An IOT Based Smart Home Automation

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ABSTRACT: In this paper, we have designed a low cost Android smart phone based home automation system using ESP8266 which is enabled with WI-FI.This design is based on Arduino which is an open source prototype and relay board where the electrical appliances are connected. The proposed system is designed to provide comfort, convenience, energy efficiency and security to people. It also improves quality of life for disabled people or those who might require care givers or institutional care. The proposed system consists of a Smart Logic Circuit (SLC) connected to the home appliances. The SLC consists of sensors, Relay circuit, Nod-Mcu (ESP8266) enabled with WI-FI. Status of all home appliances could be controlled by user from remote location with the help of user's mobile phone. The proposed system supports two level devices that only need to be switched ON or OFF manually or auto-control based on sensors. For example, Temperature sensor senses the room temperature and changes the speed of the fan accordingly.

KEYWORDS: Smart Phone, Nod-Mcu (ESP8266), Relay, WI-FI Router, Home Appliances, LDR (Light Sensor), LM25 (Temperature Sensor), Arduino, Android

I. INTRODUCTION

The primary objective of the proposed IOT based smart home automation is to operate home appliances with ease using a smart phone. In the 21st century, the interaction between humans and computers are breaking all the barriers and invention of smart phone has brought drastic change in the lifestyle of common people. Automation has brought many revolutions in the existing technologies. There has been a significant increase in home automation in recent years due to higher affordability and advancement in smart phones which allows vast connectivity. Automation can replace the existing switches in home which may produce spark or fire in few situations.

Due to the advancement of wireless technology, technologies such as Bluetooth, ZIGBEE, RFID, GSM and Wi-Fi have enabled researchers to contribute towards advancement of Internet of things. Every wireless technology has its own specifications and applications. Considering the advantages of Wi-Fi, an advanced home automation has been developed to provide better control over electrical appliances in home.

In this paper, we have developed an android application to control the appliances using Arduino IDE and Node-McuESP8266 microcontroller which acts like a server. The proposed home automation system works as follows:

- The communication between the user and the system is established by Wi-Fi. User commands which are transferred to the server (i.e ESP8266) is done through Wi-Fi over internet.
- In the home automation server, the incoming commands are processed ,then digitized and sent to the relevant relay unit which has to be processed. In each unit they are consisting of separate electrical device to receive the commands from the transceiver and which apply these to the home appliances attached to the relay.

II. RELATED WORK

In [1] authors have implemented GSM based home automation system .Here we need to send message/make a call to control home appliances. It has more time delay and complex system. In [2] authors have implemented a java based home automation system. Authors have used an embedded board linked to devices physically. A web server based mobile control is used to operate devices. Though this method is secure it requires a high end PC. In [3] authors have implemented Bluetooth based home automation system. Here Bluetooth communicating devices are divided into primary controller and Sub controller. Sub controller is connected physically to the devices that are to be controlled. These sub controllers then send commands to the primary controller. Though this method has reduced cost for wiring it involves congestion & delay in commands sent to primary controller. In the paper [4] the authors have told that the Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet framework. Typically, IoT is expected to offer advanced connectivity of devices and systems, and services that goes beyond M2M i.e. machine-to-machine communications and covers a variety of protocols, various domains, and applications. The interconnection of all these embedded devices which also includes smart objects, is expected to lead in automation in nearly all fields enabling advanced applications like a Smart Grid. According to Gartner, there will be nearly 26 billion devices on the Internet of Things by 2020. ABI Research has estimated that more than 30 billion devices will be wirelessly connected to the Internet of Things by 2020.According to the recent survey and study done by Pew Research Internet Project, a huge majority of the technology experts and engaged Internet users who responded 83 percent agreed with the conception that the Internet of Things, embedded, wearable computing will have widespread and beneficial effects by 2025.It is clear that the IoT will consist of a very large number of devices being connected to the Internet. In the paper [5] the authors have stated that, the home automation system has been experimentally proven to work satisfactorily by connecting sample appliances were successfully controlled from a wireless mobile phone. The Wi-Fi was successfully tested on different mobile phones from different manufactures, thus proving its portability and wide compatibility. Structural scalability and informal extension is possible because of new or changed necessities, organizing a wireless network is especially beneficial, extension of the network is compulsory. In wired installations cabling extension is monotonous. This makes wireless installation a seminal investment. Some authors designed home automation using Wi-Fi. But in those designs they implemented only ON/OFF functionalities. In this design it can implement ON/OFF functionality along with the voltage variations and all the home appliances are controlled by using android application.

