# REAL TIME ROOM AUTOMATION USING IOT DEVICE

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**ABSTRACT**

The project aims to design an advanced Room automation system using Wireless technology. The devices can be switched ON/OFF using an Android phone through Wireless Technology - IOT. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to their user-friendly nature. These can be used as a replacement for the existing switches in Room which produces sparks and also results in fire accidents in few situations. The proposed system develops the Wireless Technology – IOT based advanced automation system to control the appliances in the Room. Wireless Technology - IOT is a wireless technology that uses radio frequency to transmit data through the air. Wireless Technology - IOT has initial speeds of 1mbps to 2mbps. Wireless Technology – IOT transmits data in the frequency band of 2.4 GHz. Range of Wireless Technology – IOT technology is 40-300 feet. The controlling device for the automation in the project is a Microcontroller. The data sent from Mobile phone over Wireless Technology - IOT. Microcontroller reads the data and decides the switching action of electrical devices connected to it through Relay switches. All components are associated to micro controller Arduino. Arduino ESP8266 micro controller is used to process input and produce output by using ARDUINO IDE with Embedded C programming and operated through Regulated power supply which gives 5v of DC voltage to all hardware modules.

**Keywords:** Internet of things, home automation, Wireless communication.

## 1. Introduction

The purpose of this project is to control electrical devices with home remote using WIFI Module. The Wi-Fi modem provides the communication mechanism between the user and the microcontroller system by means of an IOT webpage. Users can monitor the status and also control multiple electrical devices by sending suitably formatted selection in IOT webpage to the microcontroller-based control system. These accessing commands are interpreted by microcontroller system and are validated. This system provides a modern era automation system where we can control the status of the appliances from anywhere in the world. Here the devices to be controlled are interfaced to Microcontroller unit through switches Relay and controller which receives command through Wi-Fi module interfaced to it, processes them and performs appropriate action on the devices. This project finds its applications in industrial environments, home automation and for any other commercial purposes. An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The "IOT based home automation" using ARDUINO

microcontroller is an exclusive project which is used for automatic controlling of devices depending on the input given through Wi-Fi technology. Internet of Things (IOT) is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. The mechanical and digital machines are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Basically, it started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. Using a WIFI shield to act as a Micro web server for the Arduino eliminates the need for wired connections between the Arduino board and computer which reduces cost and enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot and this would act as the gateway for the Arduino to communicate with the internet. With this in mind, an internet based home automation system for remote control and observing the status of home appliances is designed. Due to the advancement of wireless technology, there are several different type of connections are introduced such as GSM, WIFI, and BT. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system. The aim is to design a prototype that establishes wireless remote control over a network of home appliances. The application is designed to run on android device providing features like, switch mode control, voice command control and a provision to view the status of the devices on the application itself. Considering its wide range of application, following are the scope of this prototype. The system can be implemented in homes, small offices and malls as well, being in- charge of control of the electrical appliances. For remote access of appliances in internet or intranet. The appliances in the above mentioned environment can be controlled in intra-network or can be accessed via internet. The development of technology friendly environment. The system incorporates the use of technology and making HAS. By the use of day to day gadgets we can utilize them for a different perspective. A smart home inculpates sensors, actuators, middleware, and a network and has two major interacting components which is a smart network and a smart load. The Smart home known as House automation, with the use of new technology, to make the domestic activities more convenient, comfortable, secure and economical. The Internet of things can be defined as connecting the various types of objects like smart phones, personal computer and Tablets to internet, which brings in very newfangled type of communication between things and people and also between things. With the introduction of IoTs, the research and development of home automation are becoming popular in the recent days. Many of the devices are controlled and monitored for helps the human being. Additionally various wireless technologies help in connecting from remote places to improve the intelligence of home environment. An advanced network of IoT is being formed when a human being is in need of connecting with other things. IoTs technology is used to come in with innovative idea and great growth for smart homes to improve the living standards of life. Internet helps us to bring in with immediate solution for many problems and also able to connect from any of the remote places which contributes to overall cost reduction and energy consumption. Home automation refers to the automatic way to control of house hold appliances, there are various systems used for home

