An agile and diligent Application of IFTTT Google Assistant supported Domicile Mechanization and Quantification of Energy

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Abstract: This paper discusses the development of a personal assistant that helps the users interact with the household appliances using speech commands to provide a more interactive and user friendly living experience. The proposal aims at achieving a smart automated house application using different IoT platforms where the energy consumed and the cost is calculated. Here, the basic house facility can be handled by devices from any place such as ON and OFF of light, fan, AC, etc., This system is being implemented using natural voice commands given to the Google Assistant along with the help of IFTTT (If This Then That) application, Webhooks and the Blynk application. The commands are decoded and then sent to the Node MCU (ESP8266) microcontroller. This Node MCU controls the relays that are connected to it. The entire system is communicated via Wi-Fi modem in which they requires the internet access as it belongs to the Internet of Things (IoT). Our work aims at interacting with the electronic devices in a smarter way and also to maintain their usage of the appliances so that we can reduce the one we highly consume. The main motive of the system is to develop an application and identify the energy consumed and calculate the cost of the energy consumed by the appliances which are connected in a smart way.

Key Words: **Node MCU (ESP8266), IFTTT (If This Then That) Application, Internet of Things (IoT), Blynk Application, Google Assistant, Voice Control, ThingSpeak.**

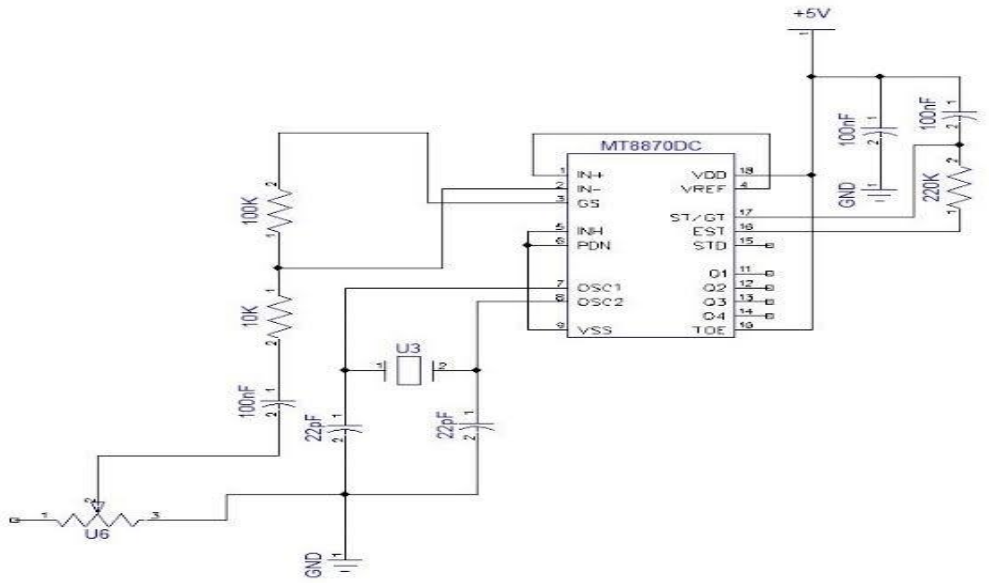
I. INTRODUCTION

Home automation, also known as, Domotics is nothing but, building automation for a home called as a Smart home. This system will control the lighting, entertainment systems and appliances. An automation system may also include home security such as access control and alarm systems. Thus, when connected with the internet, home devices become an important constituent of the IoT.With IoT home automation, you are less worried about home security. You can control the security of your home with your phone. If anything goes wrong, you may receive notifications on your phone and you may probably operate you lights or locks through your phone.You have the control of all your devices connected through IoT. It makes it very convenient for you to have all the devices adjusted just through your phone. Consumers also choose smart home devices to better control functions within the home. With home automation technology, you can know what's happening inside your home at all times. The IoT based Home Automation will enable the user to use a Home Automation System based on Internet of Things (IoT). The modern homes are automated through the internet and the home appliances are controlled. The user commands over the internet will be obtained by the Wi-Fi modems. The Microcontroller has an interface with this modem. The system status is displayed through the LCD display, along with the system data. This is a typical IoT based Home Automation system, for controlling all your home appliances. The implementation of the Smart home system includes various different purposes that has been taken into consideration such as child care, elder care, health care, security alerts to prevent accidents and intruders, and most importantly, to reduce the energy consumption. Therefore, for these purposes, the networking of the smart home appliances need to be combined with an easy and flexible controlling systems such as personal computers, tablets, smart phones, etc., via the internet.This proposal involves IR remote, Bluetooth and GSM methods for the implementation of home automation. They are used to control the AC appliances using android app. This method is found to be useful over the traditional method of switching ON and OFF. The result of this implementation is to achieve home automation involving the control and automation of home appliances through mobile application from remote locations [1].This paper describes the use of various open source hardware such as Arduino, Raspberry Pi, etc. to build smart and secure homes. The hardware is open source and hence cost efficient. This home automation system allows the end user to monitor his home or office with a smartphone, tablet, or any computer. This paper also explains the use of the security system for fire hazards that may occur due to a gas leakage and can be detected using a smoke sensor. It uses a low power NRF24L trans-receiver at each node around the house to create a mesh network that connects to a Linux based central hub **[**2].The work discusses the development of an IoT-Personal Assistant using Raspberry Pi. The Raspberry Pi collects the data from sensors and takes in speech or gesture commands to manage the household appliances [3].In this paper, two prototypes namely home automation using Bluetooth in an indoor environment and home automation using Ethernet in an outdoor environment are presented [4].This paper is clarifying that monitoring of circuit devices through wireless using Node MCU and controlling using App Blynk. It mainly focused on overcoming everyday problems faced by the people in world where regular power cut-off, unmanaged urbanization, lack of manpower in agriculture and farming, etc are blatantly evident [5].The implementation of this system is by giving voice commands to the Google Assistant, with the help of IFTTT and Blynk Application. Microcontrollers and the relays are connected as required with the appliance.These relays are switched ON and OFF as per the users' request to the Google Assistant. This system is found to be highly reliable and efficient for aged people and also differently abled people, on a wheel chair, unable to reach the switches for operating the appliance [6].In this proposal, a cost-efficient and user friendly remote controlled home automation system is presented using Arduino board, Bluetooth module, Smartphone, Ultrasonic sensor and moisture sensor. This system has certain features such as ultrasonic sensor and soil moisture