III. PROPOSED ALGORITHM
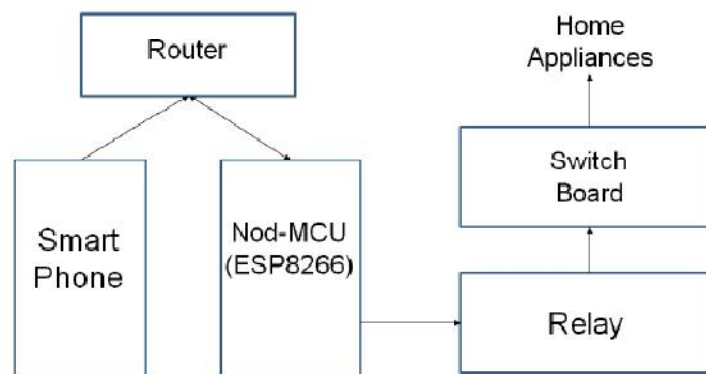
A. System Architecture

Fig 1 . System Architecture

As mentioned the proposed home automation system consists of three main modules, the server, the hardware interface module, and the software package. The following figure 1, shows the proposed system layout. Secure Wi-Fi technology is used by server, and hardware interface module to communicate with each other. 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.

B. Modules

   i.   Home appliances
        The proposed system operates three types of home appliances like LED light, fan and Lights. These can be operated using smart devices with the help of app. The speed of the fan can also be controlled.

   ii. Sensor
        Sensors are used to continue sensing the home appliances. The light sensor module (LDR) is easy for operation. Light sensors detect light, which is used to turn ON/OFF of lights. The temperature sensor (LM 35) is used to detect the temperature and accordingly the fans are turned ON/OFF. Sensors sense same data and send to the ESP8266 board which act like a server.

   iii. Relay circuit
        A relay is an electromagnetic switch which is continually operated by a relatively small electric current that can turn off /on a much larger electric current. Relay circuit act as actuators, in proposed system smart device are used to send ON/OFF command to the server, after that server send on/off signal to the rely circuit which used to control the home appliances .

   iv. Wi-Fi Router
        The WI-FI unit provides the medium for communication between home appliances and sensors. It can be also configured to make security services. The Wi-Fi should be configured with a user commands and certain address will be directing through Wi-Fi unit.

   v.   Smart devices

Smart devices such as smart phone, pc (personal computer), tab are used. Android app of the smart devices can be used to control and monitor home appliances.

C. *Description of the Proposed System:*

Aim of the proposed algorithm is to maximize the network life by minimizing the total transmission energy using energy efficient routes to transmit the packet. The proposed algorithm is consists of three main steps.

Step 1: Login to the downloaded Application.

Step 2: Connect the smart phone and micro controller using Wi-Fi.

Step 3: Sends user input over the network to the Micro controller.

Step 4: Forward the incoming input to the corresponding relay unit

Step 6: Relay sends the user input to the connected appliances

III. SIMULATION RESULTS

This section describes the screens of the "IoT Based Smart Home Automation". The snapshots are shown below for each module.
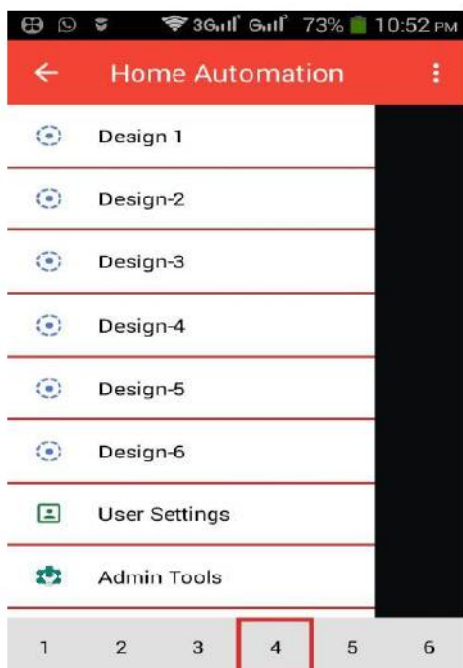
Fig 2 . Menu of the App
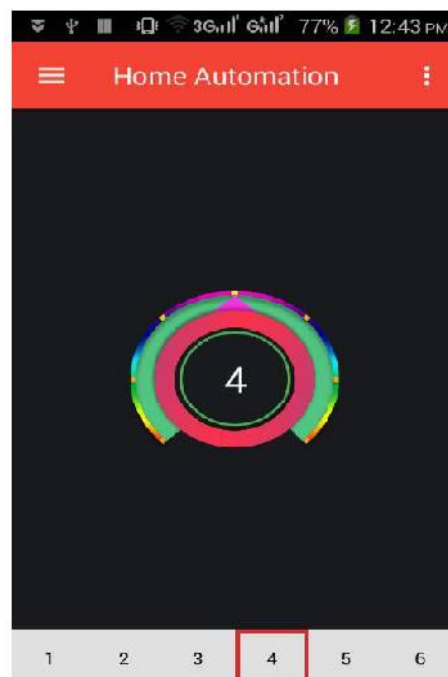
Fig 3.Fan Controller

