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# Home Appliances Controller using Internet of Things

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## ABSTRACT

Internet of is the platform where appliances are connected to the software sensors and other equipment. The devices are allow to transfer the data over the network and also can communicate with each other. The method is incorporated in our home to make the appliances automated and easily usable. The Home Appliances controller is the source of current task performed inside the house and this home appliances controller can be developed easily now a day's, because of powerful computational devices and wireless devices to provide user friendly and cost fairly home automation system. In Home Appliances Controller using IoT different technologies like Wi-Fi, Bluetooth are used for communication, and different devices like smart phone, tablet and laptop used for controlling various appliances. Some of the currently available systems provide a view of the house from a web application; but this can cause trouble to the user. Because user must access the web each time he/she wishes to view the status of the home appliances. Therefore, the motivation behind the development of this system is to let people know about these technologies, and make the system as simple as possible for an ordinary person to understand. We are going to mobile application for controlling the home appliances form any remote location using internet of things.

**Keywords :** MOSFET, IOT, WI-FI, TTL, IC, CMOS, IDE, SQL.

## I. INTRODUCTION

Today, there is large demand of remote or automated systems so that people can reduced their work. The Internet of Things is using set of services to many domains. Home automation represents the Smart work of any work. According to research the number of people is using now a day automated appliances for better work and time management. This modern technology i.e. Home Appliances controller is become very useful of the handicapped people. It is very useful to the user control and handle all appliance that are connected to the system. This project focuses on a system that provides feature of home appliances control relying on internet of things to operate easily, in addition tho that is includes, the user friendly android application to controller all the appliances. The user can make use this application to control switching on of button form adored app for lights fan curtains, switch, and speed controller for the fan. The user can assess this system completely form the anywhere using Internet. This devices that connected in to the home must have internet connectivity. As per our survey there is exist many system that can control come appliances but not using android phone other system. But In this system home appliances can

be monitored and controlled locally via the embedded system board, or remotely through a smartphone from anywhere in the world using Internet.

Our system can access devices using internet as well as the Bluetooth. This application will provide an interface between users and the actual appliances which user wishes to control. This proposed system is adjust to control the speed variation and control the speed of appliances using Bluetooth signal and through Wi-Fi using android application.

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## II. METHOD AND MATERIAL

### 2.1 System Architecture

Our project is associated with the two part hardware and the software part. In this architecture fig.2.1 is showing the system how it will going to be work. We are going to used cardboard to making our experimental setup that contain kits, power supply and devices. This devices control by the mobile application that is design in the android application making software. The architecture of system give a brief Idea of operation home appliances controller using IoT.

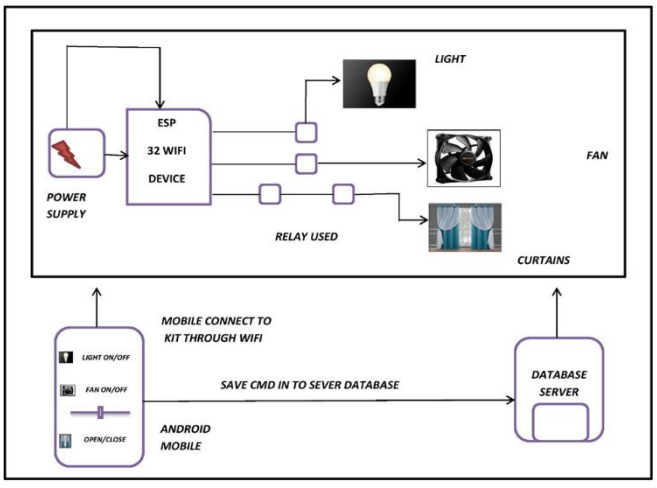


**Fig. 2.1** System Architecture

We used for to use four different appliances such as fan, light and curtains which are operated remotely using Wi-Fi and through an application installed on android. For the connection, we will use the ESP32, it is an open-source electronics platform based on easy-to-use hardware and software. These appliances are connected through ESP32 with its digital input/output ESP32 is a series of low-cost, low-power system on chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth which is use for communication. We will use relays for ON/OFF operation and use Google firebase for storing data. Relays are nothing but the switches that open and close circuits electromechanically or electronically.

So we will firstly connect our hardware component to each other i.e. connection of ESP32 and all device and relays for ON/OFF. For the driving the relays we used the ULN2003 IC that is relay diver IC with connected between the relay and the ESP32 device. For the control fan we used MOSFET because we have given a speed controller seek bar in to the android application. We have given an ON/OFF buttons for the light and fan and a speed adjustment bar for fan for controlling the speed of fan. For curtains, we have one button for ON/OFF. This all hardware component is connect to the power supply we used a Google firebase database server for storing our data and command for controlling our system. The Google firebase database server is a cloud-hosted No SQL database that lets you store and sync data between your users in real-time. We developed an application through android studio which is the official IDE (Integrated Development Environment) or tool (layman terms) for developing application exclusively for Android platform. Our app contain a user friendly interface such that user can easily use and access the feature of system. Application have different buttons for different functions. It have ON/OFF button for each module, and a speed

adjustment bar for controlling the speed of fan. And our app is also going to notify that if the fan is on or off or curtain is closed or open. Our Google firebase database server is connected to hardware component as well as our software i.e. application.

When user open application, user will see user interface for controlling his appliances. When user will press a button for turning on the light, it will send a command to database and save it in the database. Each button has different command according to programming function. When command saves in the database, server will check the command. The command is form in (0) and (1), if the command is (0), no operation will perform. If the command is (1), then the specific operation will perform. The server will give the command to the relay for switch ON and OFF the component that is connected to device. All the operation is perform by this way.