automation that is based on different microcontrollers and take different parameters to monitor and control the home appliances. The system providing facility to control of home appliances by IoT sensor and other communication devices efficiently. We can control home appliances by mobile device or laptops or over web anywhere in the world. The system is used for controlling various tube lights, fans, home appliances, electrical motors, air conditioner, air heating systems etc are easily controlled by web or internet enabled devices, All these types of systems becoming more popular due to its less cost of implementation and provides flexible functionality that can be easily configurable by every one according to their need that's why all the IoT system are in great demand and have a lot of value because helping peoples like the people having disabilities, as they can't walk more much then this system is very useful to them and also for the patient or for the old aged person that remains mostly on the bed or also beneficial for the persons that live alone in their houses.

## 2. LITERATURE SURVEY

In [1]:A comfortable thermal indoor environment is crucial for occupants' well-being and productivity. Building Management System (BMS) is usually used to monitor the thermal condition of buildings. One of BMS's main challenges is in the data visualization stage, in which 2D vector graphics are used, which is not fully interactive and can only be manipulated by a trained operator. Building Information Modeling (BIM) has emerged as a useful tool in the construction industry, which can be applied in all stages of a project lifecycle. The use of BIM in facilities management is currently limited since BIM applications have primarily been implemented within the design and construction phases. The main objective of this study is to integrate a sensor-based alert system into BIM models for thermal comfort monitoring in buildings during the operational phase and visualize a building's thermal condition virtually. Gaun, Aleksandr, et al(2021)[2]:Performing large-scale plasma proteome profiling is challenging due to limitations imposed by lengthy preparation and instrument time. We present a fully automated multiplexed proteome profiling platform (AutoMP3) using the Hamilton Vantage liquid handling robot capable of preparing hundreds to thousands of samples. To maximize protein depth in single-shot runs, we combined 16-plex Tandem Mass Tags (TMTpro) with high-field asymmetric waveform ion mobility spectrometry (FAIMS Pro) and real-time search (RTS). Zhao, Shuofeng, et al(2021)[3]:With the increase in the capacity and power rating of batteries in today's HEVs and EVs, the battery thermal management (BTM) system bears growing importance in vehicle safety and efficiency. A practical BTM system is commonly coupled with the passenger cabin heating-ventilation-air-conditioning (HVAC) system, which makes a major energy consumer and a challenging control object. Thanks to the connected and automated vehicle (CAV) technology, predictions of the vehicle speed profile and power trajectory can be obtained, providing the possibility for predictive control of the BTM and HVAC coupled system in order to maintain battery safety, passenger comfort, and to reduce energy consumption. However, the tradeoff among higher energy saving potential and wider control range from a long and sparse horizon, and higher accuracy from a short and dense horizon is inevitable in the conventional predictive control. In this paper, a two- layer predictive control strategy for warm/hot weather is proposed to address the aforementioned tradeoff.

Uppal, Mudita(2021)[4]:The novel paradigm of Internet of Things (IoT) is gaining recognition in the numerous scenarios promoting the pervasive presence of smart things around us through its application in various areas of society, which includes transportation, healthcare, industries, and agriculture. One more such application is in the smart office to monitor the health of devices via machine learning (ML) that

