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Voice Assisted Home Automation

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Abstract: *The idea behind Google assistant-controlled Home automation is to control home devices with voice. On the market there are many devices available to do that, but making our own is awesome. In this project, the Google assistant requires voice commands. Ada fruit account which is a cloud based free IoT web server used to create virtual switches, is linking to IFTTT website abbreviated as "If This Than That" which is used to create if else conditional statements. The voice commands for Google assistant have been added through IFTTT website. In this home automation, as the user gives commands to the Google assistant, Home appliances like Bulb, Fan and Motor etc., can be controlled accordingly. The commands given through the Google assistant are decoded and then sent to the microcontroller, the microcontroller in turn control the relays connected to it. The device connected to the respective relay can be turned ON or OFF as per the users request to the Google Assistant. The microcontroller used is Node MCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).*

Keywords: Home automation

I. INTRODUCTION

"Home automation" refers to the automatic and electronic control of household features, activities, and appliances. The utilities and features of our home can be easily controlled via Internet. There are three main elements of a home automation system: sensors, controllers, and actuators.

Having day to day developing technology is a proud moment to the whole world. The foremost aim of the technology is to increase the efficiency and to decrease the effort. In this trending world, Internet of Things is being given extreme importance. In that, Automation, leads to have less effort and much efficiency. By using IoT, we are successful in controlling the appliances in various areas, in which one of them is to control the home automation by using Node Microcontroller. We can also use other boards like raspberry pi, beagle bone etc., in the present- day technology, the whole work is done through communication so the effective way of communication can be done through voice.

Even though the technology is developing in our day to day life, there is no help coming into existence for the people who are physically not good on the basis of technology. As the speech enabled, home automation system deploys the use of voice to control the devices. It mainly targets the physically disabled and elderly persons. The home automation will not work if the speech recognition is poor. The speech given by the user will be given as input to the Microphone. Microphone recognizes the speech given by the person and sends it to the recognizing module. It searches for the nearest word even if there are any disturbances in it. If the command (ON/OFF) is given, the action is done. Similarly, the line following robot functions with respect to the speech commands given to it. The line following robot moves forward and backward with the help of sensors and a motor driver board.

Home is the place where one desires to be rest after a long tiring day. People come home exhausted after a long hard-working day. Some are way too tired that they find it hard to move once they land on their couch, sofa or bed. So, any small device/technology that would help them switch theirs lights on or off, or play their favorite music etc. on a go with their voice with the aid of their smart phones would make their home more comfortable. Moreover, it would be better if everything such as warming bath water and adjusting the room temperature were already done before they reach their home just by giving a voice command. So, when people would arrive home, they would find the room temperature, the bath water adjusted to their suitable preferences, and they could relax right away and feel cozier and rather, feel more homely. Human assistants like housekeepers were a way for millionaires to keep up their homes in the past. Even now when technology is handy enough only the well to do people of the society are blessed with their new smart home devices, as these devices

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costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keeps growing.

INTERNET OF THINGS:

The major concept using in the Google assistant-controlled Home automation is the Internet of Things. The Internet of Things (IoT) can be connecting various types of objects like smart phones, personal computer and tablets to the internet, which brings new-fangled type of communication between things and things, and things and people. The Figure shows the Home automation system.

Fig. Home automation system

Any man-made objects that can be assigned an IP address and it has the ability to transfer data successfully over a network, the interaction through a network is called IoT. The internet helps us to bring immediate solutions for many problems and able to connect from any of the remote places. The Internets of Things technology is used to come in with innovative idea and large development space for smart homes to improve the living standards of life. The growth of the Internet of Things will reform a number of sectors, like healthcare, automation energy, transportation, etc. The cloud computing can be used in such case to implement the IoT infrastructure that augmented with sensors and actuators to monitor and control "things" from anywhere.

