

DOMESTIC APPLIANCES CONTROLLED AUTOMATION SYSTEM WITH NODEMCU AND ANDROID APPLICATION

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Abstract: This paper presents a low cost and flexible home control and environmental monitoring system. In today's world advancement of technology in the fields of automation is getting simpler and better in all aspects. There is a rapid increase in number of internet users. Smart phones have played a very important role in helping users with a much better internet service and different online applications. The concept of home automation is applied using internet of things. This paper can be explaining the idea of home automation using node MCU, and IOT (Internet of Things) only in online mode with the help of a data service provider. Home automation can include all home appliances to be managed and controlled by using mobile application. The rate at which more people are adapting to the home automation options is high. This is an approach that provides the users more comfort in their homes. These are features that include, ventilation, air conditioning, lighting and heating among others. Our main motive is to provide an easy control over appliances for disabled persons, That will provide convenience to their daily life and they can control appliances even when they are away from home. This system is implemented using "Android Things" and "Firebase" by Google, the latest technology in the field of IOT (Internet of Things) . Home automation develops the lifestyle by automating the appliances. This project aims to achieving the home automation using wireless technology. This paper focuses on flexible, cost friendly wireless smart home system, which would be based on an Android App.

Key words: Internet of Things (IOT), Home Automation, Mobile Application, Node MCU.

1. INTRODUCTION

As rapid change in technology always aim to serve the mankind, the expectation for living a simple yet advance life keeps on increasing [1]. Internet has become an important part of human's social life and educational life without which they are just helpless. The Internet of things (IOT) devices not only controls but also monitors the electronic, electrical and various mechanical systems which are used in various types of infrastructures. Internet of things (IOT) is expressed as the different computers [6].

Home automation using IOT is one of the best technologies to improve our home and making economically improve country. This paper provides the information about home automation using IOT and mobile application. Home automation can be defined as it is the removal of human interaction [5]. Using the concept of IOT we make sensors to communicate with each other which are powerful in automation [7]. The efficient use of electric energy is highly dependent on energy metering. presents an idea or a concept for smart home. Smart home or home automation can be said as the residential extension, it also involves the automation and controlling of lightings, ACs and security, which includes other home appliances. Data is collected with the help of node MCU ESP8266 [4]. Home automation is providing home safety for dwellers. It automatically switches on appliances in closets, stairways, and other dark

places. Thus accidentally tripping or running into thing is decreased. Home automation system using IOT is a way through which one can explore and control home appliances or devices with the help of internet connection. Internet has become the basic need for everyone and thus internet can be used for controlling the basic devices or appliances like TV, lights, fans, Air conditioners and much more.

This technology is operated with the help of smart phone and sensor (The only thing which is needed is the automation system should be connected to the cell phone).The main purpose of home automation system is to "SAVE ELECTRICITY" when not is used an as it is the important part of our daily life it should be save for further purpose when not in used. This system can control the settings of lights (brightness, dimming, switch (ON/OFF), use of fans (speed high or low) as per the people present in a particular room as shown in fig1.



Fig 1: Home automation prototype.

2. BACKGROUND INFORMATION

Kumar Mandula [2] discusses about the process of home automation using Bluetooth and Ethernet. When connectivity between Arduino and smart phone is established using Bluetooth, short range wireless communication is possible in an indoor environment. Ethernet module is used for connecting Arduino board from any part of the world.

Bharat Bohora[3] designed a system based on Blynk framework which controlled and monitored appliances via smartphone by using Wi-Fi as communication protocol and raspberry pi as private server. All the appliances and sensors are connected to the internet via NodeMCU. Ming Wang[4] in his paper discussed about his work on system that uses a smart central controller to set up a 433 MHz wireless sensor and actuator network (WSAN). A series of control modules, such as switch modules, radio frequency control modules, have been developed in the WSAN to control directly all kinds of home appliances.

P.Siva Nagendra Reddy [5] used android mobile to send commands to the Arduino board through Wi-Fi module and Arduino processed them to control all the home appliances. This system controlled the voltage levels of home appliances like fan, light etc. They got the status of their home appliances in their android mobile phone.