makes the equipment more efficient by allowing real-time monitoring of their health. It guarantees indoor comfort as per the user's satisfaction as it emphasizes on fault prediction in real-life devices. Early identification of various types of faults in IoT devices is the key requirement in smart offices. Rao, Aravinda S(2022)[5]:The construction industry is one of the world's largest industries, with an annual budget of $10 trillion globally. Despite its size, the efficiency and growth in labour productivity in the construction industry have been relatively low compared to other sectors, such as manufacturing and agriculture. To this extent, many studies have recognised the role of automation in improving the efficiency and safety of construction projects. In particular, automated monitoring of construction sites is a significant research challenge. This paper provides a comprehensive review of recent research on the real-time monitoring of construction projects. The review focuses on sensor technologies and methodologies for real-time mapping, scene understanding, positioning, and tracking of construction activities in indoor and outdoor environments. Farooqui, Nafees Akhter, Amit Kumar Mishra, and Ritika Mehra(2022)[6]:Focusing on the effect of universal food insecurity, over 60% of sub- Saharan countries are predicted to be in a state of malnourishment and yet several farming places are under drought state. The climatic condition is believed to be biannual dry seasons which is very difficult for farmers to cultivate crops due to shortage of water and poor soil fertility. Yet heavy rainfall is still a great threat for the farmers since it devastates cash crops. The use of a smart greenhouse with Artificial Intelligence to grow and protect plants in both dry and wet seasons and reduce labor-intensive human tasks and automate pervasive data analytics of daily plant status can surprisingly boost food security. Here we present a fully automated greenhouse system with artificial intelligence embedded in it that uses around 10,000 plant images in it that initially nurture plants under optimum atmospheric conditions by taking real-time decisions, detecting any kind of illness, and interestingly notifying the stage of fruit ripeness.

Zahid, Hamza, Oussama Elmansoury, and Reda Yaagoubi(2021)[7]: The building sector is a major source of energy consumption mainly due to the use of Heat Ventilation and Air Conditioning (HVAC) systems, to achieve the indoor thermal comfort of occupants. To reach the optimal energy-efficient indoor temperature that satisfies thermal comfort, this paper describes an optimization approach named 'DynamicPMV' combining BIM (Building Information and Modeling) and IoT sensors (Internet of Things). This integration allows taking advantage of the geometric and parametric richness of BIM models and the real-time streaming of environmental data (humidity, temperature, etc.) collected by IoT sensors to optimize the indoor thermal comfort. First, the IoT measurements are interpolated according to a regular three-dimensional grid while considering inter-room heat exchanges using the parametric information of the BIM model. Renigier-Biłozor, Małgorzata, et al(2022)[8]:The main aim of the paper is to systematise the terms and methodologies used in the property valuation and market analyses domain (single property or mass valuation). The need for this is justified by different semantic and procedural approaches and legal regulations in countries around the world. The research was carried out using the method of critical analysis of current state-of-art literature of the subject, valuation standards, and opinions of practitioners and experts of real estate markets available on social media. Answers of international respondents were gathered as well by using questionnaires. Coito, Tiago, et al(2021)[9]:The simultaneous integration of information from sensors with business data and how to acquire valuable information can be challenging. This paper proposes the simultaneous integration of information from sensors and business data. The proposal is supported by an industrial implementation, which integrates intelligent sensors and real-time decision-making, using a combination of PLC and PC Platforms in a three- level architecture: cloud-fog-edge. Automatic identification intelligent sensors are used to improve

the decision-making of a dynamic scheduling tool. The proposed platform is applied to an industrial use-case in analytical Quality Control (QC) laboratories. The regulatory complexity, the personalized production, and traceability requirements make QC laboratories an interesting use case.

Ali, Rahmat, et al(2021)[10]:An autonomous unmanned aerial vehicle (UAV) system integrated with a modified faster region-based convolutional neural network (Faster R-CNN) is proposed to identify various types of structural damage and to map the detected damage a GPS-denied environment. The proposed method reduces the number of false positives significantly using a real-time streaming protocol and multi-processing, particularly in the case of very small cracks in blurry videos due to the UAV vibrations. In comparative studies, the modified Faster R-CNN using ResNet-101 as the base network showed superior performance in detecting small and blurry defects with a mean average precision of 93.31% and mean intersection-over-union of 92.16% in video frames captured by the low-cost autonomous UAV.