II. DESCRIPTION OF THE PROBLEM

Existing Method:

A home automation system allow users to control electric appliances of varying kind. Many existing, well established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through Internet from anywhere around the world. Internet or IP protocol-based communication in home automation systems is always a popular choice. The capacity of a product or system to communicate in a standard way with other products or system is Interoperability. The existing system has a drawback that the graphical user interface (GUI) is not provided to the user and the user has to remember all the AT commands to control the connected devices. Also, the system uses the java-based functions.

Now a days, the usage of those mobile has less. But in the proposed system we are controlling all devices through android mobile and web server and the user no need to remember the commands also. Some devices are automated like cooler, Fan, Light, Electric motor etc.

Proposed Method:

The proposed system eliminates the complication of wiring in case of wired automation. Considerable amount of power supply is also possible. Operating range is more than the Bluetooth. The existing system does not allow remote monitoring and controlling of appliances.

But where as in the proposed system the system using the Wi-Fi based home automation system it allows to monitor and control the appliances. The home automation of the existing system in 1990's, the people in every home has electronic devices which are controlled manually but in our proposed system we are controlling all electronic appliances through remotely. The IOT application have become this popular in this 21st century is due to dominant use of the internet, evolution

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of smart phone technology and raised standard of mobile communication.

Problems of Home Automation:

Wired or wireless systems, while in the house not very likely to face many problems. However, when controlling through the application locally or remotely, we can face problems such as delays in performance and that is frustrating. Delays could be due to poor internet connection and planning in the house. If we are having battery operated devices and their usage is more than normal, then battery problems could be another issue for what we to deal with and also the voice-recognition of Google assistant is not up-to the mark if there is noisy Environment.

Due to Interference of the nearby noise, the Google assistant commands may also not work properly. Home Automation is still an expensive product, by Indian consumer standards, and there's a lot of scope of the prices to be whittled down by an order of magnitude at least in the next few years. This will happen as more companies manufacture the key components of Automation systems (controllers, Gateways etc.,) and economies of scale takes over.

III. METHODOLOGY

The methodology of this project design includes implementation of the proposed method. There are some basic steps involving in the Methodology of the product. The first major step is setting up the Adafruit IO. Adafruit IO is a website used to create virtual switches which will be turned ON or OFF depending on the commands given to the Google assistant and the second step is connecting the ESP8266 and the last step is connecting to Google assistant through IFTTT. IFTTT is also a website used to create simple chain of conditional statements for like if else statements. By following these three steps, the implementation of the proposed system is going to be done.

IV. LITERATURE REVIEW

Inventions to Home Automation

When people think about home automation, most of them may imagine living in a smart home: One remote controller for every household appliance, cooking the rice automatically, starting air conditioner automatically, heating water for bath automatically and shading the window automatically during night. To some extent home automation equals to smart home. They both bring out smart living condition and make our life more convenient and faster.

Early home automation began with labor-saving machines. Self-contained electric or gas-powered home appliance became viable in the 1900s with the introduction of electric power distribution led to the introduction of washing machine (1904), water heater (1889), refrigerator, sewing machines, dishwashers and clothes dryers. Currently there exists system neither at cheaper rates nor easy to handle. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary, closed and not very user friendly Based on Arduino or GSM or low-cost home security system and home automation system.

Tan, Lee and Soh (2002) proposed the development of an Internet-based system to allow monitoring of important process variables from a distributed control system (DCS). It proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively rent designations. Potamitis, Georgila, Fakotakis, and Kokkinoss, G. (2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition. In the year 2006, S. M. Anamul Haque, S. M. Kamruzzaman and Md. Ashraful Islam proposed a system entitled "A System for Smart-Home Control of Appliances Based on Time and Speech Interaction" that controls the home appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine tools for speech recognition purpose. Appliances can be either controlled by timer or by the voice command. Jawarkar, Ahmed, Ladhake, and Thakare (2008) propose remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task. Prof. Era Johri in (2001) have successfully completed the project on "Remote Controlled Home Automation".

