



Smart Home Automation Using AI

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ABSTRACT: This paper presents an idea or a concept for Home Automation using AI. Today, home automation industry is growing widely. Smart home or home automation can be said as the residential extension of building automation, it also involves the automation and controlling of lightings, ACs, ventilations and security which includes different home appliances which uses WiFi for monitoring via remote. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches and devices. Presently, conventional wall switches are located in different parts of the house which makes it difficult for the user to go it to operate. Even More it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most latest modern solution with smart phones. Home Automation must have compliance with all the household standards to make it easy to use.

This paper focuses on flexibility, cost friendly wireless home automation system which would be based on an Android App. The app will be working with the help of wifi module and arduino uno. The App would be featuring the method of voice recognition/command and it that might be taking commands from user so as to regulate different home appliances that might be connected via IOT. In order to achieve this, a Wi-Fi module is interfaced to the Arduino board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where appliances/loads are connected. By touching the specific icon/button on the GUI, the loads can be turned ON/OFF remotely through this technology. The loads are operated by Arduino board. AI function will operate the loads automatically based on the presence of any human in the house.

KEYWORDS: Home Automation, Android Application, Smart Phone, Connectivity, AI, Wi-Fi.

I. INTRODUCTION

As the mobile devices are continuously increasing in its popularity from longer time and also for its smooth functionality the demand for advanced and responsive mobile applications is increasing day by day in people's daily routine. Web services utilization is the most open and also practical way for providing remote service access or enabling the applications to make them communicate with each other. Busy and the most engaged families also individuals with physical limitations are the people who represent an attractive market for home automation including networking. Because of rapid development in internet of things and internet, we all have been highly integrated at an uneven scale. Internet Of Things often abbreviated as IOT refers to the interconnection of different devices or any appliances through any possible mode to the internet. The other idea that is used in this app is speech recognition. As we all know that speech has been one of the best means of communication between all individuals and will always be. The problem of communication with computer device led to a heavy research on speech recognition before this the communication between users and computers was simple click method which was suitable for a limited process but researchers wanted a more enhanced communication for the betterment of the people and technology and break the small thin barrier between user and computer. This similar method of speech recognition will be used in this app to control the home appliances with the user's voice commands.

II. PROPOSED METHODOLOGY

In today's busy world everyone has shortage of time and in this era of technology there should be a mobile app that could be used to control the home appliances with the help of android based GUI application or by speech recognition. This project will use the home appliances and will be powered with the Arduino uno and the WiFi module making an interconnectivity between the devices and creating an internet of things.

In this project the Arduino UNO and the WiFi module have been used to implement the smart home Automation System.

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use, convenient, hardware and software. The Arduino Uno is a microcontroller board that is based on the ATmega328. It almost has 20 digital



input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection and a power jack, an in-circuit system programming (ICSP) header, and a reset button. Low voltage switching relays are used to integrate the devices with the Arduino uno for demonstrating the switching functionality in the board.

In this proposed project a mobile application is created and it includes all the features of controlling the home appliances with the help of GUI or speech recognition and interconnectivity of devices.

The mobile app that is created, contains all the commands like switching on/off the Fan, Lights, etc.

Thus this concept basically contains the smart appliances in a home that can be controlled by WiFi and arduino and connected wirelessly with the mobile phones.

The mobile app in the mobile phone will be containing the options to give different commands to the appliances and controlling it with our mobile app from distance.

The main page of the app will be having the Home Page that will help in setting page that will be used to add and view the Layouts.

There will be switches provided in the app to control the devices and the appliances of the home and these switches can be customized manually or using voice by the user.

ARDUINO UNO

Arduino Uno is one of a type of microcontroller board based on the ATmega328P ([datasheet](#)). It has about 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection and a power jack and an ICSP header and a reset button. It contains everything that is needed to support the microcontroller; it simply needs to connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



Fig: Arduino UNO

"Uno" means one in Italian language and was chosen to mark the release of Arduino Software (IDE) 1.0. The Arduino Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards which also have a reference model for the Arduino platform; for an extensive list of current and past or outdated uno boards see the Arduino index of boards.