## 3. EXISTING SYSTEM

### 3.1 USING ARDUINO MICROCONTROLLER

A voice-based control system is proposed that will enable the elderly and disabled people to control appliances remotely. The primary communication is through GSM. An laptop or computer is used to get voice commands and converts them into text. This is sent via SMS to another phone through the GSM network. This module is connected to Arduino controller.
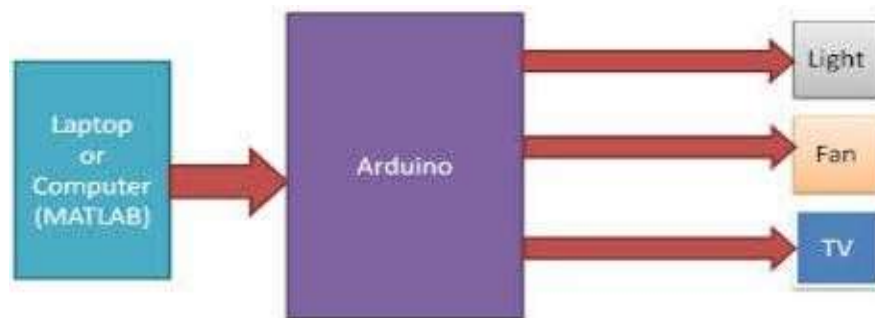


Figure 1: Process of Arduino Microcontroller

**BLUETOOTH BASED HOME AUTOMATION**

This system uses cell phones and Bluetooth technology. Bluetooth technology is secure and low cost. It makes use of Arduino Bluetooth board. An interactive python program is used in the cell phone to provide the user interface. The I/O ports of the Bluetooth board and relays are used for interfacing with the devices which are to be controlled. Bluetooth is password protected to ensure that the system is secure and not misused by any intruders. Bluetooth has a range of 10 to 100 meters, 2.4 GHz bandwidth. The client is a PC that is connected via USB to the Bluetooth module. This module is connected to it and will allow it to receive commands via Bluetooth.
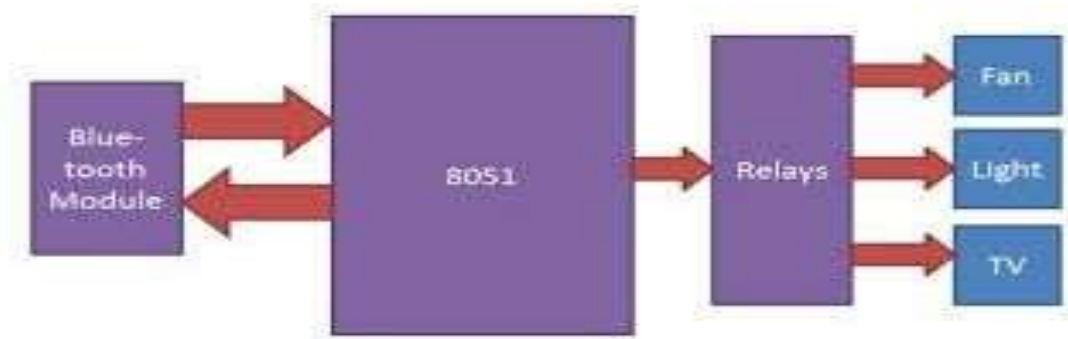
Figure 2: Process of 8051 Microcontroller

