Real Time and Low Cost Smart Home Automation System Using Internet of Things Environment

Deepjyoti Choudhury

Computer Science & Engineering, Faculty of Engineering & Technology, Assam down town University, Guwahati, India

Corresponding Author: deepjyotichoudhury05@gmail.com

Abstract— This paper represents the real time Home Automation System measuring cost efficiency using IoT environment. The logic behind this paper is to control the home appliances like any electronic gadgets through Google Assistant which links with the IFTTT server. If the condition satisfies, then the action will be taken to the Adafruit MQTT server to get communication with the home appliances. We have also presented the way to replace the manual system and to save the electricity and human energy in this paper.

Keywords— *Internet of Things (IoT), Home Automation, ESP8266 ESP-12E NodeMCU WiFi module, Google assistant.*

I. INTRODUCTION

Now a day's automation system has come up in the way which has replaced tremendously the manual system [8]. Many techniques have been implemented in the era of information technology to control almost all home appliances using different features. We utilize every day to raise our quality of liveliness to stay connected with home appliances via a mobile device significantly.

The smart home is also known as home automation, which use the new term of engineering science to get the life activity more convenient, comfortable, safe and economical [4]. The smart home includes the main components are user interface, such as computer or mobile device that give the order to control the system, mode of transmission which may be wired or wireless connection, central controllers which is considered as the hardware interface that can communicate with the user interface, and the electronic devices which is compatible with the mode of transmission to connect with the central command system [6].

The large scale of the IoT could reverse the core purpose as it may overwhelm users as an option in the IoT systems rapidly increase leading to complexity rather than restraint. In order to IoT to remain effective in the computing industry which needs to understand the ingredients such as the changes in society that has caused the technology to be important as well as the part that engineering plays in the influences in the development of the changes in society and it is important for a thorough understanding in the past and current state of IoT

in order to ensure that it remains sustainable, simple and efficient for the future [16].

Internet of things can be reported as connecting various devices like smart phones, televisions, sensors and actuators to the internet where the devices are intelligently links together that enables new forms of communication [4]. The internet of things (IoT) also provides new concepts and development space for smart home security to supply intelligence, comforts and improved quality of liveliness. This smart home security can also be used to supply security for residential, industrial, and for all commercial purposes using internet of things applications. Internet is now a day's appeared as the medium of communication among the users also making everyday activities more efficiently.

IFTTT is a popular trigger action programming platform whose applets can automate more than 400 services of IoT devices and web applications [13]. They interactions among different entities, measure how the applets are used by the end users, the test performances of applets execution. Overall they observe the fast growth of the IFTTT and its increasing usage for automating IoT tasks.

In this paper, Part II describes the Related Work where several previous works have noted. Part III of the paper introduces the different service platform like Adafruit IO, IFTTT and Google Assistant. Methodology is explained in Part IV of the paper. ESP8266 NodeMCU is the requirement of equipment that is shown in Part V. Part VI of the paper describes the Results & Discussion. Then we conclude the

paper along with future scope in Part VII. Acknowledgement and References are shown at the end of this paper.

II. RELATED WORK

There are many existing project we have seen IoT based Real Time and Low Cost Smart Home Automation System. In 2017, Kishore. P et. al [12] present an IoT based real-time home automation and security system using the Arduino UNO, ESP8266 WiFi module and the adafruit MQTT server for controlling and monitoring home appliances from anywhere in the world. In 2015, Mamata Khatu et al. [4] explain the concept of IoT for all objects around us as part of the internet. Formerly all, the device is connected to each other they enable more and more smart processes and services that confirm their basic demands, environment and health. They describe how the Internet of Things and cloud computing can work together can address the Big Data problems. In the paper "Wireless home Automation technology using Internet of things" [6] by the Kaushik Ghosh et al., they describe the emerging technology that involves the interaction among things through internet without interference of mankind. It represents an affordable and flexible home control system using an Arduino, web server with IP connectivity to interact with the device and home appliances. In 2015, Vinay Sagar K N et al. [5] explain the advancement of Automation technology the life is getting simpler and easier in all aspects now a day's the Automation systems are more preferred than manual system. In their paper they have used the Intel Galileo that employs the integration of cloud networking, wireless communication, to provide the user to control the various home appliances and storing the data in the cloud. In 2016, Gabriela Amaral Araújo de Oliveira et al. [15] describe some open source applications for home automation using IoT that let us to monitor and configure various devices. Freedomotic is the open source, flexible, secure IoT development framework. Home Assistant is also used to track and control all devices at home. HomeGenie is the open source, programmable, home automation server that is used to connect devices and appliances. Mister House is perl-based home automation software that contains support for all kinds of devices; openHAB is the vendor and technology agnostic and open source automation software for our home. In 2017, Divya Purohit and Moumita Ghosh [11] discuss some of the different types of smart home that build up using various technologies are Wi-Fi based, Android & Wi-Fi, Zigbee Protocol, cloud based, Raspberry-pi based and Bluetooth based.

