

INTERNATIONAL CONFERENCE ON RECENT TRENDS IN ADVANCED COMPUTING  
2019, ICRTAC 2019**IoT based Voice/Text Controlled Home Appliances**Uma S<sup>\*a</sup>, R.Eswari<sup>a</sup>, Bhuvanya R<sup>b</sup>, Gopisetty Sai Kumar<sup>b</sup><sup>a</sup> National Institute of Technology, Tiruchirapalli-620015, India<sup>b</sup> Vel Tech Rangarajan Dr Sagunthala R&D Institute of Science and Technology, Chennai 600062, India

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**Abstract**

Internet of Things (IoT) is formulated to remotely connect, access, monitor and control the existent world entities through the Internet. When the IoT is conceptualized towards home, it converts simple home to smart home which is safer and automated. In this paper a Voice/Text controlled Home Application is developed where the users can remotely access the home appliances. The users can merely provide voice commands or text messages through which they will be able to turn the appliances ON or OFF depending upon the necessity. The users can schedule the status of the appliances when they are not physically present in the environment. They will also be provided with the information regarding the previous schedules, and they can also turn on the appliances for specific period of time. The Node-RED Technology is used for the functions of the application which is embedded with IoT device (NodeMCU). This developed application is deployed in the Dialog Flow Account. The NodeMCU is connected with regular home appliances. As per the parameters fetched from the cloud the NodeMCU operates the Home Appliances. The implementation cost of this application is very cheaper since high performance and least cost equipment's are used. This application is greatly consistent and proficient for the elderly people and differently abled person who cannot reach the switch, for switching ON/OFF the device.

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**Keywords:** IoT; Node-RED; NodeMCU; Dialogflow

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## 1. Introduction

Internet of Things (IoT) is currently an emerging technology spread globally. IoT has stepped in various fields comprising of Industries, Government, academia, and still various research are carried in this domain. Now a days IoT plays a vital role in the business sector, many glooming and blooming business depends on IoT and Industrial IoT. IoT cuts across various presentation domains ranging from civilian to security sectors. Legacy fields like agriculture, horticulture, healthcare, space, manufacturing, construction, water, and mining, are transiting from their old infrastructure setup to the modernized IoT setup.

A software program designed to model an interaction or discussion with human users, especially over the Internet. It is a subordinate that interconnects with others through text messages, it is also a computer-generated friend that incorporates into instant messengers, websites, or applications; and helps business persons to get closer with the customers [6]. Such a communication can be established with the users through the automated system called Bot. To get rid of our routine tasks, parallel or concurrent processing of multiple requests from the users, Chabot's is designed. Further, a great speed of processing users' demands with Chabot's helps in gaining customers' attraction. The features that motivate people to use Chabot's are productivity, entertaining the users, social and relational factors, improvising communicative skills and curiosity to develop new things.

In the current scenario home automation is grasping the attention of wide variety of users, with the true objective of advancing the life style of users. Home automation offers the users a trendy way of life, in which an individual gets the chance to control his entire house by following the simple steps, to switch on the fan, locking/opening doors etc[8]. Regardless, to get or extend such system increases money as increase of utilization of devices. This is the important reason of why home computerization has not yet got much demand in the society. It is essential to make it adroit and easy to reach people so that they will use it in homes, work environments and schools. This application Voice/Text controlled home appliance is offered at affordable price, everyone can change their homes to smart homes by scheduling their device status.

The remainder of the paper is organized as follows: Section 2 presents the related work and the benefits of the proposed system over the existing ones; Section 3 presents the working principle of the proposed system; Section 4 illustrates the system implementation, the details of the components employed and the overall functioning; Section 5 discusses the experimental results; Section 6 concludes the paper with future enhancements.

## 2. Related Work

The authors [1] proposed a smart home security system that sends to the owner when it detects any person and alerts the owner by raising an alarm when it detects any intruder. Moreover, the same can also be activated for home computerization by building the smart home with the use of the similar set of sensors. The microcontroller used by the current prototype is the TI-CC3200 Launchpad board which comes with an in-built micro-controller and an on-board Wi-Fi shield making use of which all the electrical and electronics appliances inside the home can be accessed and monitored. In the proposed method, we make use of Arduino uno3, ESP8266 Node-MCU which is least cost when compared to the existing systems TI-CC3200 Launchpad, ESP8266 is also provided with the Wi-Fi which receives instructions from the Wi-Fi device connected, and controls the status of the devices connected.