The Uno differs from all preceding boards in that series it does not use the FTDI USB-to-serial driver chip. Instead, its features are the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a additional resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

WI-FI MODULE

The ESP2866Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP2866 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP2866 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as we know that Wi-Fi Shield offers (and that's just out of the box)! The ESP2866 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with more sensors and other application specific



devices through its GPIOs with minimal development up-front and minimal loading during runtime state. Its high degree of on-chip integration allows for minimal external circuitry and including the front-end module, is designed to occupy minimal PCB area on the board. The ESP2866 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. Wifi module is shown in Fig.

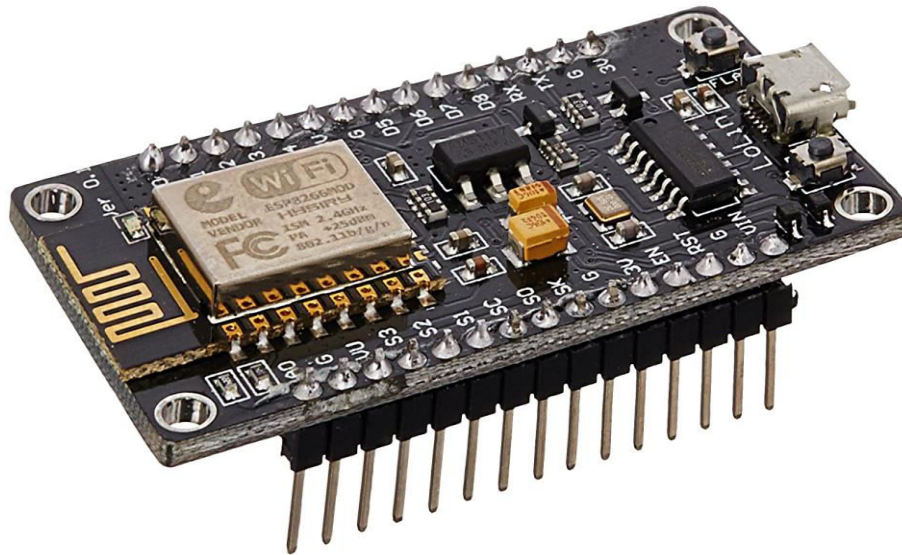


Fig: Wi-Fi Module

RELAY BORD/MODULE

A relay board is basically a switch which is operated by an electromagnet. All kind of electromagnet requires a small voltage to get activated which we will give from the Arduino and once it is activated, it will pull the contact to make the high voltage circuit.

The relay module we are going to use in the project is the SRD-05VDC-SL-C. It runs on 5V power supply and we can control it with any micro-controller but we are going to use Arduino.

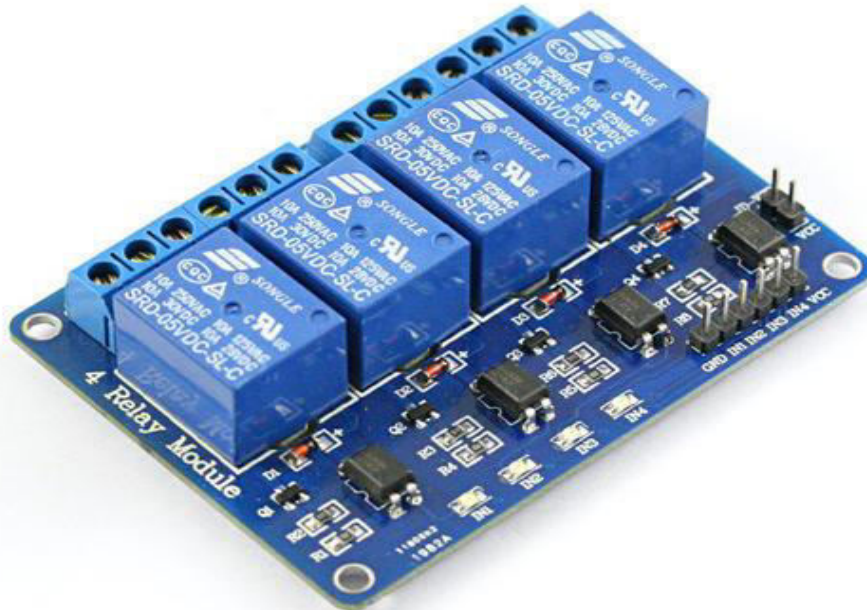


Fig: Relay Module

The relay module which we have used is a separate hardware device used for remote device switching. With it you can remotely control devices over a network or the Internet. Devices can be remotely powered on or off with commands



coming from the device is delivered over a local or wide area network. You can control computers systems, peripherals or other powered devices from across the office or across the world.