III. SERVICE PLATFORM

The available service platforms we have used for our system are mentioned as shown in below:

- **Adafruit IO**: Adafruit IO is the system that makes data useful and ease to use that allowing the data connection with the programming required. IO includes the client libraries that are wrapped our REST and MQTT APIs.
- **IFTTT**: "If This Then That" is also known as IFTTT. It is a free web based service that creates a simple conditional statement called applets. An applet is triggered to changes that occur with the other services such as Adafruit IO and Google Assistant, like we use in our project.
- **Google Assistant**: The google assistant is a virtual assistant that developed by Google that are available in smart home devices, that which can control by the vices command.

IV. METHODOLOGY

The process is to control the devices or Household appliances through Internet of Things by using the voice command through the Google Assistant with Adafruit IO and IFTTT Protocols. The ESP8266 ESP-12E NodeMCU Wi-Fi module is connected to Wi-Fi router to connect the internet to the Adafruit IO server. The user sends the voice command through the Google Assistant to control the desired home appliances which links to IFTTT server. And if the condition satisfies the action will take to Adafruit IO MQTT server and its sends to the ESP8266 NodeMCU Wi-Fi module to do the action.
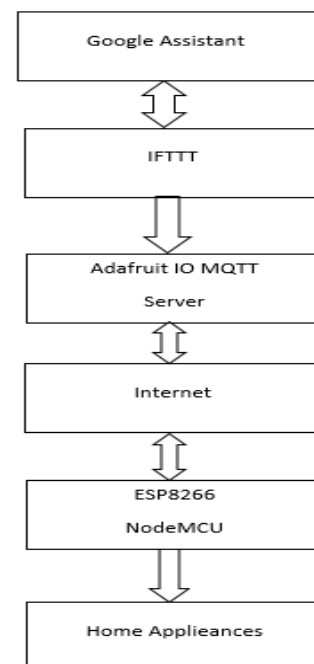
I. Block Diagram:

Fig1. Flow Diagram of the Working System

II. Working Procedure*:*

The steps of the working procedure of the system are shown in below:

- Step 1: The ESP8266 NodeMCU is connected to the Wi-Fi router to get the internet.

- Step 2: Login to the Adafruit IO account to make a feed on the dashboards.

- Step 3: Login to the IFTTT services to make the applet on IFTTT platform to connect with Google assistant select +this and choose google assistant to connect to the service choose the trigger to select the simple phrase (e.g. What do you want to say? 'Turn On the light one'. What do you want the Assistant to say in response? 'Ok, turning on the light one'), then the trigger is created. Now select the action service page to Adafruit IO account which the action is sent the data to Adafruit IO Feed name.

- Step 4: To connect the IoT device using Google Assistant we use in our mobile phone by saying 'Turn on the light one' or 'Turn off the light one' then the ESP8266 NodeMCU get respond accordingly.

V.　REQUIREMENT OF EQUIPMENT

ESP8266 NodeMCU: It is the open source of IoT platform. It includes the firmware that runs with ESP8266 WiFi. NodeMCU is most popular alternative of firmware that runs with the ESP8266. The commands are sent to the ESP8266 via the serial UART interface. NodeMCU is the great starting point for markers to provide an interactive the environment which allows the commands to run and control ESP8266 wireless interface, and also GPIO hardware functionality. NodeMCU development board is the ships with the latest version of the NodeMCU firmware.