This work [2] presents a least cost flexible and consistent home motorization system with additional security using Arduino kit, with Internet Protocol connectivity through local Wi-Fi for monitoring and guiding devices by authenticated users remotely using the mobile phone application. They presented a smart home using Arduino UNO and esp8266-01 as a connectivity module. It helps the user to control various electrical and electronics appliances remotely. In the existing system, IP address has to be fetched every time from the LCD display, to authenticate the operation in the phone. In the proposed system, this IP address authentication can be avoided, more over the existing

system does not support the voice based commands, but our system can control the home appliances using voice/Text.

This paper carried out a study on web based smart home automation system. It allows user to monitor home appliances using smart phones. This system uses remote control for accessing electrical or electronics appliances and monitors security and energy management [3][7]. The authors quoted the issue of security, authentication and access control of interconnected home appliances. But they did not provide solution for the issues. Since the proposed system makes use of the user's mobile phone for controlling the home appliances, security for home automation remains secure; also it uses the Firebase Cloud Service which also provides security.

In [4] this it is quoted that there are variety of IoT product providers exist in the market. They are Apple, Amazon, Google, Samsung etc. They provide platform and solutions for smart homes. But, these smart gadgets will work only inside the provided infrastructure. They cannot be carried outside and the devices connected to them cannot be controlled. In the proposed system distance is not a barrier. Any devices connected through the Wi-Fi device can be controlled from anywhere, even our physical presence is not needed in the surroundings.

The [5] system is implemented using Amazon Echo, Amazon's cloud services, and its voice services. A Raspberry Pi 3 is used by them as the hardware which provides smart features for non-smart homes. But, in the proposed method, Arduino uno3, ESP8266 Node-MCU is used which is least cost when compared to the existing systems Raspberry Pi 3. ESP8266 is also provided with the Wi-Fi which receives status from the Wi-Fi device connected, and controls the status of the devices connected. Also instead of Amazon cloud services Firebase cloud services are used, which includes latest technologies and it is free of cost. Large datasets are not used, as minimum number of instructions is given to switch ON/OFF. It is sufficient to use Firebase instead of Amazon echo or Amazon Cloud services.