Fig 4.Controlling using web page
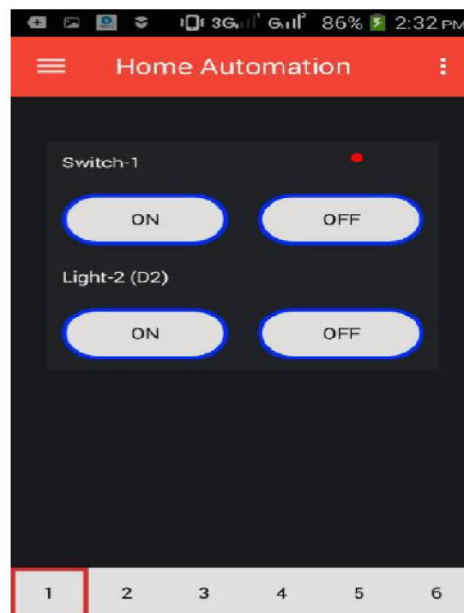
Fig 5 . Individual Appliances
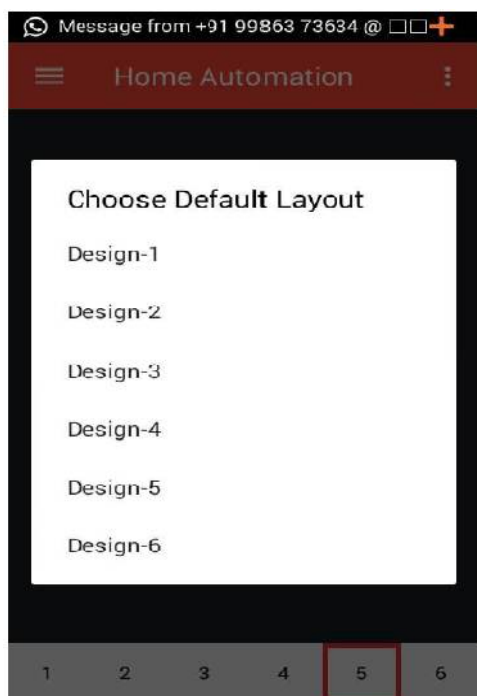
Fig 6. Choosing the default Layout
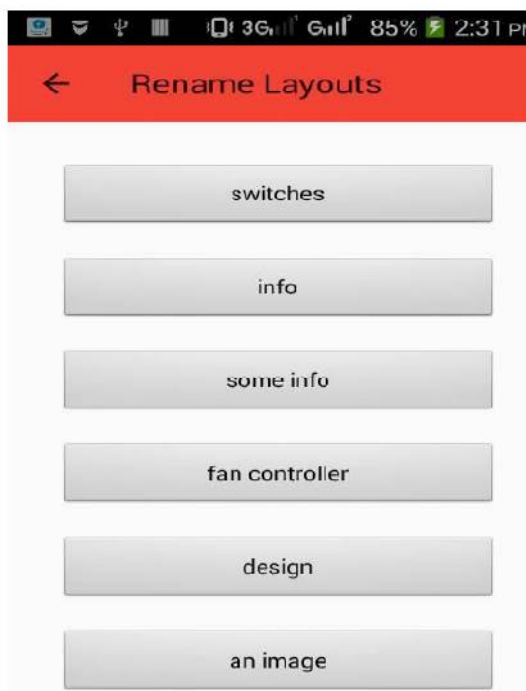
Fig 7. Main Activity

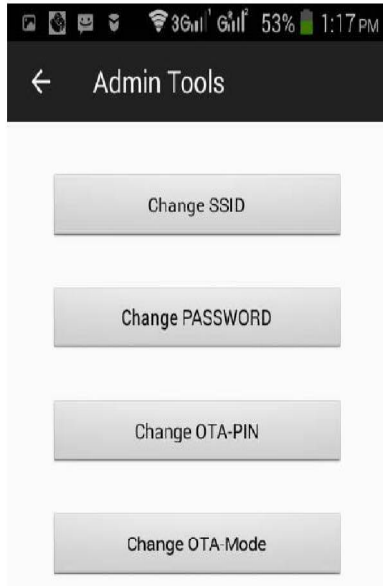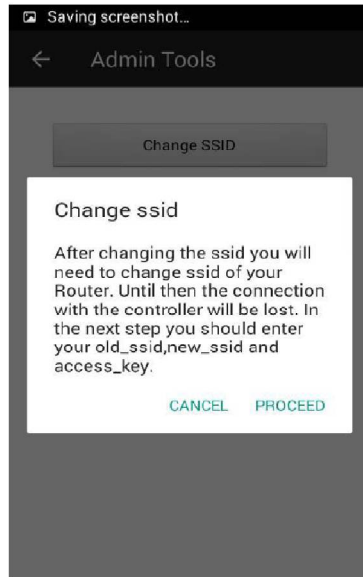Fig 8 . Authentication Details