M L Sharma [6] developed a system in which a home automation system was interfaced with Android mobile devices. The mobile device and system communicated with each other via Wi-Fi.

Somnath Singh [7] in his paper discussed about designing a web-based control of home appliances which allowed user to switch appliances on/off by clicking on a webpage specially designed to interact with those devices, by being anywhere in the world with a computer or a smart phone connected with the Internet. Miss.

Aboli Mane [8] used Blynk app in her project of home management system and security. Different sensors were connected with NodeMCU. With the help of Wi-Fi,

NodeMCU was connected with Blynk app. On detection of any unwanted incident by different sensors, messages were sent to Blynk app.

2.1 Home Automation

Home automation makes a home smarter. Smart home is the term which has huge demand in present world and huge possibilities in near future. A home automation system may control lights, temperature, climate, entertainment and many other appliances. Home security is also a part of automation which includes security control and alarm system. Security control means controlling entries based on facial recognition and let recognized people in. On the other hand security alarms could be for fire or security breach in the home and notifying the owners. Home automation typically controls all the appliances from a central hub. The end user interface may vary based on application. The control system could be wall mounted, computers, a mobile phone application or web interface. It actually depends on the developers and the users. In our proposed system we have used mobile phone android application based control system.

2.2 IoT Based Home Automation

Internet of Things allows us to control connected devices from anywhere and exchange data over the devices. Home automation system controls home appliances automatically and when this system is connected to internet it becomes a part of IoT. There are three main generations of home automation. First is, different wireless technology with proxy servers, second is Artificial Intelligence (AI) controlled home automation and lastly robots which directly communicate with humans [2]. Our project is first generation automation. For implementing the first generation of the home automation appliances needs to connect with internet so users can control the system from any remote place. That's why IoT has become a need for automation.

2.3 Related Work

In paper [3] they have proposed a sensor based home automation system which can be controlled over android phone. Yet it needs to be controlled manually by increasing or decreasing the speed of fans and intensity of lights from phone. Paper [4] proposed an android based home appliances control and monitor system. Their proposed model can control appliances from internet and from switchboards. Again this system cannot give a solution for a long time control system in home automation. In paper [5] they have proposed a network assistant platform or server for controlling appliances in different modes. This system proposed less power consumption by disabling devices to low power mode.

3. SYSTEM DESIGN

3.1 Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board and the core of the board is ATmega2560 microcontroller chip. As shown in Fig 3.1 which we have used has 54 inputs/outputs pins among them 14 can be used as PWM (pulse with modulation) to level the voltage, some pins are used for communication also like Serial pin: 0 (RX) and 1 (TX); Serial pin 1: 19 (RX) and 18 (TX); Serial pin 2: 17 (RX) and 16 (TX); Serial pin 3: 15(RX) and 14 (TX). Used to receive (RX) and transmit (TX) TTL serial data and rest of the pins are used as digital inputs/outputs. Another 16 pins are used as analog inputs form the environment. It also has 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button.



Fig 3.1: Arduino Mega 2560

Arduino Mega runs with 5V of DC voltage which can be a battery or an AC to DC Adapter. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. Normally, 6V-12V as input voltage is recommended. Each pins gives 40mA DC current for 5V operation and for 3.3V operation it provides 50mA DC Current and also has an internal pull-up resistor (disconnected by default) of 20-50 kohms. It also provides 256 KB flash memory for code storage among them 8KB used for bootloader. As well as 8KB Static Read Only Ram (SRAM) and 4 KB Electrically Erasable Programmable Read Only Memory (EEPROM).

The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. The channel creates through USB and a virtual com port to arduino IDE on the computer. To run the code operating system like Windows need an .inf file and for other operating system machine will recognize the board as a COM port automatically. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being

transmitted via the ATmega8U2 chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

3.2 Esp8266 NodeMCU

There are various platforms for IoT system one of them is NodeMCU. It provides lower level control on devices which is known as firmware. These control runs on ESP8266 Wi-Fi SoC, which hardware is based on ESP-12 module. Esp8266 is a Wi-Fi based communication system's microchip. It uses TCP/IP protocol for communicating with internet through router. It uses 802.11b/g/n slandered technology for Wi-Fi communication. It is a Tensilica L106 32-bit RISC instruction unite microprocessor with 32 KB instruction RAM, 32KB instruction Cache RAM, 80KB Data memory.ESP8266 (Pin) and Arduino Mega's (Pin) common pins are GND TX (0)-3.3V, RX (0), 3.3V. For running the ESP8266 on Arduino platform we need to install ESP8266 package in Arduino IDE. As a board is using, we need to give the additional board manager.