## 3.3 ZIGBEE BASED HOME AUTOMATION

The zigbee wireless communication can be applied for the home automation. This system uses voice recognition for this purpose. The voice commands are taken from the mike.They are compared with the voice stored and processed. The microcontroller then transmits the commands through zigbee to the receiver. It uses relays to control the respective appliances. It has a disadvantage that zigbee is a low range communication medium.
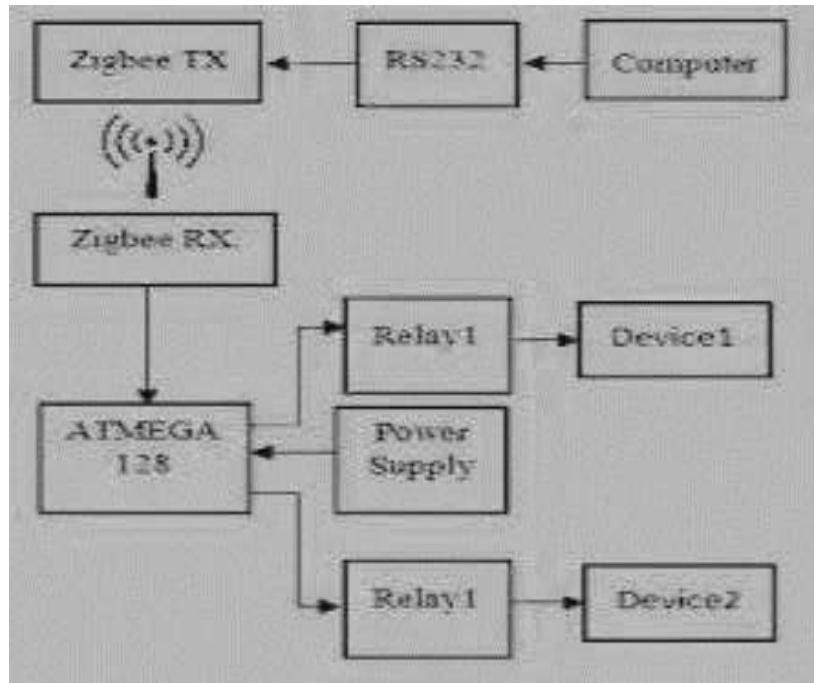


Figure 3: ZIGBEE based home automation.

In all the above models the major drawbacks are: Status of the devices cannot be monitored. Power consumption is more. Efficiency is less, Internal storage capacity is less.In the proposed model "ARDUINO microcontroller" is used to overcome all the disadvantages in the existing models.

## 4. PROPOSED SYSTEM

Initializing

System ready

When it displays "System ready" then user is allowed to send SMS. In this project we are controlling three devices

Device 1-Light Device 2-Fan.

Received message from-Mobile number.

dev1on/dev20n/dev3on/dev1off/dev2off/dev3off

The messages we send should be of lowercase and no spaces are given. For example, we send dev1on then light is going to ON and same for the remaining devices. Status of the devices can be monitored by following the below steps:

Activate the Wi-Fi in the mobile

Connect Wi-Fi to "project"

Open Google

Type 192.168.4.1 in the URL

Then automatically it shows the status of the devices.

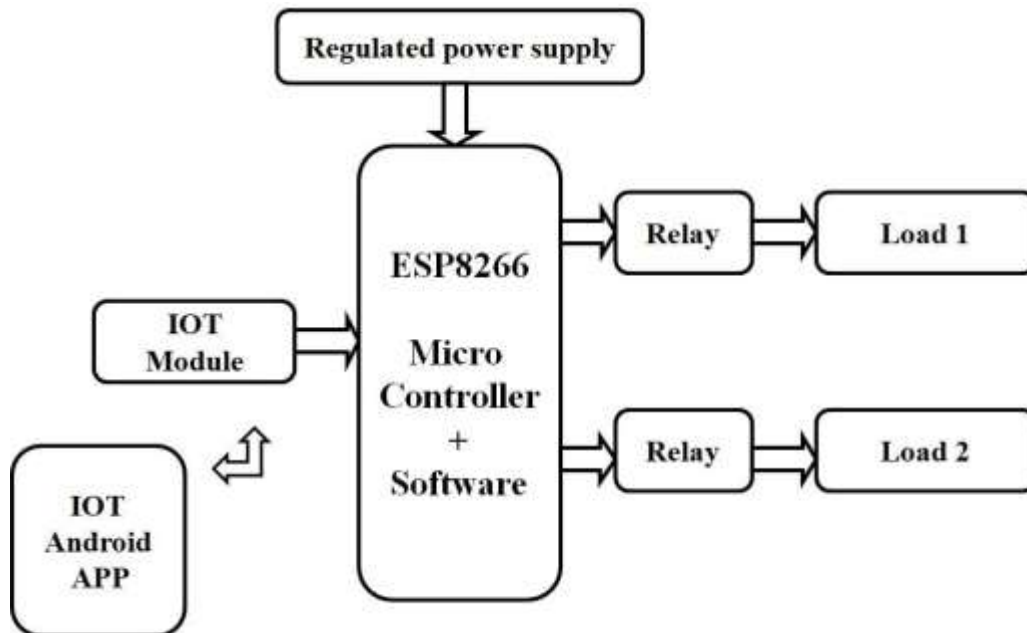192.168.4.1 is the IP address of this system.