sensors. It also describes the hardware and software architecture of the system [7].The objective of this proposal is, constructing a fully functional voice based Home Automation system that uses IoT, Artificial Intelligence and Natural Language Processing (NLP). This provides a cost-effective and efficient way to work together with home appliances. This project aims at providing a fully automated voice based solution that users can rely on and perform more that just switching ON/OFF the appliances. The appliances are associated with the mobile device through an Arduino Board that established the concept of IoT [8].This proposal presents an efficient implementation of IoT, which is used for monitoring and controlling the household appliances through World Wide Web. This work aims at controlling the home appliances via smart phones, where the Wi-Fi acts as a communication protocol and the raspberry pi as server system. The user will be handling the system through a web-based interface over the web. The home appliances like lights, fans and door lock are remotely controlled by an easy website .Here, the server will be interfaced with hardware relay circuits which controls the appliances running at our home. The server will be communicating with the respective relays. In case, if the web affiliation is down or the server isn't up, then, the embedded system board will manage and operate the appliances. This proposal is a climbable and cost effective Smart Home System [9].This paper investigates the implementation of the voice Google Assistant on a Raspberry Pi microcomputer. This newly created device has several working modes that are analyzed. Finally, a speech recognition system that works in Romanian language is presented and evaluated [10].This research proposes a cost effective smart home model which can be used devices to make life more convenient, comfortable and home automation be brought within the reach of common public. ESP and Node Mcu components have been proposed to connect home with appliances from various vendors [11].This paper proposes harmonized and interoperable home automation solutions exploiting the concepts of Edge Computing, Virtual IoT Devices (VID) and the Internet of Things (IoT). We present a smart home architecture, prototype and its application in a use case. Our efforts establish the prototype as a lightweight and secure solution for emerging smart homes [12].The main aim of the paper is to design a smart home automation system using IoT, that is to turn a customary home to a smart home for accessing and controlling devices and appliances remotely using Android based Smart phone app. To be specific, we aim to design a low cost, extensible, flexible wireless smart home automation system using IoT which employs the integration of wireless communication, cloud networking to provide users to control a variety of devices from remote locations by providing an user friendly interface and ease of installation [13].In this paper, Smart Home Automation system is being proposed via use of PIC Technology utilizing PIC 16F877A microcontroller. The system contains HC-05 Bluetooth sensor for long range and energy efficient wireless communication and the system is fully operational to control various applications like TV, Bulbs, Tube lights, Fans and AC [14].This system is very beneficial for old ages and handicapped people as well for working people, it is a blessing as it alert the person if any nasty situation raised at home in their absence. Though there are various technologies used but in every technology mobile plays important role, to automate home appliances or to get alert in risky situations. Here a comparative analysis is based on Smart Home System to Control, Monitor and Secure Home based on technologies like GSM,IoT, Bluetooth and PIC Microcontroller with ZigBee Modulation Technique[15].This paper proposes a low-cost Wi-Fi based automation system for Smart Home (SH) in order to monitor and control home appliances remotely using Android based application. An Arduino Mega microcontroller provided with Wi-Fi module is utilized to build the automation system. In addition, several sensors are used to monitor the temperature, humidity and motion in home [16].The android phones are an open source and they allow easy access to the hardware components by providing communication interfaces. The IoT helps in transferring the data from sensors through wireless network, achieving the recognition and also information exchange in open computing network. The IFTTT platform is an easy way to get the apps and devices working together. Wi-Fi has been chosen as the mode of communication and the devices are being controlled through the Blynk app.In this paper, we are proposing an inexpensive and efficient application system that aims to implement the control of smart home appliances by using internet and android smart phone through voice commands given to the Google Assistant which acts as a trigger. Thus, the IFTTT platform, Webhooks and the Blynk application are being activated. Also, we are calculating the amount of energy consumed by the appliances and obtaining the cost of the energy consumed by that particular appliance in order to manage the usage of highly consumed appliances in the upcoming days.

