX is used to receive the data. The other special function pins are the SPI pins, SPI: MISO pin 50, MOSI pin 51, SCK pin 52, SS pin 53. It also has 16 analog input pins provides 10 bits of resolution (1024 different values) and uses the `analogRead()` function. In this we have 10 bit SAR ADC to convert analog data into digital form.

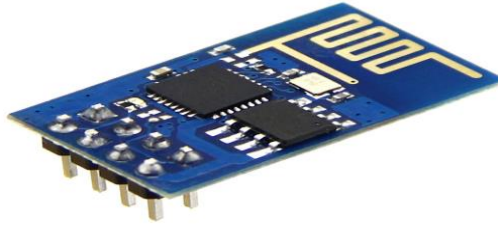


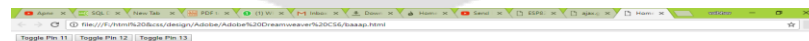
Figure 4.6

4.6 ESP8266

ESP8266EX offers a complete and self-contained WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the WiFi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; sample codes for such applications are provided in the software development kit (SDK).

5. Working

The Arduino board is interfaced with the temperature sensor, LED and temperature sensor in order to control the fan speed, light intensity and to check the temperature. We can vary the speed of fan depending on the temperature at our home. Temperature is measured by using LM35 sensor. Similarly the intensity of light is varied depending on the necessity by using LDR. We can detect the temperature of the house and status is displayed in the LCD display. The status of light and fan are also displayed on the LCD display. The Wi-Fi module and the Arduino board are connected through MAX232. The light and fans are connected to Arduino board through relay which acts as switch. All these appliances are controlled using webpage that is created and can be accessed using both laptop and mobile browser. At first the computer and its web browser is connected with Wi-Fi module's IP address and then the characters are sending to the Arduino board through Wi-Fi module. Respective characters are assigned to the corresponding appliances in the code so that we can change the intensity of the light, speed of fan and check the status of temperature by sending those codes through the webpage in the web browser.

Figure 5.1: **Web page** : This the webpage with three toggle buttons in order to control the home appliances

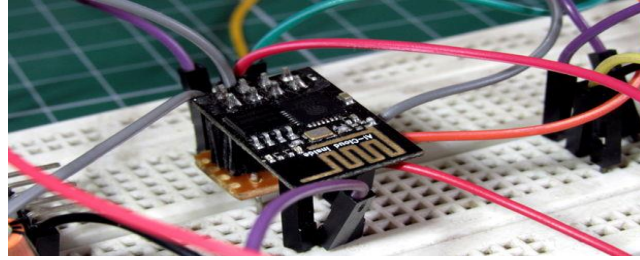


Figure 5.2: **ESP8266** :This output describes the ESP8266 connection

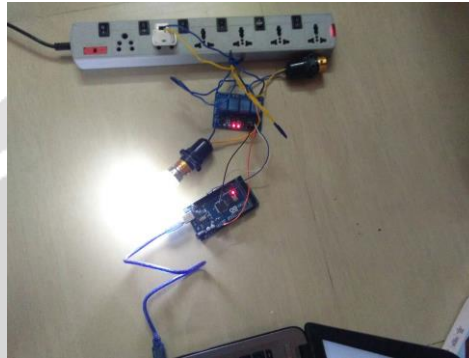


Figure 5.3: **Relay Connection**: This output shows the different relay outputs connected to the Arduino Mega board

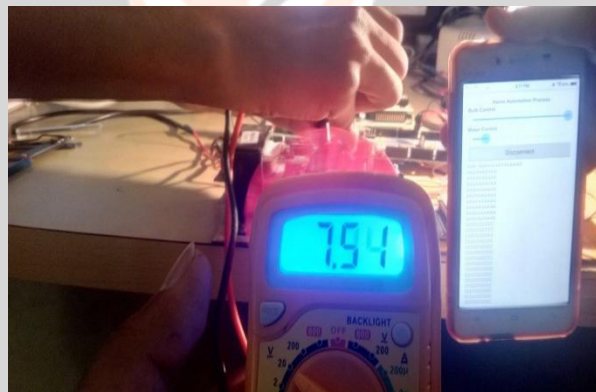


Figure 5.4 Results of Home Automation Using Webpage

6. CONCLUSIONS

The Arduino based secured home wifi automation system is the combination of many different technology which includes embedded system,networks,web technology.This system contains a variety of modules but in itself it is one of the most simplest yet most effective system in the field of IOT based home wifi automation.This system is made highly secured overcoming many of the disadvantages of the existing system.Ideas have been taken from the existing system and its issues are revolved in the proposed system.The system is made user friendly and flexible.It is cost effective since it doesn't require cables and many of the other complex modules are avoided in order to make this system more easier and simpler to use

7. ACKNOWLEDGMENT

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8. REFERENCES

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