Figure 4: Block diagram

Anyone can control a device over the internet using this electronic board with Wi-Fi support. It has the necessary features to facilitate installation and automation. The Wi-Fi automation devices market sell their products, but you cannot modify the software as per your needs. It prevents you from:

- Create, sell and earn money by creating specific solutions for your customers,

- You are dependent on the equipment on the market and its updates,

- Learn to build your own solutions with a free board.

- For these reasons we created the WIFI ESP8266 Relay Board.



Figure 6: Wi-Fi IoT ESP8266 Relay Board

We developed this board for you to create any automation application with Wi-Fi control. See the main features of this electronic board.

- Power circuit with AC-DC converter,

- Electrical surge protection circuit,

- Relay activated via optocoupler,

- Circuit for isolated supply to the relay,

- Jumper to isolate the circuit supplies, and

- Buttons and connectors to configure the board for recording and reset mode.

All these electronic resources allow you to develop any application freely and independently. Remember, devices on the market are protected technologies and do not allow changes. You can easily create the control logic, created based on your needs and board the ESP8266 from the electronic board. Do you believe you can advance the automation market and create your own standalone solutions in the future? If you believe in this and don't want to be tied to the solutions on the market, then you should acquire the files for this board and build your own projects. Today you don't have an electronic board capable of solving your customer's problem. How much does it cost you not to be able to develop a specific solution for a customer? You are missing an opportunity to make money from automations and projects. I want you to take advantage of this opportunity, download and purchase this electronic board at PCBGOGO.

Now we will present the complete operation of the electronic circuit of this board.

## 5. Results and Discussion

The final outcome of this project is a real time application for a simple room automation system which can control room electrical appliances with a touch of a finger from the android application. On the front end, there is an Android app to control the room appliances and PCB board to which a number of appliances are connected.

Step 1: First, we have to download the Android Package Kit (APK) into our Android mobile phone and open the app. The Android application name is AutomateEm.



Figure 7. IoT device used for automation.


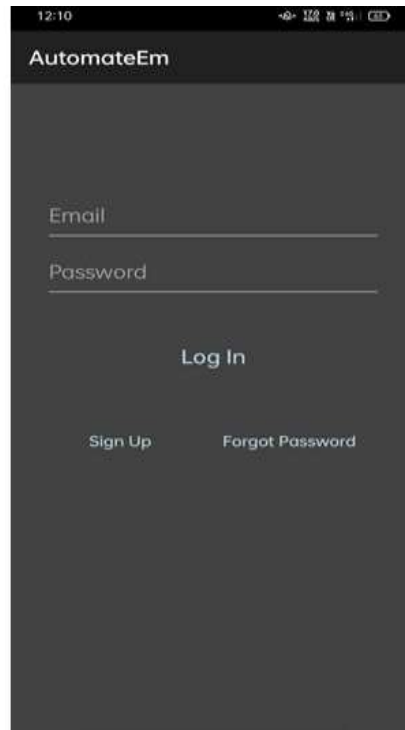
Figure 8. Android Application.