II.LITERATURE REVIEW

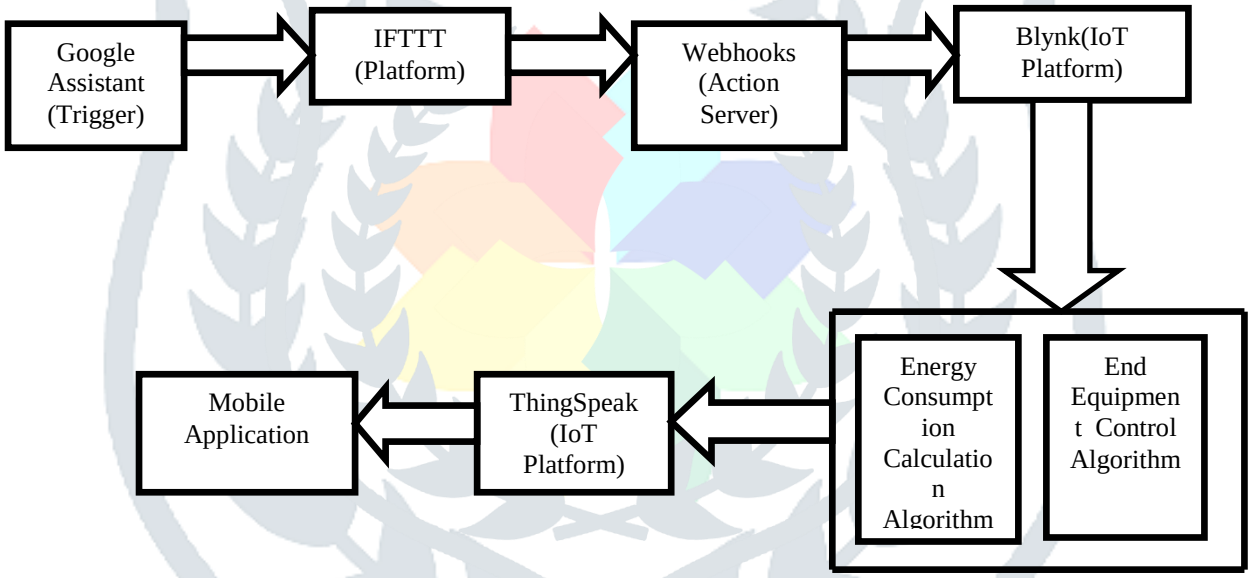
Smart Home Automation system is being proposed via use of PIC Technology utilizing PIC 16F877A microcontroller. The system contains HC-05 Bluetooth sensor for long range and energy efficient wireless communication and the system is fully operational to control various applications like TV, Bulbs, Tube lights, Fans and AC.In the other system, the use of various open source hardware such as Arduino, Raspberry Pi, etc. to build smart and secure homes. The hardware is open source and hence cost efficient. This home automation system allows the end user to monitor his home or office with a smart phone, tablet, or any computer. This paper also explains the use of the security system for fire hazards that may occur due to a gas leakage and can be detected using a smoke sensor. It uses a low power NRF24L trans-receiver at each node around the house to create a mesh network that connects to a Linux based central hub. The existing system is a gesture based recognition system to control the electronic devices.The other work discusses the development of an IoT-Personal Assistant using Raspberry Pi. The Raspberry Pi collects the data from sensors and takes in speech or gesture commands to manage the household appliances. Using the registered gestures, we can easily control the devices without any interruption. Here, Dual-Tone Multi-Frequency (DTMF) is used. The DTMF is a