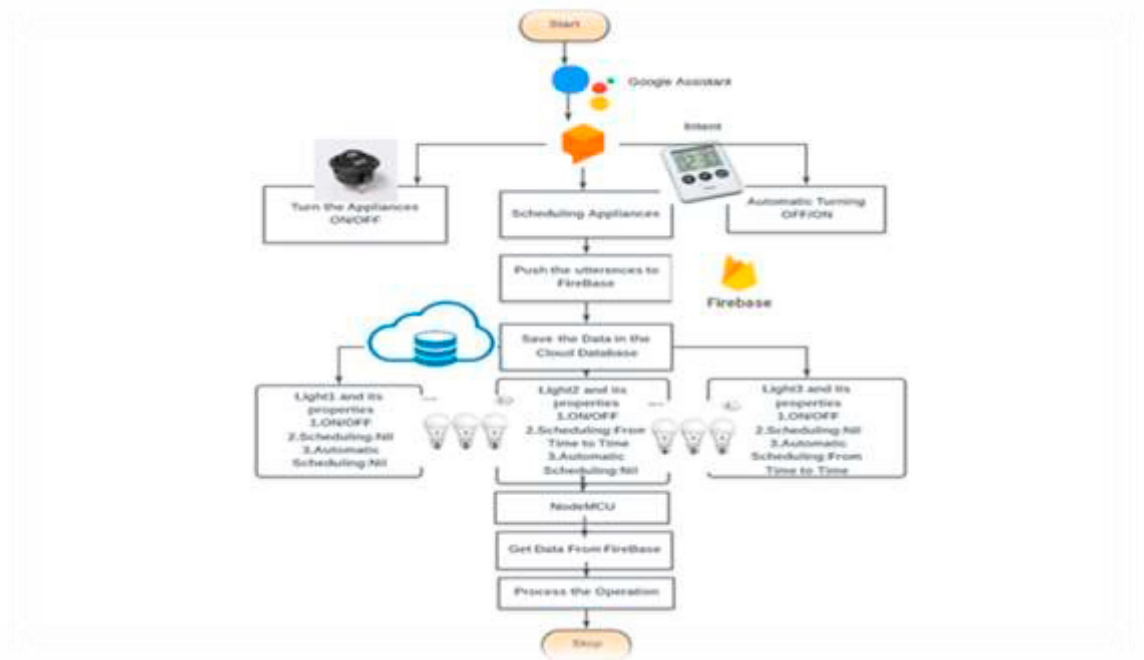
### **3. Proposed Work**

In this proposed application, when the user launches the application, the skill will be checking the authorization of the user. For unregistered users it will give a message to login to continue to access the services of the application. In case of registered users, users will receive a welcome message along with the details of the appliances in his home, and daily update of the current state of the appliances in the home.

#### *3.1 Working Principle*

The application input is provided by the user using the Google Assistant through his mobile phone. Using this application the users can schedule the devices connected to Arduino and ESP8266. The input given by the users is fed into the Firebase. The Wi-Fi connected ESP8266 fetches the information from the firebase and turn on or off the devices depending upon the users requests. Any device can be scheduled independently using this application.

The Node-RED Technology is used for the functions of the application which is embedded with IoT device (NodeMCU). This developed application is deployed in Dialogflow Account. The NodeMCU is connected with regular home appliances. The flow written in the Node-RED is deployed in the Dialogflow that will be integrated with Google Assistant. Whenever commands are given it triggers the API call through the cloud Firebase Real-time database to store the values in the integrated NodeMCU. As per the parameters fetched from the cloud the NodeMCU operates the Home Appliance as shown in Figure 1.

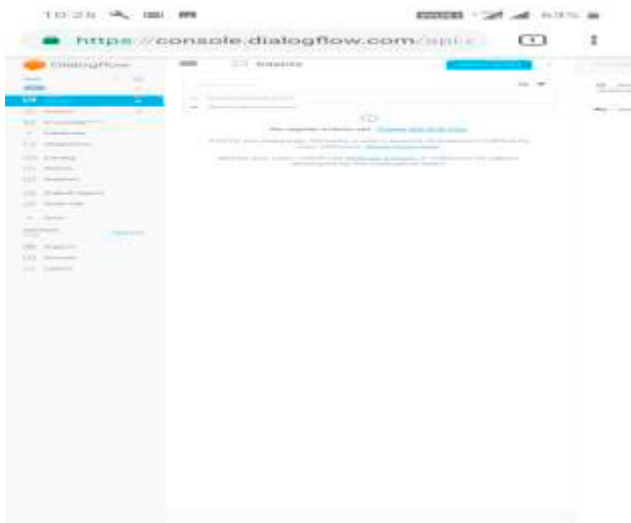


### Figure 1 Architecture of Proposed System

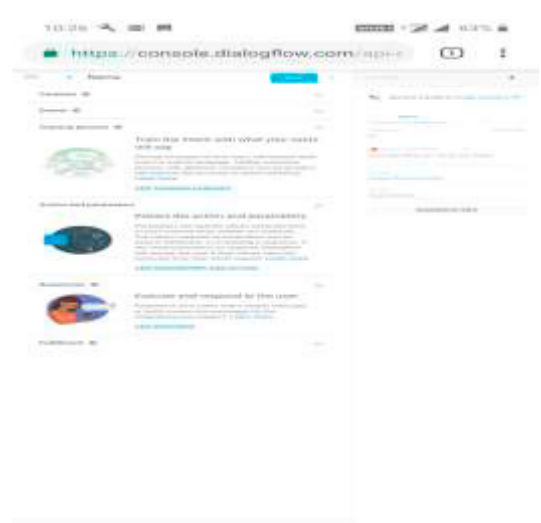
### 3.2 Dialogflow Account Creation

In Dialogflow, the basic flow of interaction involves the following steps:

1. The user is required to give the input
2. The given input is parsed by the Dialogflow agent
3. The agent created returns the response to the user.