VI.　RESULTS AND DISCUSSION

In our system we are able to successfully control the light and fan in our home by using the Google Assistant. When we send a command through a Google Assistant by voice command 'turn on the **light one'** then it responds 'ok, turning light one'. After turning on the light, if we send command 'turn on the **light two'** then it responds 'ok, turning light two' which is shown in figure 2 and figure 3.
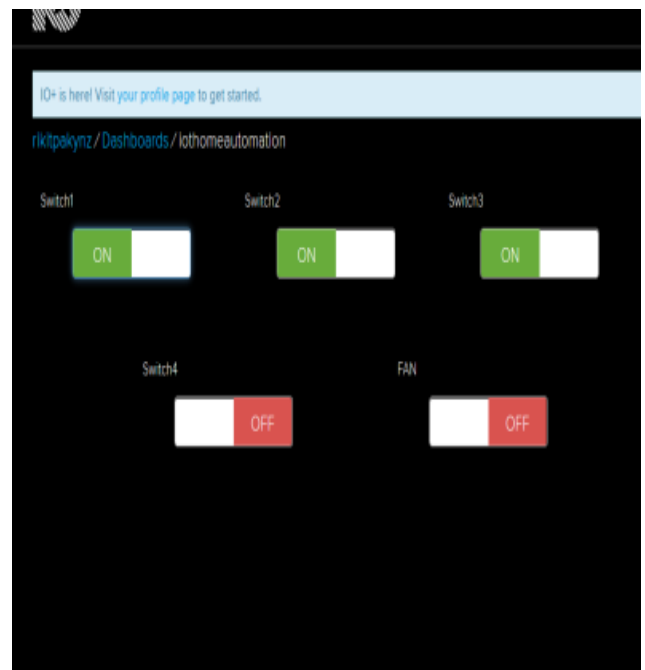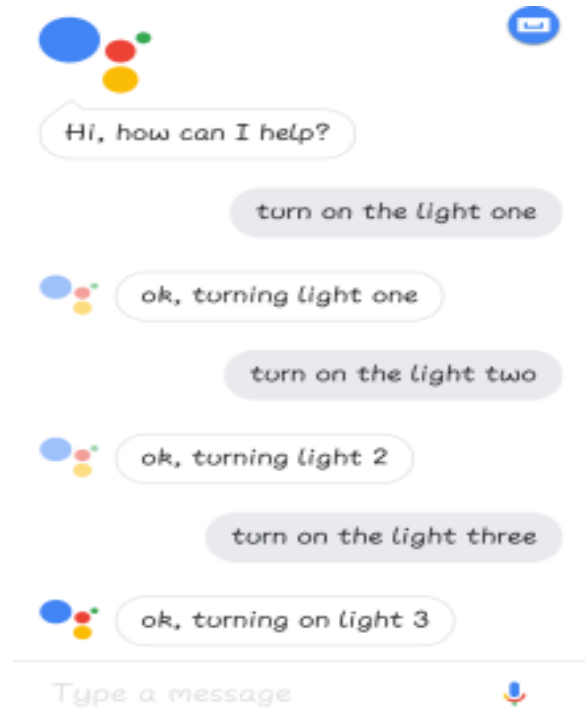

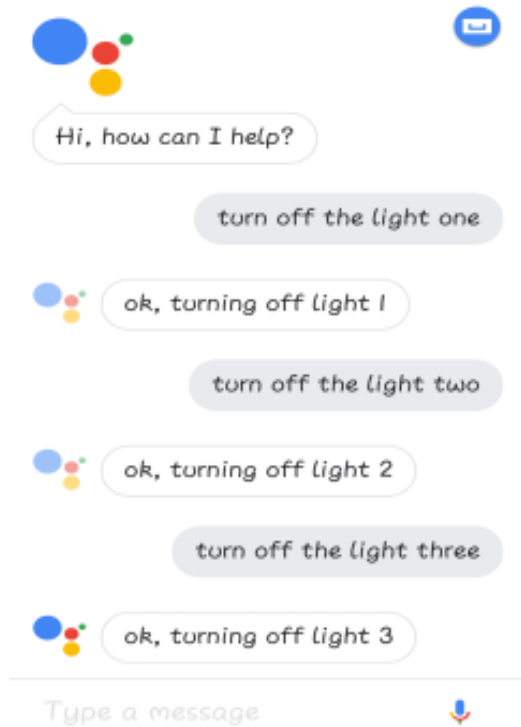Fig 2. Google Assistant and Adafriut IO interface

Fig 3. Google Assistant and Adafruit IO interface

We have seen in the above figure that Adafruit IO interface has four switches and one fan. In fig. 2, the Google Assistant interface shows the send command to 'switch on the light', then the Adafruit IO get respond to on the switch feed. In the fig. 3, the Google Assistant interface shows the send command to switch off the light, then the Adafriut IO get respond to off the switch feed.

VII. CONCLUSION AND FUTURE SCOPE

The internet has changed the way we live today; it is the interaction between the people at the virtual level in several contexts from the professional life of the social relationships. The motivation behind to design this system is not just to control the lights and fans but also to control the other home appliances like temperature sensor of the room before reaching the house to save time and effort or motion detectors, etc.