method in which we can dial the registered numbers so that the respective devices will switch according to the number dialed. In this system, those electronic devices which are connected can be easily controlled using the gestures which are registered. Here, the gestures are to be remembered by the people in order to control the device the next time. This system has a drawback in which the older people find difficulties in remembering the gestures and the numbers registered. DTMF doesn't have a feedback system in the home automation. There is no direct method for these gesture recognitions. In order to overcome this drawback, our system uses voice controlled system which is to control the electronic devices with the general commands. Also in our system, we calculate the energy consumed and the cost of the energy consumed by the devices in which the existing systems don't have such method.



Circuit Diagram of DTMF(Dual-Tone Multi-Frequency)

III.PROPOSED METHODOLOGY

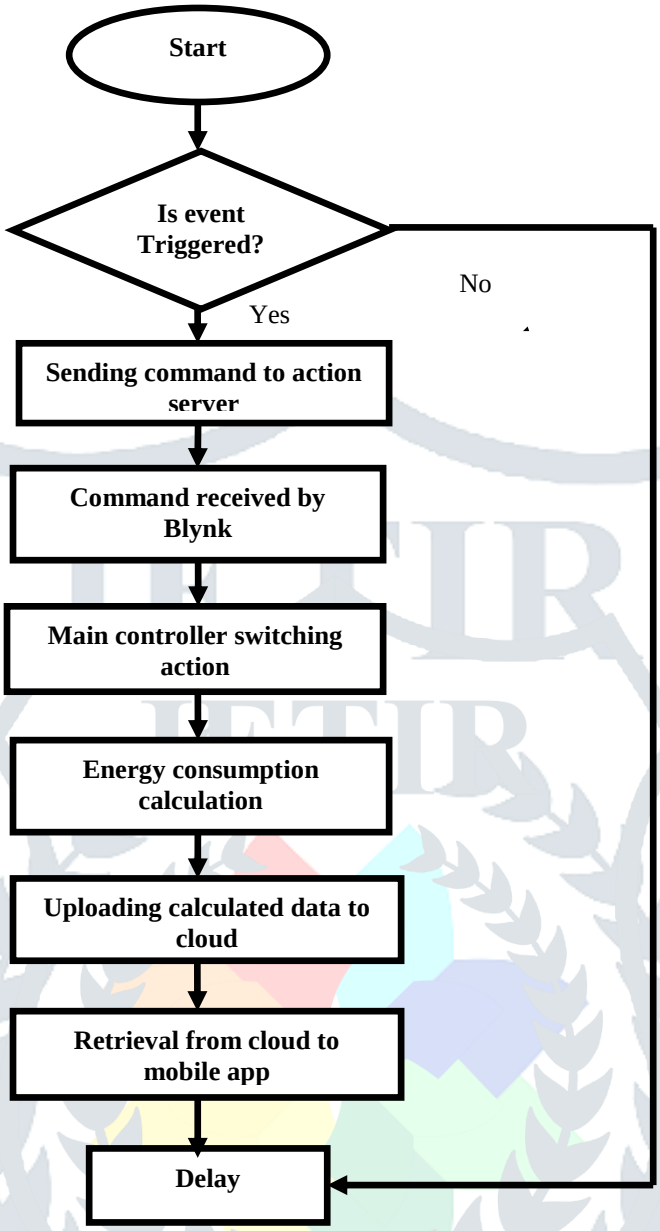
The main scope of our work is to calculate the energy consumed by the devices and also the cost is calculated so that people can easily know their regular usage of those devices. The different devices are connected via Node MCU, a Microcontroller and they are made to connect with the Google Assistant via IFTTT application. Here the process is done by the Webhooks which helps to activate the commands given by the user.