The Relay module can be used to sense any kind of external On/Off conditions and to control a variety of external devices. The PC interface connection is made through the serial port present.

The Relay module houses two SPDT relays and one wide/high voltage range, optically isolated input. These are brought out to screw-type terminal blocks for easy field wiring so that it cannot be damaged. Individual LED's present on the front panel monitor the input and two relay lines. The module is powered with an AC adapter.

III. ANDROID APPLICATON

There are several platforms for developing smart phone applications such as Windows Mobile, iOS and Android.

In the proposed system, the Android platform application is developed as most of the phones and handy devices support Android OS to provide better gui option. Java programming language using the Android Software Development Kit (SDK) has been used for the development and implementation of the smart home app for the android/smart phone.

We can control the home appliances using this app, the thing which we have to do is just simply install this app in the smart/android phone. Which will provide all the feature to control and operate the appliances as per our need. It will provide GUI to the user so that it become easy to operate.

The designed android app for the smart home system provides the following functionalities to the user:

- Device control and monitoring.
- It provide Scheduling tasks and setting automatic control of the smart home environment.
- Supports voice activation for switching functions.

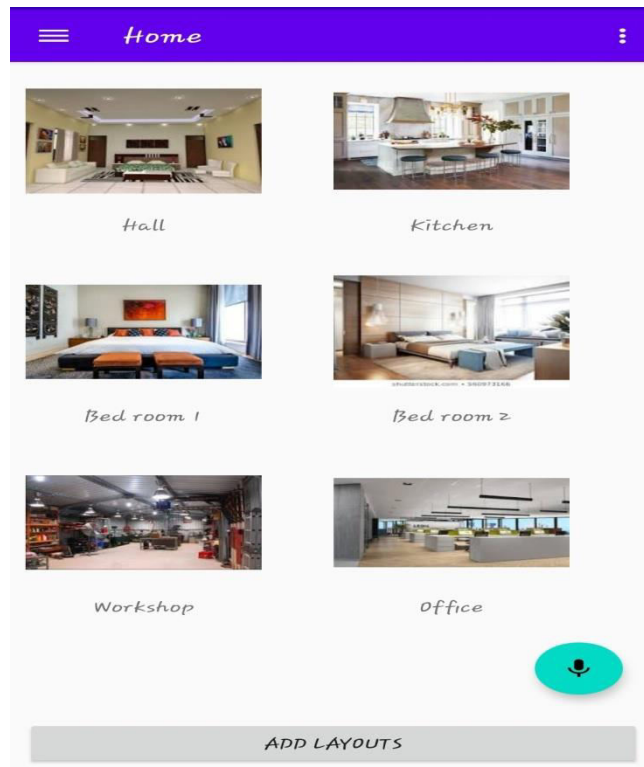


Fig: Android Application (Home Page)