### Figure 2 Intent Creation



### Figure 3 Training the Intent

Figure 2 shows how to use the dialog flow account, create the intent under the agent, and name the intent. Figure 3 shows how the Intents are used to train the agents to respond to the user. The conversation begins only if the training is provided. The intents in the agent must map the user input as responses. For Example in our experiment if the users enter into the environment it greets them with welcome message and puts a question “how may I help you?”. The user queries the agent, like Lamp ON, this in turn triggers the intent and it extracts the response from the training set like Lamp ON or Lamp already ON. Figure 4 illustrates how the training phrases are trained.

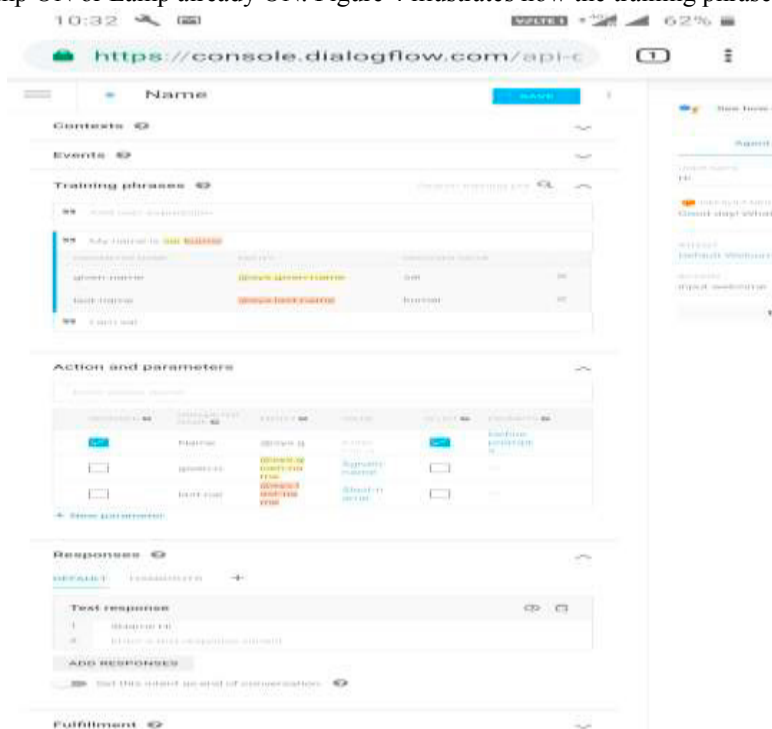


Figure 4 Training Phrases

## 4. Experimental Setup

The following components and software's are used in the proposed application.

**4.1 The Node-MCU** (Node Microcontroller Unit) is an open source firmware development environment used in Home Automation. The ESP8266 comprises of all necessary elements of the recent computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. This makes this as the excellent choice for more projects [9].

**4.2 Relays** are the controlling or switching devices for most of the equipment's. It also provides primary protection for the devices. All the relays are switches that open and close the circuits and respond to one or more electrical quantities like voltage or current.

**4.3 The Arduino IDE** facilitates a software library from the Wiring project, Only two functions are required from the user: first for starting the program; next for sketching the main program loop.

4.4 *Dialogflow* is used to create Intents under agent. The training phrases trained in the will respond to the user when the user queries. The users inputs are carefully mapped as response to the users. It is an interaction based technology like NLP/NLU.

4.5 *Firebase* provides a real time database and backend services to the users. It is a mobile or web based application development platform owned by Firebase. The Firebase Cloud service, which is free of cost, can be used by the users. Firebase will work fine with small amount of datasets where querying is little.

4.6 *Node.js* is a server side scripting language written using JavaScript run-time environment that executes JavaScript code outside of a browser. It is an open source and cross platform supporting language. Node.js lets developers to run scripts on server-side to produce required web content before the page is transferred to the user's web browser.

4.7 *Node-RED* is used to wire the hardware devices, APIs and online services together using the programming tool. It is a web browser based flow editor which is used to write JavaScript functions.

## 5 Results and Discussion

Figure 5 depicts how to schedule the devices. In the experimental results, two different setups of this application are shown. One with single lamp control another with three lamp controls, all the lamps can be scheduled together or separately. Figure 6 shows how to reschedule the already scheduled devices and how does the bot respond to the request. Figure 7 shows, on receiving the command from Firebase the single lamp glows, in figure 5 the status is set to ON, so the lamp is glowing. Figure 8 depicts how the two lamps are turning to ON state after receiving the command from the user.