Block Diagram of the proposed system

The "OK Google" or "Hey, Google" side covers voice commands, voice searching, and voice-activated device control, letting you do things like send messages, check appointments and so on on your Android device. Google Assistant in Google Home devices forms the foundation of smart home control. It's compatible with a wide range of devices, so you can control heating, lights, and a lots more with your voice.Initially the commands which are to be given in the Google Assistant should be registered in the IFTTT application by creating different applets for various devices.Services (formerly known as channels) are the basic building blocks of IFTTT.They mainly describe a series of data from a certain web service such as YouTube or eBay. Services can also describe actions controlled with certain APIs, like SMS. Sometimes, they can represent information in terms of weather or stocks. Each service has a particular set of triggers and actions.Triggers are the "this" part of an applet. They are the items that trigger the action.Actions are the "that" part of an applet. They are the output that results from the input of the trigger.Blynk app allowsus to build apps for projects using various widgets. It is available for Android and iOS platforms. Blynkserver is responsible for all the communications between the mobile device that's running the Blynkapp and the hardware.The Blynk is application which is a platform with iOS and Android applications to control Arduino, Raspberry Pi, Node MCU and also other boards through the internet. We create a project in the Blynk app with the microcontroller we are using and then the toggle buttons are created for each relay associated with the digital pins of the microcontroller. Blynk then sends an authentication token to the registered email id for this project. The authentication token is used in the IFTTT application to complete the process which involves URL, method, content type, body. The URL should be in the following format:*http://188.166.206.43/Authtoken/pin/CorrespondingDigitalPinNo*. The method should be in 'PUT' and the content type is 'Application/JSON' and the body should be ["1"] for turning ON and ["0"] for turning OFF. This helps in functioning of the Google Assistant with the respective commands.

