

GOOGLE ASSISTANT CONTROLLED HOME AND AGRICULTURAL AUTOMATION

¹Harsh Jha, ²Omkar Kamble, ³Sudhakar Kadam, ⁴Mohan Kokare ⁵Rajashree Thakare

¹Student, ²Student, ³Student, ⁴Student, ⁵Professor

¹Department of Electronics and Telecommunication,

¹Bharati Vidyapeeth College of Engineering, Navi Mumbai, India

Abstract: The term automation stands for use of automatic equipment for various purposes. Automation has not only brought drastic changes in lifestyle of human being in various sectors but has also improved the standard of living of millions of people around the globe. One of the sectors where automation is rapidly growing is home. This project presents the overall design of Home and Agricultural Automation System with low cost and wireless system. This system is designed to assist people with disabilities, provide help to elderly at home as well as farmers and those associated with farming in agricultural fields. We are using IoT (Internet of Things) for better security and to make it more reliable. Automation System include centralized control system to control of lightning, appliances, security locks of gates and doors, provide water to plants at particular time, check soil moisture and pH value and other systems, to provide improved comfort, energy efficiency and security system.

IndexTerms - Google Assistant, IoT, IFTTT Application, Adafruit IO, MQTT, NodeMCU (Arduino ESP8266)

I. INTRODUCTION

Smart phones are being widely used in today's world giving ability to users to control devices. According to a survey, by the start of 2018 almost 2.3 billion people owned a smart phone with 85.9% of them being Android users while 14% of the remaining being iOS users. As the years have gone by, number of machines and instruments used by humans to complete day to day task have also increased. This increase in number of machinery and appliances used in our lives brought the drastic need of automating them too.

Automation is based on IoT, which can be implemented almost everywhere. Infact companies like Google and Amazon have already come up with Automation devices consisting of their own Assistants. An International survey says 52 million people all around the globe have been using Google Home since it first came while 20 million others opted for Amazon Echo. These stats show how huge impact automation devices have had to the lives of millions of people. The main aim of this project is to implement the same automation device already brought by Google and Amazon but with low cost and more features which can be controlled using smartphones that we already own thus reducing the effort put in by the user to control a device manually. The users here give voice commands to control the appliances in their home, garden or agricultural fields. The project makes use of Google Assistant on Android or iPhone to communicate with users through Arduino controller. Communication is duplex type i.e. user can give instructions and receive data at the same time and this communication takes place via internet therefore giving users the advantage of using it whilst sitting miles away from the devices to be controlled; after all it's all about safety, security and convenience at your finger-tips. Raspberry Pi 3 was used and connected to Google Assistant SDK and the developer controlled LED lights using internet based services in [1]. An application named BLYNK was used to communicate between Google Assistant API and Arduino module. It was successfully able to establish this connection using Internet and was able to control devices across home in [2]. A simple and low cost home automation system was made and controlled with an android application in [3]. Use of internet protocol IPv6 was done to send and receive data to and from the devices that were connected across the project. Thus successful implementation of automation using an android application was done in [4]. Similarly a voice controlled home automation in which a Bluetooth module acted as a communication link between the Android phone and microcontroller was used where human voice was fed and the Arduino UNO which worked as microcontroller received the voice commands in [5]. Author in [6] designed a webpage and stored it on the local LAMP server of the Raspberry Pi. Programming was done with PHP language. Use of Zigbee network adhoc protocol was done with Xbee wireless units in order to control home appliances and variety of sensors. The author in [7] used bluetooth module to transmit and receive data. The transmission was bi-directional and thus home automation was implemented. A simple automation system using NodeMCU and controlled appliances using Google Assistant was implemented in [8]. A small agricultural field using IoT based automation project was implemented in [9]. The author here used NodeMCU to control devices and sensors and used solar panel to power the motor in the circuit.