Our future work will focus on simulated model in real time, to develop the advanced motion detection algorithm for surveillance cameras, moving car autonomously, to unlock the door of the home for the visitors using the face recognition, industrial robots etc.

REFERENCES

[1] M. Mohsin, S. Nandanwar, M. Shingate, "*Home Automation and Security System Using Android ADK*", International Journal of Electronics Communication and Computer Technology, Vol. 3, Issue 2, March 2013.
[2] D. Naresh, B. Chakradhar, S. Krishnaveni, "*Bluetooth Based Home Automation and Security System Using ARM9*", International Journal of Engineering Trends and Technology, Vol. 4, Issue 9, September 2013.
[3] D. Rohith, G. Mounica, K. Vinod, "*Design and Implementation of an Embedded Web Controller for Automation*", International Journal of Emerging Technology and Advanced Engineering, Vol. 4, Issue 9, September 2014.
[4] M. Khatu, N. Kaimal, P. Jadhav, S. A. Rizvi, "*Implementation of Internet of Things for Home Automation*", International Journal of Emerging Engineering Research And Technology, Vol. 3, Issue 2, February 2015.
[5] V. Sagar K N, Kusuma S M, "*Home Automation Using Internet of things*", International Research journal of Engineering and Technology, Vol. 2, Issue 3, June 2015.
[6] K. Ghosh, K. Kalbhor, D. Tejpal, S. Haral, "*Wireless Home Automation Technology Using Internet Of Things*", Internation Journal of Technical Research and Applications, Vol. 3, Issue 6 November, 2015.
[7] P. Bedekar, S. Nargundi, "*A Review on Home Automation using Augmented Reality*", International Journal of Science and Research, Vol. 5, Issue 4, April 2016.
[8] S. Z. Z. Win, Z. M. Min, H. M. Tun, "*Smart Security System For Home Appliances Control Based On Internet Of Things*",

International Journal of Scientific & Technology Research, Vol. 5, Issue 6, June 2016.

[9]   R. Ekatpure, D. Ingale, "*Android based Interactive Home Automation System through Internet of Things*", International Journal of Sciennce and research, Vol. 5, Issue 7, July 2016.

[10]   P. Rathod, S. Khizaruddin, R. Kotian, S. Lal, "*Raspberry Pi Based Home Automation Using Wi-Fi, IOT and Android for Live Monitoring*", International Journal of Computer Science Trends and Technology, Vol. 5, Issue 2, March 2017.

[11]   D. Purohit and M. Ghosh, "*Challenges and Types of Home Automation Systems*", International Journal of Computer Science and Mobile Computing, Vol. 6, Issue 4, April 2017.

[12]   Kishore. P, T. Veeramanikandasamy, K. Sambath, S. Veerakumar, "*Internet of Things based Low-Cost Real-Time Home Automation and Smart Security System*", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 6, Issue 4, April 2017.

[13]   X. Mi, Y. Zhang, F. Qian, X. Wang, "*An empirical Characterization of IFTTT:Ecosystem, Usage, and Performance*", Proceedings IMC '17, ACM New York, NY, USA,November 1-3, 2017.

[14]   T. Kim, J. Lim, H. Son, B. Shin, D. Lee, and S. J. Hyun, "*A Multi-Dimensional Smart Community Discovery Scheme for IOT-Enriched Smart Homes*", ACM Transactions on Internet Technology, Vol. 18, Issue 1, December 2017.

[15]   G. A. Ar. de Oliveira, R. W. de Bettio, A. P. Freire, "*Accessibility of the smart home for users with visual disabilities: an evaluation of open source mobile applications for home automation*", Proceedings of IHC '16, ACM New York, NY, USA, October 04-07, 2016.

[16]   M. N. Kadima, F. Jafari, "*A Customized Design of Smart Home using Internet-of-Things*", Proceedings of ICIME 2017, ACM New York, NY, USA, October 09-11,2017.

[17]   E. Fytrakis, I. Georgoulas, J. Part, Y. Zhu, "*Speech-Based Home Automation System*", Proceedings of British HCI '15, ACM New York, NY, USA, July 13-17, 2015.

Authors Profile

Mr. Deepjyoti Choudhury pursed Bachelor of Technology in Information Technology in 2011 and Master of Technology in Information Technology from Assam University in year 2013. He is currently pursuing Ph.D. in Computer Science & Engineering and has been working as Assistant Professor in Department of Computer Science & Engineering, Assam down town University since 2013. He has published several research papers in reputed international journals and conferences including IEEE and it's also available online. His main research work focuses on Social Network Analysis, Data Science, IoT and Soft Computing. He has more than 5 years of teaching experience.