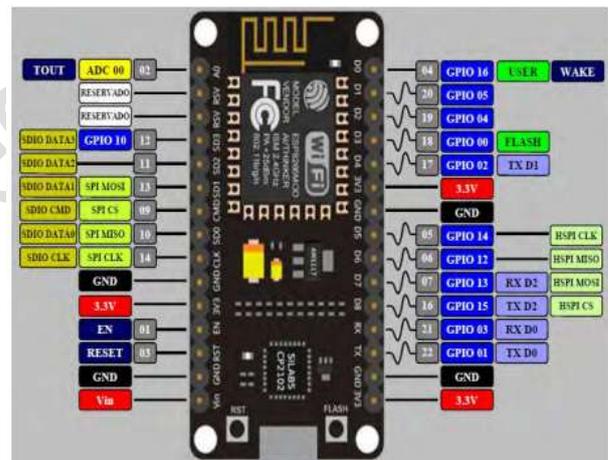


Fig3.2: Esp8266 NodeMCU chip [6]

4. SYSTEM ARCHITECTURE

4.1 System Overview

In our proposed system we have developed an android based home automation system which is capable of controlling home appliances based on user command. It also has own intelligence to control all the appliances according to user given modes. If user wishes to turn on or off any individual appliances it is capable of doing that. The most significant feature of this system is mode based operation. Like when user activates the auto mode than all the lights and fan will turn on or off with its own intelligence. If there is sufficient light on the particular room than lights will remain off. On the other hand if light is insufficient than lights will be turned on automatically. Based on different sensor values these actions are executed.

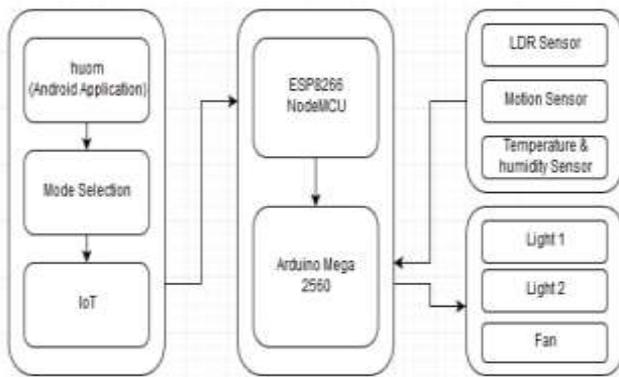


Fig 4.1: Architecture of the proposed system

As shown in Fig 4.1, user controls the modes and appliances by an android based device through our application named “huom”. User command is transmitted from device via internet. The esp8266 NodeMCU then receives the command from internet via Wi-Fi. The NodeMCU then passes the command to the controller board arduino mega 2560. Arduino then executes the commanded operation. So huom app is for end users to give input. Esp8266 NodeMCU and arduino mega is the control unit of the system. The arduino takes input from the esp8266 for executing actions. For execution of the action arduino also takes inputs from the sensors. Lastly the arduino runs the appliances according to user desired command.

5. RESULT AND DISCUSSION

TURN ON HOME APPLIENCES



Figure.5. Mobile app to turn on home appliances



Figure.6. Output for above figure-5



TURN OFF HOME APPLIENCES

Figure.7. Mobile app to turn off home appliances



Figure.8. Output for above figure-7

6. CONCLUSIONS

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. In this paper, Home automation system that can be controlled remotely upon user authentication is proposed and implementation is going to be take place. The objective of this system is to provide a convenient way to control home appliances by using the MIT app inverter and save energy as well as time. In the help of this project we are control all the home appliances through the IOT.

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