II. METHOD AND MATERIALS

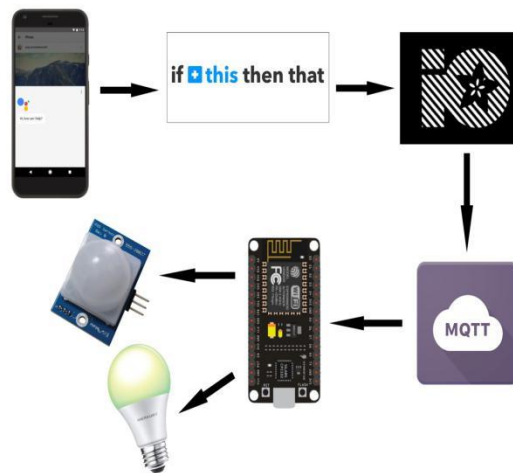


Figure 1: Process Diagram

Google Assistant is initiated at startup. Using sentences fed in IFTTT, one can give commands to the assistant. Upon understanding the type of command, the Google Assistant connects to the IFTTT. Here we are using sentence “Ok Google, turn ON motor” to turn the motor ON. A voice feedback saying “Turning ON motor” is prompted by the Assistant. Different sentences can be fed into IFTTT for controlling different devices.

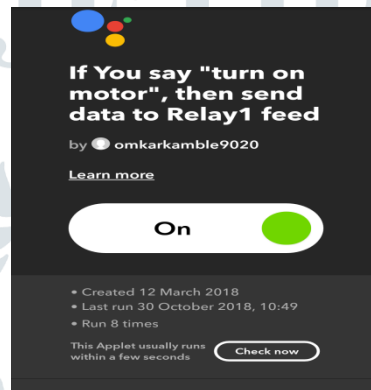


Figure 2: IFTTT Applet to turn ON motor

Once IFTTT is set it sends data into binary form i.e. 0, 1 for different purposes. For turning ON fan we feed ‘1’. This ‘1’ is then sent to Adafruit IO. Adafruit IO is setup to work as a virtual switch and a display for showing sensor readings. Adafruit is connected to Arduino ESP8266 through a MQTT server. Adafruit then sends this ‘1’ to respective relay and the motor is turned ON. Sensor’s readings are constantly uploaded to Adafruit IO.

2.1 Software and Hardware components

2.1.1 Google Assistant Application- Google Assistant is an Artificial Intelligence. Users Interact with Google Assistant using their own voice thus making this application secure although they can also give keyboard input. The Assistant is able to search the Internet, send and able to receive messages and set/delete alarms, adjust settings on the user's device, and show information from the user's Google account.

2.1.2 IFTTT application- If This Then That (IFTTT) is a free website or an application where people can make their own applets to control different things ranging from other applications to other devices and so on. An applet is triggered by changes that occur within other web services such as Google Assistant, Gmail, Facebook, Telegram, Instagram or Pinterest. It is a software platform that connects apps and services from different developers to trigger automation.

2.1.3 Adafruit IO- Adafruit IO is a cloud based service which can be accessed over the internet. It's meant primarily for storing and then retrieving data but it can be used as a virtual switch too. Adafruit IO is also used to Control motors, read sensor data and display it over the internet.

2.1.4 MQTT server- Message Queue Telemetry Transport is a Client Server messaging transport protocol used to publish or to subscribe to different things. It comprises of one server and many clients and the server acts as the broker. In this paper, clients are our smartphone, sensors etc.

2.1.5 Arduino ESP8266- The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability. Arduino ESP8266 is relatively inexpensive as compared to Raspberry Pi 3. Only a few external components are present in microcontroller module making it easy to use. Main advantage of NodeMCU is that it is compatible with almost all kinds of small and large projects.

2.1.6 Four channel relay module- Relays are switches that open and close circuits electronically. It turns ON when a high voltage is applied. Turns OFF when a low voltage is applied. Four channel module is capable of handling four devices at a time.

2.1.7 16 channel Analog/digital multiplexer- It works using both digital and analog signals, and the connections function in either direction i.e. signals can either be converted from analog to digital or vice-versa. This allows one to connect up to 16 sensors to a system using only 5 pins.

2.1.8 Sensors- A sensor is a device that detects a particular condition and responds to it by giving the proper values of it. The sensors being used are humidity sensor (DHT11), temperature sensor, light sensor, PIR motion sensor, Soil Moisture Sensor.

III. OTHER SECTIONS

3.1 Proposed model: This project aims to integrate home and agriculture sectors using a single Smartphone device and control appliances installed across both these sectors using Google Assistant and an Arduino device. Google Assistant API allows communication with different software and hardware devices and gives seamless connectivity on the go. Moreover it is available over a wide variety of devices ranging from android to IOS, windows, MAC and even Linux based computers.