Voice processing of instructions received from the user starts with the node red skill using the JavaScript, which debugs and deploy the skill to the cloud. It tests with voice input whether all the commands are recognized appropriately and integrated with NodeMCU board. When it receives API call from the cloud, ESP8266 understands the command and checks the current status of the appliances and redirects message to API. ESP8266 processes the instructions based on the received message such as ON/OFF.

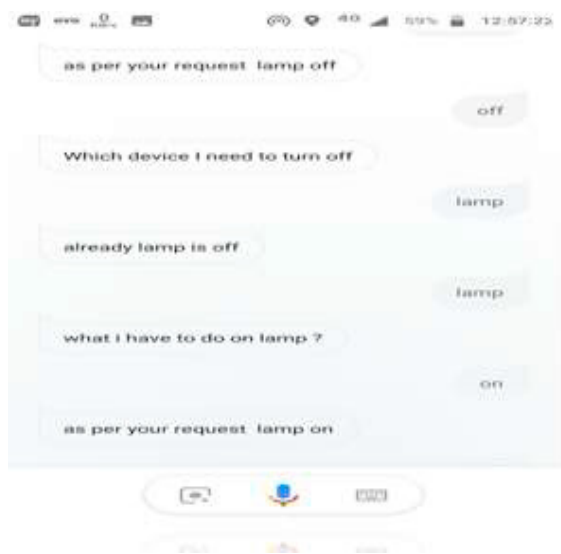


Figure 5 Scheduling a Lamp

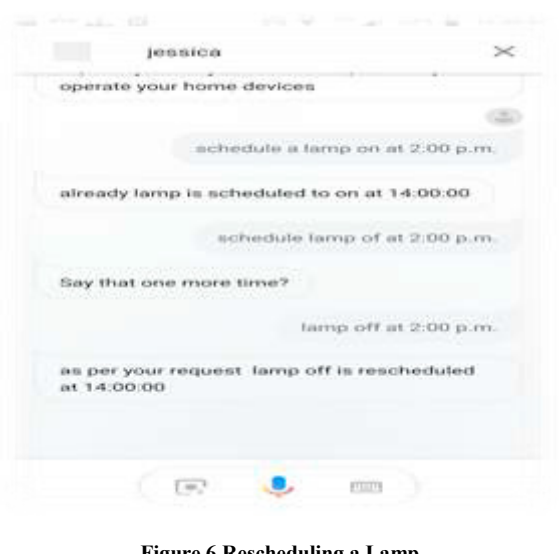


Figure 6 Rescheduling a Lamp



Figure 7 Output of Scheduled Lamp

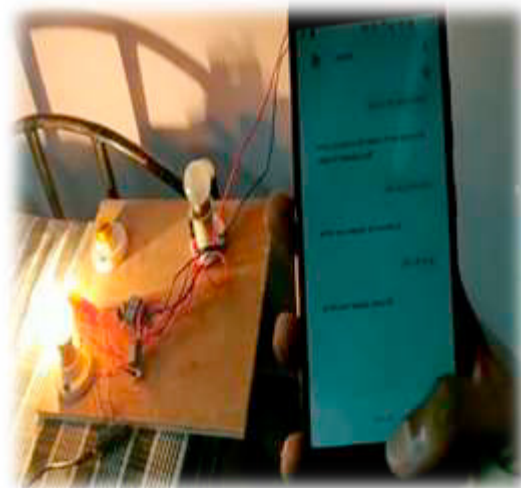


Figure 8 Output of Scheduled Lamps

## 6. Conclusion and Future Enhancement

This work aims to automatically control the home appliances through a voice based or text based control. This application is not bounded by distance constraint. A smart home is something only the super-wealthy could afford, the virtual assistant; a luxury that came with a hefty price-tag. But, our application is cost effective compared to other branded smart gadgets or controllers. This application is highly consistent and proficient for the elderly people and differently abled person on a wheel chair who cannot reach the switch, for switching ON/OFF the device.

This System can be extended to find the gas leakage in home, and automatic filling of water tanks.

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