The main advantage of our system is that we can operate our home appliances from anywhere where internet is active. This will help for saving energy, money as well as time. This system also helps handicapped and aged people that will enable them to control home appliances and alert them in critical situations.

## III. Hardware Description

### 3.1 ESP32

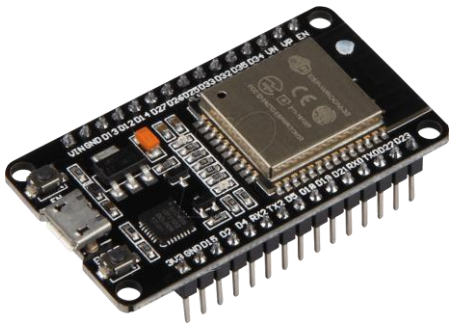

**Fig: 3.1** ESP 32 Device

The above fig.3.1 ESP32 is a low-cost system-on-chip series created by ESP 32 Systems. It is an improvement on the popular ESP32 that is widely used in IoT projects. The ESP32 has both Wi-Fi and Bluetooth capabilities, which make it an all-rounded chip for the development of IoT projects and embedded systems in general. ESP32 is highly integrated with built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. Engineered for mobile devices, wearable electronics, and IoT applications, ESP32 achieves ultra-low power consumption through power saving features including fine resolution clock gating, multiple power modes, and dynamic power scaling.[11]

### 3.2 ULN2003


**Fig: 3.2** ULN2003 Device

Above fig. 3.2 is basically a relay driver IC and it is a Darlington array having high voltages and high currents as well. It is made up of seven open collector Darlington pairs having common emitter which shows ULN2003 has a capability of handling seven different relays at a time. A single Darlington pair consists of two bipolar transistors and it operates on the current range of 500mA to 600mA ULN2003 operates on 5V and TTL (Transistor Logic) and CMOS (Complementary Metal Oxide Semi-Conductor). Its pin configuration is designed so that the input pins are at the left side of the IC whereas the output pins of it are on right side in front of the corresponding input pin. This IC has a very wide range of

applications. They are commonly used as relay drivers in order to drive different kinds of loads.

ULN2003 Pin out :

ULN2003 has 16 pins in total out of which there are:

- 7 Input pins (Pin # 1 to Pin # 7)
- 7 Output pins (Pin # 10 to Pin # 16)
- 1 Ground pin (Pin # 8)
- 1 COM pin (Pin # 9)

### 3.3 MOSFET

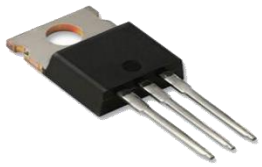

**Fig: 3.3** MOSFET Device

The above fig. 3.3 is MOSFET (Metal Oxide Semiconductor Field Effect Transistor) transistor is a semiconductor device which is widely used for switching and amplifying electronic signals in the electronic devices. The MOSFET is a core of integrated circuit and it can be designed and fabricated in a single chip because of these very small sizes. The body of the MOSFET is frequently connected to the source terminal so making it a three terminal device like field effect transistor. The MOSFET is very far the most common transistor and can be used in both analog and digital circuits. [11]

### 3.4 RELAY


**Fig: 3.4** Relay Driver Device

Above fig.3.4 are Relays nothing but the switches that open and close circuits electromechanically or electronically. Relay is connected to the ESP32 and its output is connected to the home appliances in a sequence as (i) light (ii) fan (iii) curtains. Relay takes low current and voltage and triggers the switch which is connected to a high voltage. 4 input pins of relay are connected to ESP32 which takes 5V supply from it and can trigger up to 10A, 250V supply. [5]

## IV. EXPERIMENTAL SETUP RESULT

### 4.1 Hardware Setup

The following fig: 4.1 is the hardware experimental setup of project. It contain cardboard having all devices with electronic component.

**Fig: 4.1** Experimental Hardware Setup

### 4.2 Software Experimental Setup

The following fig: 4.2 is the software experimental setup of project. It contain one mobile android application having login pages for user and one dashboard for controlling the appliances form that application. For each component different module is present in the application. It's having ON/OFF button for each component and Speed control bar for Fan. [10]

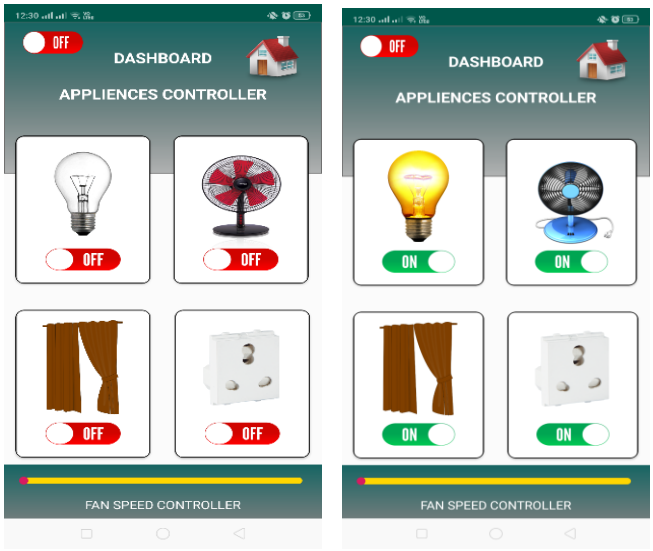


**Fig: 4.2** Experimental Software Setup

## V. CONCLUSION

Home automation and IOT is widely accepting technology across the world. Our goal is to provide useful system to the world. Using mobile the Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for automation of electrical devices has been designed perfectly. Secondly, using highly advanced device like ESP32, Relay modules, other devices with the help of growing technology, the project has been successfully implemented with a great idea. Thus the project has been successfully designed and tested.

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