IV. RESULTS AND DISCUSSION

Google Assistant is activated by saying the keyword Ok Google continued by the phrase turn ON motor as shown in Figure 3 to send data '1' to the NodeMCU. Upon receiving command from Google Assistant, IFTTT forwards this data in form of 0,1 to Adafruit and feeds in Adafruit turn ON/OFF as shown in Figure 4. Adafruit IO gets connected to NodeMCU via MQTT. The Arduino Esp8266 has to be connected to a local Wi-Fi network in order to send and receive data. Data '1' is sent by Arduino to relay port. Respective relay port senses the data '1' and the motor gets turned ON.

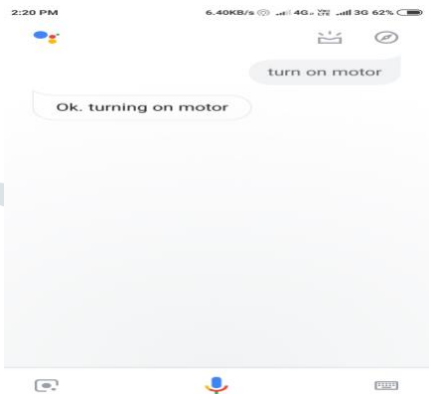


Figure 3: Voice command given to Google Assistant

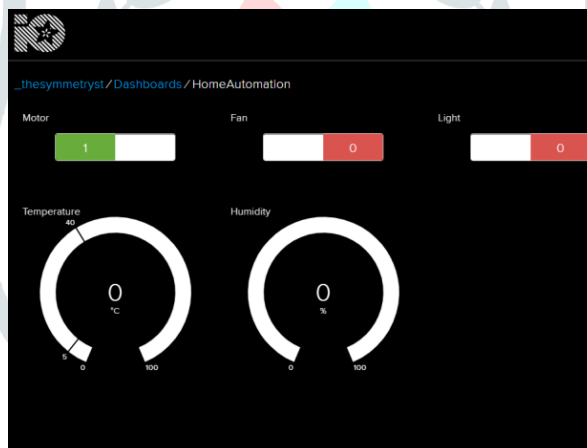
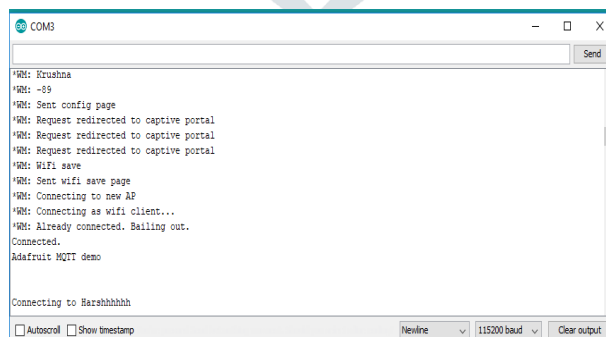


Figure 4: Motor switch turned ON in Adafruit IO



```

COM3
Connecting to Harshhhhhh

WiFi connected
IP address:
192.168.15.104
Connecting to MQTT... MQTT Connected!
Motion 2
...OK!
CO2 2
...OK!
Sound 3
...OK!
Light 2
...OK!
Failed to read from DHT sensor!
Motion 3
Autoscroll Show timestamp
Newline 115200 baud Clear output

```

Figure 5 and 6: Arduino connected to Adafruit IO using MQTT

Figure 5 and 6 show the connection establishment between NodeMCU and MQTT server via the local WiFi network. A feedback is received at the assistant that the motor has been turned ON. Sensor readings are displayed simultaneously on the Adafruit IO dashboard. Buzzer sounds at the start indicating connection being made via MQTT.