Figure 9. Sign Up/ Sign in Step

Step2: Tap on "Sign Up" to create a new AutomateEm Account. Sign in if you already have AutomateEm Account. Enter your E-mail ID and tap next. In the next section, enter OTP received on your Email to verify. Create your own password and click on "Done" to complete your sign in/up process.

Step 3: After Signing up, we can see the screen like in Figure 10

Here, we can add different sections such as Groups, Cabins, Rooms, etc.

Groups section is used to control number of appliances such as appliances in the homes, colleges, offices, etc.

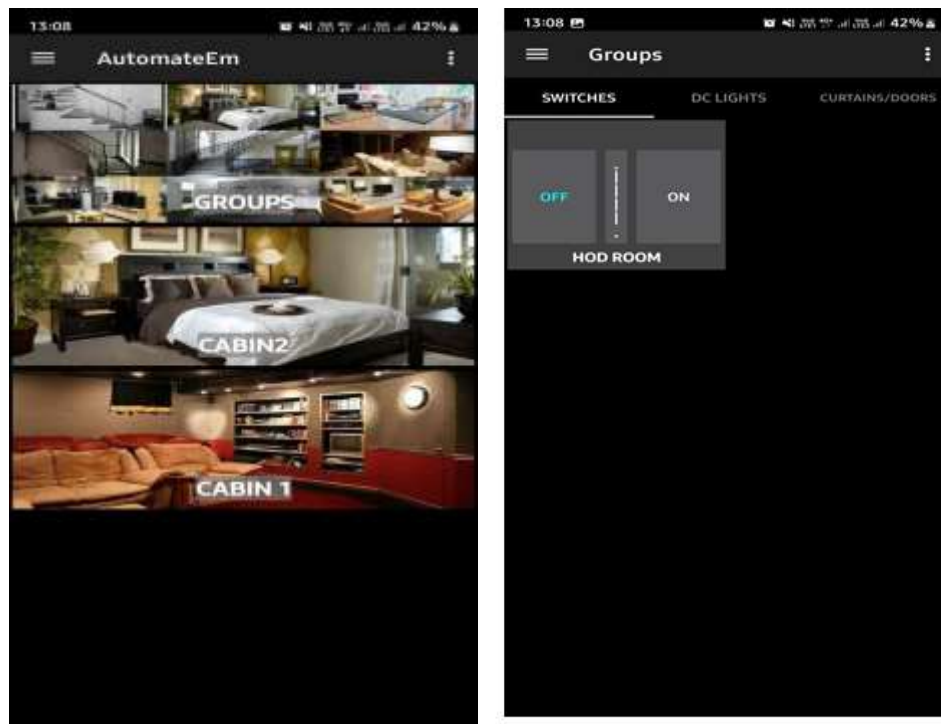Cabins and Rooms are used to control one or two appliances.

Figure 10. Screens of application.

Step 4: To add the new room in your AutomateEm app, click on the top right corner of the home page and select the file to be displayed, which represents the room and name it as per your choice. You can group multiple switches as one switch by adding switches in one group. You can also create a group of your own choice. Click on top right corner on your app. Add or edit group and select the switches, which need to be grouped as one, and title it as per your choice.

Step 5: In this project, we are adding two appliances which are interfaced with the switches and named it cabin. Through this app, we can control the switching action of these appliances. To add new switches, select the room you want to add and click on top right corner of the App.