Withings is a consumer Electronics Company is the leader in the connected health revolution. The Home camera alerts the user to many motion or noise while out of the House. It also tracks the indoor air quality, notifying the user if dangerous

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levels of voltaic organic compounds are detected. It has taken security, privacy and home health to the next level through a partnership with IFTTT, a service that allows rule-based actions and triggers between a range of devices and services. Users can enhance their Withings Home, a HD security camera equipped with environmental sensors, by connecting with IFTTT app to make household automation a reality.

The comprehensive Home Monitoring solution was first presented at Consumer Electronics Show in 2014. Withings Home is one of the most comprehensive home monitoring solutions on the market, allowing users to stay connected to their home and family from anywhere. The camera can be used with the IFTTT app to create a number of recipes between connected services and the camera, such as turning it on when user's phone is using geolocation or when the door is locked, or making it turn on the air purifier when bad quality is detected. Parents can take comfort in having superior features such as Baby Monitor Mode, which has continuous monitoring, alerts and interactive push-to-talk.One of the topics which is gaining popularity of Home Automation System is because of its innumerous advantages. Home automation refers to the monitoring and controlling of home appliances remotely. with the never-ending growth of the Internet and its applications, there is much potential and scope for remote access and control and monitoring of such network enabled appliances. The effort targeted on the home automation concept of where the controlling and monitoring operations are expediting through smart devices. Wide-ranging home automation systems and technologies considered in review with central controller based (Arduino or Raspberry pi), cloud-based, Bluetooth-based, SMS based, ZigBee based, mobile-based, RF Module based, web based and the Internet with performance.

One of the most important Hardware requirements of the project is Node Microcontroller. To understand more about it, one must know about Microprocessors and Microcontrollers and also the differences between them.

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V. SYSTEM DESIGN AND FLOW

In Google assistant-controlled home automation, first the user should have an Android smartphone with Google assistant installed in it. When the user gives commands to the Google assistant, the commands will be checked with the commands in the IFTTT website which are already set.

Then the next step is setting up the virtual switches in Adafruit website. If the commands given by the user matches with the commands in the IFTTT website, then depending on that commands, the virtual switches in Adafruit will be turned ON or OFF. This will be sensed by the Node microcontroller and it will turn ON or OFF the relay depending on the commands. All this will be done over the Internet. In this, the relay will act as a switch and the Home appliances connected to the relay will be turned on or off. The number of Home appliances connected depends upon the number of relays.

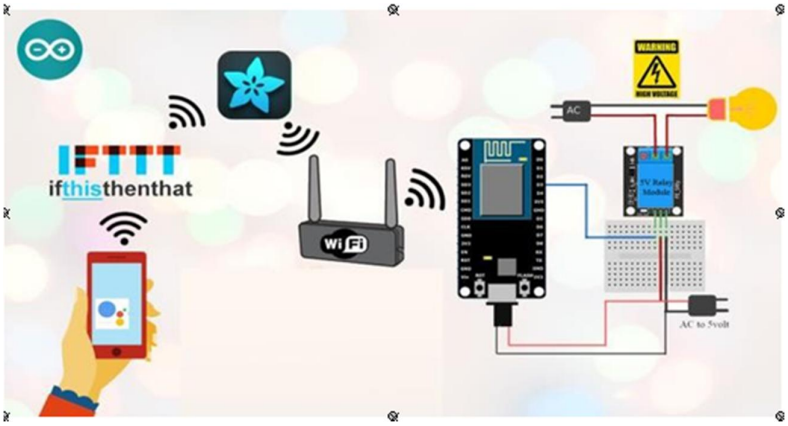

Fig. Block diagram of Google assistant-controlled Home automation.

TROUBLESHOOTING

There are a number of places that the connection between our voice and the light can break down. If the light isn't changing when the user speaks, there are a few things should be checked.

The light should be turned ON or OFF when the user toggles the switch on the Adafruit IO dashboard. If not, the ESP8266 is either not connecting to the server, not subscribing to the feed, or not checking for the correct string values.