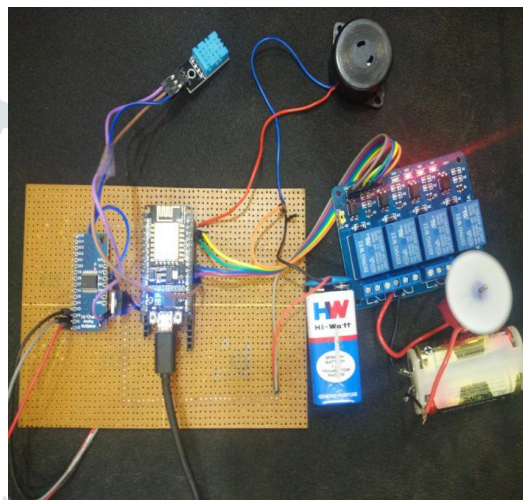


Figure 7: Motor turned ON using Arduino ESP8266

V. CONCLUSION

The aim of this paper was to create a low cost, easily accessible smart device which is capable of controlling numerous devices present at one's home or garden/farm. Approach discussed in this paper was successful as the project was implemented successfully. With this project, old aged, partially disabled, paralyzed person's dependency on others is reduced and he/she can easily control the devices from far-away places too. Moreover, as Google Assistant being voice controlled, no person other than owner can access this system without permission.

VI. ACKNOWLEDGEMENTS

Our project not only gave us chance to explore our field but also gave us an opportunity to learn the minute's details of the Electronic and Telecommunication. With the completion of our project, we owe grate many thanks to all those without whom this world have been a distinct reality. Firstly we express our grate fullness to Dr. M. Z. Shaikh, Principal, Bharati Vidyapeeth College of Engineering, Navi Mumbai for providing with a vital opportunity and an environment to carry out our project work successfully. We extend our heartfelt thanks to Prof. P. A. Kharade, Head of Department of Electronics and Telecommunication department B.V.C.O.E. and our project guide Prof. Rajashree Thakare for providing us with the best of facilities to make this project and for consistently encouraging and giving us full liberty with the project. Thanks to our friends for giving their support at the hour of need lastly, deepest thanks to our families who provided us with the conducive environment and infrastructure in successfully completion of the present work.

REFERENCES

- [1] Mummaka Sai Srinath, Manepalli Nanda Kishore, M.D. Anto Praveena “Interactive Home Automation System With Google Assistant” International Journal of Pure and Applied Mathematics Volume 119 No. 12 2018.
- [2] Manish Prakash Gupta “Google Assistant Controlled Home Automation” International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 05, May-2018
- [3] Seong Ro Lee and Rajeev Piyare “Smart Home Control and Monitoring System Using Smart Phone” 1st International Conference on Convergence and its Application (ICCA), Volume: 24.
- [4] Byungjoo Park and Ronnie D. Caytiles “Mobile IP-Based Architecture for Smart Homes” International Journal of Smart Home Vol. 6, No. 1, January 2012.
- [5] Sonali Sen, Shamik Chakrabarty, Raghav Toshniwal, Ankita Bhaumik “Design of an Intelligent Voice Controlled Home Automation System” International Journal of Computer Applications (0975 – 8887) Volume 121 – No.15, July 2015.
- [6] Prof B.P Kulkarni, Aniket V Joshi, Vaibhav V Jadhav, Akshaykumar T Dhamange “IoT Based Home Automation Using Raspberry Pi” International Journal Of Innovative Studies In Sciences And Engineering Technology ISSN 2455-4863 Volume: 3 Issue: 4, April 2017.
- [7] Joceli Mayer “IoT Architecture for Home Automation by Speech Control Aimed to Assist People with Mobility Restrictions” Int'l Conf. Internet Computing and Internet of Things , ICOMP'17
- [8] Aayush Agarwal, Anshul Sharma, Asim Saket Samad, S Babeetha “UJALA- Home Automation System Using Google Assistant” IJARIE-ISSN(O)-2395-4396, Vol-4 Issue-2 2018
- [9] CH. Manjusha, K. Mounika “IOT Based Agriculture System Using Google Assistant” International Journal of Engineering Trends and Applications (IJETA) – Volume 5 Issue 2, Mar-Apr 2018
- [10] Google Assistant: <https://developers.google.com/assistant/sdk/overview>
<https://www.digitaltrends.com/mobile/google-assistant/>
- [11] IFTTT: <https://www.computerworld.com/article/3239304/what-is-ifttt-how-to-use-if-this-then-that-services.html>
<https://www.androidcentral.com/google-home-setting-ifttt-assistant>
- [12] Adafruit IO: <https://learn.adafruit.com/home-automation-in-the-cloud-with-the-esp8266-and-adafruit-io/introduction>
- [13] Arduino ESP8266: <https://arduino-esp8266.readthedocs.io/en/latest/>