Fig 9. Resetting SSID
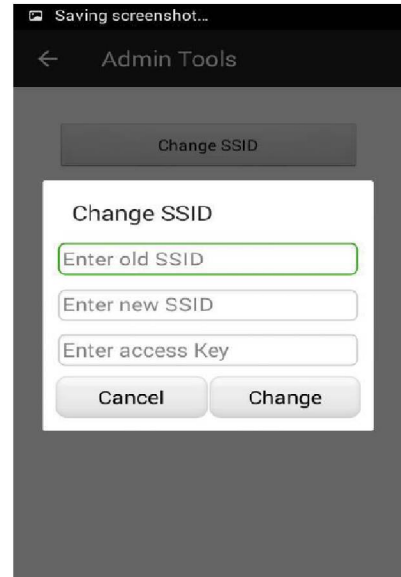
Fig 10. Microcontroller Settings
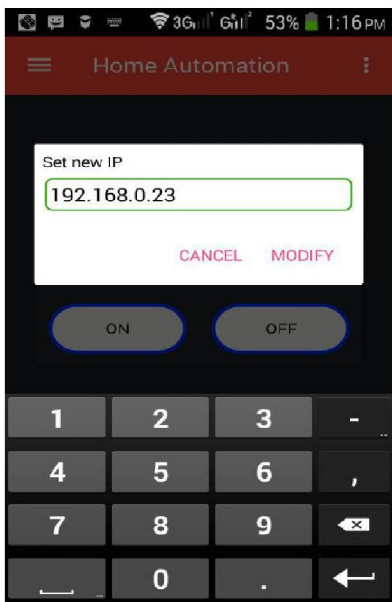
Fig 11. Setting IP address
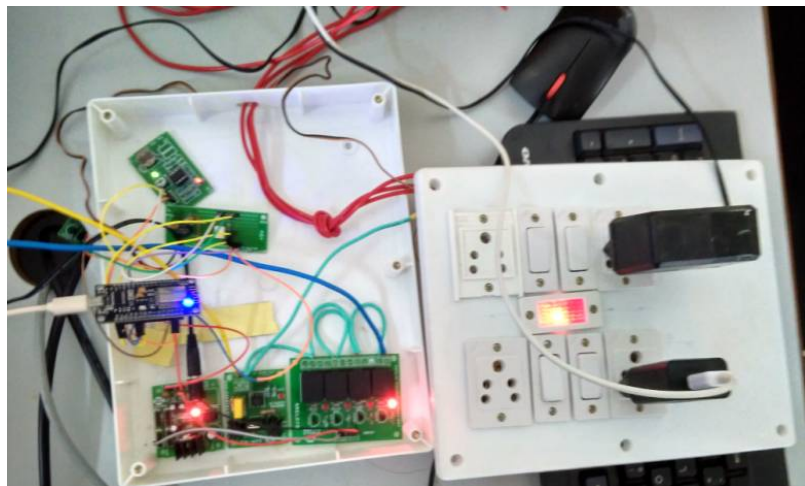
Fig 12. Snapshot of the circuit

IV. CONCLUSION AND FUTURE WORK

From the end users point of view, Internet is a means of Communication which is easily available and affordable. Android phones and applications are already a part of human life. Thus a combination of these technologies will make life more simple and easy to live.

This project gives basic idea of controlling various home devices using Android phone. This project is based on Android platform which is Free Open Source Software. The total implementation cost of the project is very cheap and it is affordable by a common person. The consumer can interact with the application interface of the android phone and send control signal to the Arduino which in turn will control the other embedded devices.

As a result it has been seen that the introduced design and implementation of a low cost Smartphone based home automation system. This home based automation system can be easily manufactured on a large scale for mass production because of its simplicity and ease of design. Another advantage is that application software is based on Android, which has the largest Smartphone base. With improvements in technology of Android software which is open source, cheap Smart phones can be used as the controller in our project, making the total system cost affordable for mass production. Further enhancements can be implemented on the system such as the incorporation of an intelligent controller that controls the various home devices based on various factors like pressure, humidity, etc.

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