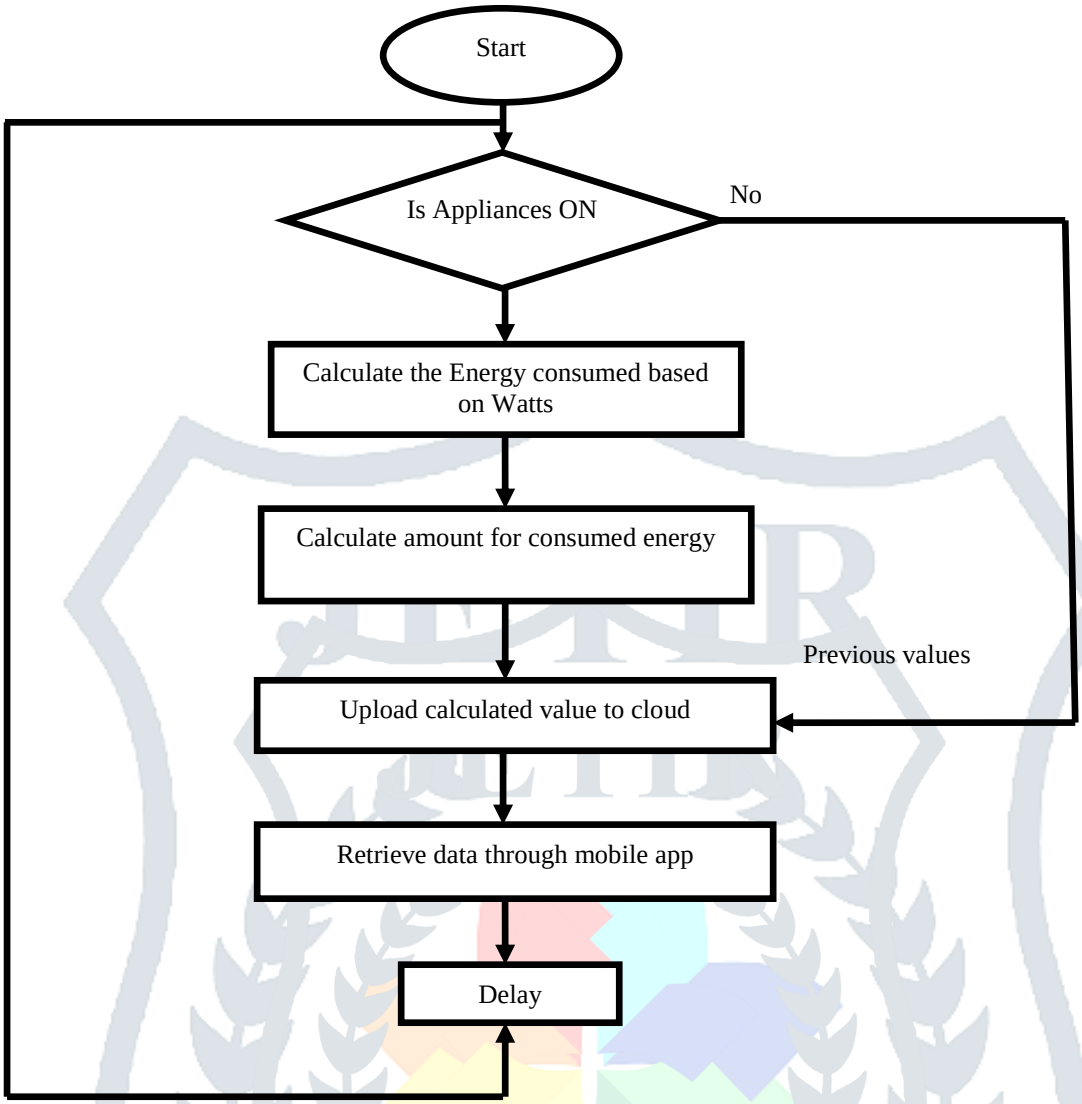
The below given flowchart explains the complete overview of our system:



IV.ENERGY CONSUMPTION CALCULATION ALGORITHM

Here, the energy is calculated for each and every electrical device which is operated through Google Assistant. The consumed energy is calculated using an algorithm. Initially, it is checked whether the electrical devices are ON and then the energy consumed by the particular devices are updated according to the usage of that device. Our proposed system not only aims at calculating the consumption of the energy but also the cost of the connected devices with their respective units consumed by the device. This helps the people to check their usage of the devices and this will be easier method to know the accurate units consumed by those devices.

The main advantage of the energy consumption calculation is that it will update the unit values as the devices are turned on and off. If four devices are connected to the Google Assistant, the energy consumption and the cost calculation for each and every device are displayed separately. The energy consumption is first calculated and then the respective amount is calculated. The calculated values are uploaded to the cloud. These data are stored in the cloud and then the calculated values are retrieved from the cloud through a mobile application. This mobile application is nothing but the result of the system in which it consists of the energy consumption values and the cost calculated.This proposed system has the flow chart which describes the energy consumption algorithm as:



4.1 Algorithm

Step 1: Initialize the ports and set the corresponding wattage

Step 2:

If (equipment1=ON)

{

Increment the value every one minute

}

Else

{

Retain the previously incremented value

}

Step 3: For equipment 2(60W)

If (equipment2=ON)

{

Increment the value every one minute

}

Else

{

Retain the previously incremented value

}

Step 4: For equipment 3(80W)