The experimental model was made according to the circuit diagram and the results were expected. The appliances in the room can be remotely switched ON/OFF over WiFi or the internet connection. Even though the room is automated and controlled through an application, we can still control the devices manually. It is evident from this project work that an individual control room automation can be cheaply made from the 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. And better still, all the components required are small and few that they can be packaged into a small inconspicuous container. The designed room automation was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system.
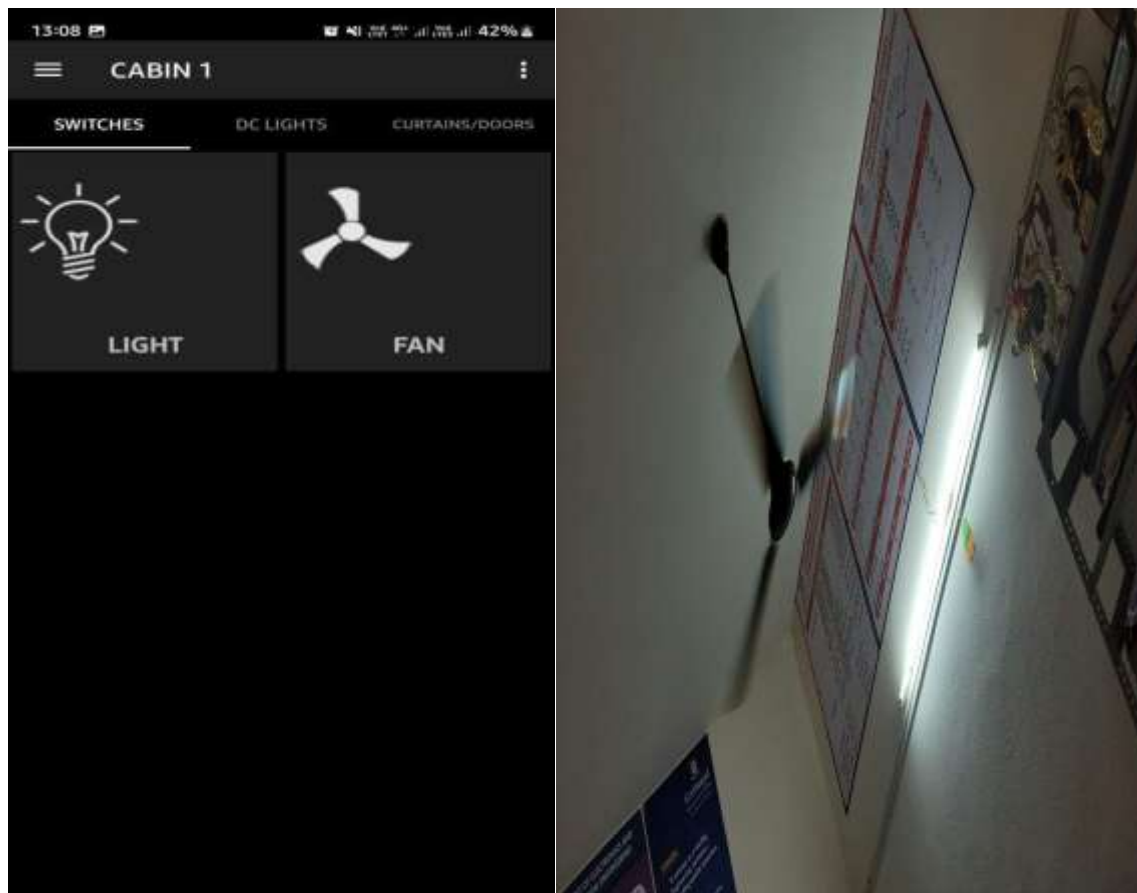
Figure 10: Home page of App (left). Output result (right).

## 6. CONCLUSION

Hence, "IOT Based ROOM Automation" is Integrating features of all the hardware components used have been developed in it. Advanced micro controller is used in it. Multiple electronic devices can be controlled, and status of those devices can be monitored through internet. Our project "IOT Based ROOM Automation" is mainly intended to control the electrical home appliances using IOT. This project has an IOT module, a 2-relay board to connect the home electrical appliances which are interfaced to the micro controller. The Micro Controller is programmed in such a way that depending on the received data from the phone the devices are operated that will be switched ON/OFF automatically based on the input received by the IOT module. This project can be extended by adding GSM technology. GSM module can be used to get SMS alert about the status of the appliances of multiple devices like lights, fans, coolers…etc. Raspberry Pi can be included. Video monitoring can be included.

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