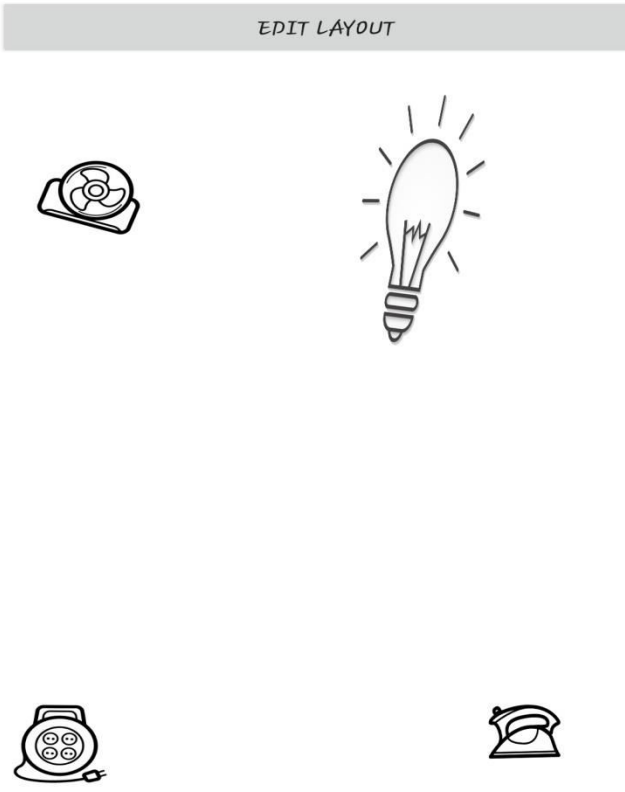


Fig: Android Application Layout

IV. SYSTEM ARCHITECTURE

Our proposed system is an arduino based home automation system done with Arduino connected to a wifi and controlled via android app or a social media network. This system deals with the safety in home and smart home technologies which will be cost efficient to every user. Block Diagram of the proposed system is shown in the Figure below.

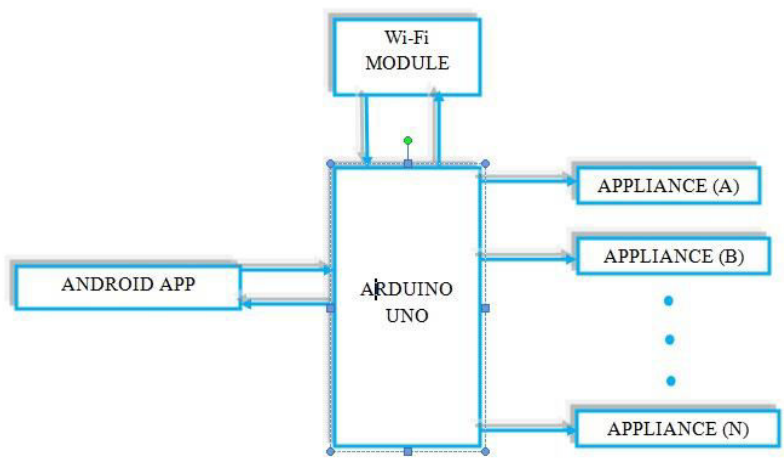


Fig: Block Diagram

1. The Android application that is installed in the mobile sends the signal to the Wi-Fi module which is connected to same network. Android application will have all the GUI buttons for each appliance.
2. Wi-Fi module receive the signal from the mobile and transfer this signal to the arduino board for



- processing purpose.
3. We have used arduino board as controller to control all the appliances. Relay board and Wi-Fi module is connected to arduino board systematically. Each command is processed by arduino board in the system and control the relay board for switching on/off the appliances
 4. Relay board are used as electrical switches, for performing on/off operation. Power supply is provided through the relay board to the appliances connected to the board.
 5. Finally user can access the android application in mobile and give command to Wi-Fi module which is connected to arduino which can control the all appliances in home automation system.

V. RESULT

Each sub-system was implemented and tested successfully in the proposed project. Each components are working properly and each them are in proper working condition as expected. All the features were integrated in the into the home automation system. It provides a better standard of living, enhanced energy efficiency and an environment adapted for the elderly and physically disabled.

VI. FUTURE WORK

In the present system we have used the wifi module to connect to the android and the proposed system. So in future we can provide access to the system remotely via the cloud and IoT technology to make it more smarter. A fingerprint authentication system could be implemented on the main user interface to achieve high security levels. A messaging or email system can be set up to notify users of system status.

We can add more hardware interface modules, and modify application software to handle them. By adding these all in the existing system will increase system mobility, configurable, and scalability.

More intelligent devices/Components should be added to hardware modules to make them capable to take decision according to triggered alarms. That will increase the response time of the system.

VII. CONCLUSION

The proposed project provides a Home Automation System that uses WiFi module and Smart phone with the help of Android application. Smart Home System provide interface between various types of home and electrical appliances like lights and fans etc. It provide control and ease of use of appliances as per users need. The project provides a user friendly automation system with good performance. The user gives command through android application which is connected to Arduino UNO with the help of WiFi module then the electrical Appliances of home can be regulated. Any android supported device can be used to install the smart home app, and control and monitor the home environment. Prospective future works may include incorporating SMS alerts and call alerts.

By using Home automation system we can manage cost, make flexible and energy efficient smart homes.

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