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Check the Serial Monitor output of the ESP8266 device to find out.If the Google Assistant doesn't hear the user properly, use the Google Allo app, users can see what the Assistant heard, or can directly type the phrase which the user want it to interpret. If the Google assistant doesn't respond with the correct phrase, then Google account and IFTTT account aren't connected. Make sure that the same Google accounts for the Google assistant and IFTTT is used. If the Adafruit IO dashboard doesn't update when the IFTTT applet triggers, then Adafruit IO account and IFTTT account aren't connected. Double check on IFTTT to make sure that both the accounts have been linked.

INTERFACING NODEMCU WITH RELAY

The interfacing diagram of NodeMCU with Relay module is shown in Fig. The +5v Vin pin of the NodeMCU is given to the Voltage pin of relay module. The ground pin of Node Microcontroller is connected to ground pin of the Relay module. The NodeMCU consists of 8 data pins, clock, reset, enable, transmitter, receiver, flash etc., If the 4-Channel relay is used, then the data pins D0, D1, D2, D3 are connected to the 4 data pins of the Relay in which D0 is used to control 1st relay, D1 is used to control the 2nd relay, D3 is used to control the 3rd relay and D4 is used to control the 4th relay. The output of the relay consists of 3 pins in which two of them are given to the output like bulb, fan etc., and the one is of no connection.

CONNECTION OF BULB TO RELAY MODULE

While connecting bulb with the relay module, one of the wires of the bulb is directly connected to the power supply, the other wire of the bulb will be given to the power supply through relay module as shown in the Fig.

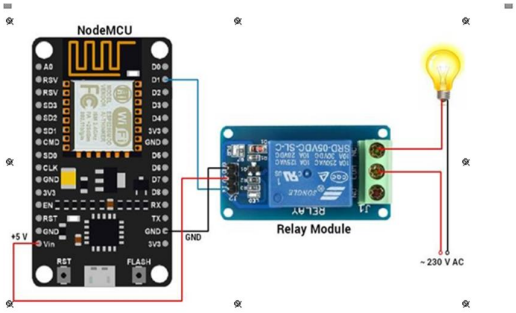

Fig:-Interfacing Diagram of Node MCU(ESP8266) with Relay module

VI. PROJECT IMPLEMENTATION

The Implementation of the project design can be divided into two sections; Hardware and Software implementations. The hardware implementation consists of the development of the main controller, sensor networks and the smart home while the software implementation focuses on the programming of the Node microcontroller using Arduino IDE.

We are combining two things together, hardware and software. As we are coding in the microcontroller and the software we need to be aware of the developing process of the application and the hardware. As we have used SDLC (Systems development life cycle) method to demonstrate the developing steps of the hardware and the software. We have planned everything in this project in a sequence so that all the project goals are achieved as required. So, for system design, we have used certain criteria that could combine both software and hardware in an orderly manner. In this chapter, we will describe the tools and skill required to develop a system with the combination of software and hardware.

To illustrate our system design we have used various diagrams, like activity diagram, use case diagram, data flow diagram and Gant chart etc.

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Fig: Connections of Google Assistant-controlled Home automation