If (equipment3=ON)

{

Increment the value every one minute

}

Else

{

Retain the previously incremented value

}

Step 5: For equipment 4(100W)

If (equipment4=ON)

{

Increment the value every one minute

}

Else

{

Retain the previously incremented values

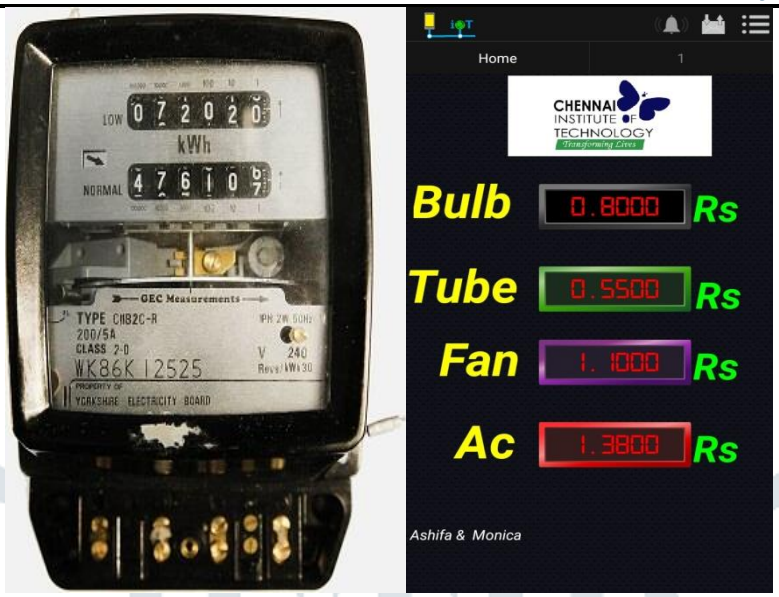
}

Step 4: Upload the status to IoT cloud every minute

V.COMPUTATIONAL ANALYSIS

The computational analysis is nothing but the analysis of our proposed system with which it equals the values that are recorded in the Electric meter in the house. It mainly calculates the amount of energy consumed , then the number of units used and finally the cost calculation. Here, the number of units is checked in the electric meter and in our developed mobile application. The analysis is that the value recorded in the electric meter and the mobile application is almost equal in which it is clear that the mobile application works good.Here, we are obtaining the unit rate mapping in order to calculate the energy consumed by the appliances and their cost respectively. The EB meter that we have in all our homes, will provide us the cumulative readings of the energy consumed by the appliances. We don't know which particular appliance is consuming more energy.To identify this, we have made a comparison between the EB meter readings and the readings that are being recorded in our application. The overall readings of the EB meter tallies with the cumulative readings of all the home appliances.

Before turning ON the devices, the cost is at zero which is displayed in our application.



The display of the used appliances with the cost calculated as per their energy level is updated in our developed application.

VI.CONCLUSION

The implementation of the smart home systems using Google Assistant for obtaining the cost and energy consumed by the home appliances is the major development made in this type of smart systems. This paper sets a new trend in developing the smart home systems by presenting a simple, easy, inexpensive, and flexible and a remotely controlling system with the help of a smart phone using a sophisticated wireless communication medium. Our prototypical system is applicable to real-time home automation, monitoring and controlling of remote systems. This could be a major advantage in assisting the old and differently abled persons to control the appliances in their home easily. The other advantage is that we can easily view the difference between the cost and developed application. The services provided by the smart phones are affordable to almost everyone. Also the Smart Home Automated System is used to easily connect with the home appliances so that the disabled people and the aged people can operate those appliances from their place without any strain of their health. In our system, the appliances are therefore connected with the Node MCU with a WI-Fi Modem in which there should always the internet access present as it is of Internet of Things(IoT). This is the utmost possible method for the control of the home appliances but this can be further developed by some technologies with the help of further algorithms. Here, we have developed using an algorithm, but with the use of future algorithms, this system can be highly improved. With the help of further studies, we can develop this proposed system so that it could be very useful and will be an efficient method. In future, smart home systems would become necessarily essential one in all our homes.

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