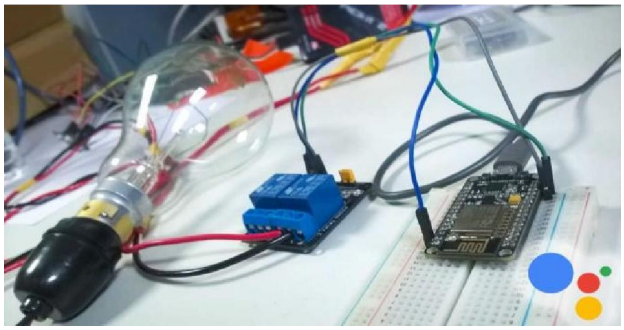

Fig: Results of Google assistant-controlledHome automation

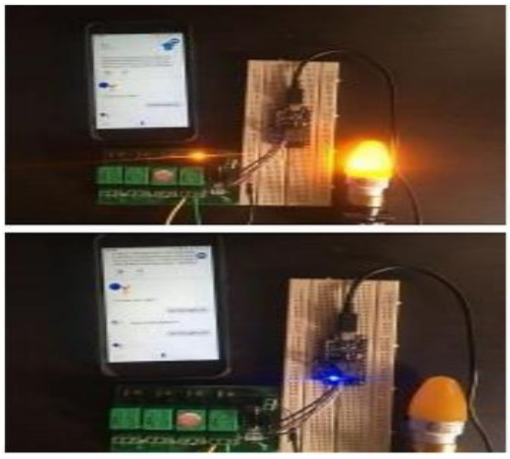

Fig: Light turning On and Off

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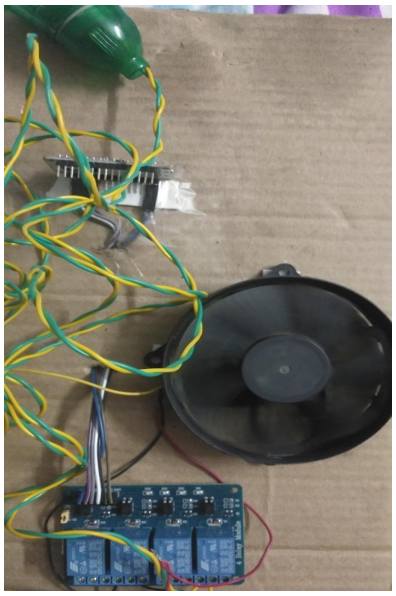

Fig: Rotation of Fan

VII. ADVANTAGES & APPLICATIONS

Advantages:-

- Optimized Controls. With all your devices and appliances connected to the same control system, and it's unifying app, it's easier to operate each of these items individually.
- Increased Energy Efficiency.
- Flexibility for New Devices.
- Improved Home Security.

Applications:-

- Lighting control system
- Appliance control with a smart grid
- Indoor positioning systems
- Home automation for elderly and disabled people

VIII. CONCLUSION & FUTURE WORK

In this project, voice commands are given to the Google assistant. The voice commands for Google assistant have been added through IFTTT website and the Adafruit account is also linked to it. In this home automation, user have given commands to the Google assistant. Home appliances like Bulb, Fan and Motor etc., are controlled according to the given commands. The commands given through the Google assistant are decoded and then sent to the microcontroller and it control the relays. The device connected to the respective relay turned On or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).

There has been tremendous growth in the home automation sector, and many reputed companies utilizing their opportunity to work with IFTTT to deliver an elegant way to connect families to their homes. Consumers are looking to secure their home environment in today's unpredictable world, and the new Home automation service gives them the peace of mind that they need to protect their family's well-being.

This project is about wireless home automation using Android mobile helps us to implement such a fantastic system in our home at a very reasonable price using cost-effective devices. Thus, it overcomes many problems like costs, inflexibility, security etc. In addition, will provide greater advantages like it decrease our energy costs, it improves home security. In

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addition, it is very convenient to use and will improve the comfort of our home. The project has proposed the idea of smart homes that can support a lot of home automation systems. C# programming language and Node microcontroller have been used to connect the sensors circuit to the home. Also, in home and building automation systems, the use of wireless technologies gives several advantages which cannot be achieved by using a wired network.

Reduced installation costs.
Easy deployment, installation, and coverage.
System scalability and easy extension.
Aesthetical benefits.
Integration of mobile devices.

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

Future work:

There are a variety of enhancements that could be made to this system to achieve greater accuracy in sensing and detection.

- There are a lot of other sensors that can be used to increase the security and control of the home like pressure sensor that can be put outside the home to detect that someone will enter the home.
- Changing the way of the automated notifications by using the GSM module to make this system more professional.

A smart garage that can measure the length of the car and choose which block to put the car into it and it will navigate the car through the garage to make the parking easy for the homeowner in his garage

ACKNOWLEDGEMENTS

The completion of our project brings with it a sense of satisfaction, but it is never complete without those people who made it possible and whose constant support has crowned our efforts with success. One cannot even imagine our completion of the project without guidance and neither can we succeed without acknowledging it. It is a great pleasure that we acknowledge the enormous assistance and excellent co-operation to us by the respected personalities.

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