WIFI SOCKET

MINI PROJECT

2019-20

Done by

Sam Ruben.C	**913117104075**
Pandiya Rajan. R	**913117104058**
Ramji.V	**913117104069**
Vijay.M	**9131171040109**

Department of Computer Science and Engineering

VELAMALL COLLEGE OF ENGINEERING AND TECHNOLOGY

VIRAGANOOR, MADURAI-625009

ANNA UNIVERSITY, CHENNAI-600025

WIFI SOCKET

MINI PROJECT

2019-20

Done by

Sam Ruben.C	**913117104075**
Pandiya Rajan.R	**913117104058**
Ramji.V	**913117104069**
Vijay.M	**913117104109**

Department of Computer Science and Engineering

VELAMALL COLLEGE OF ENGINEERING AND TECHNOLOGY

VIRAGANOOR, MADURAI-625009

ANNA UNIVERSITY, CHENNAI-600025

VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY, MADURAI-625009.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2019-20

BONAFIDE CERTIFICATE

This is to certify that the thesis work titled

WIFI SOCKET

Was done by

Sam Ruben.C **Pandiya Rajan.R** **Ramji.V** **Vijay.M**

of sixth semester –Computer Science and Engineering Department in partial fulfillment of the requirement of Mini Project during the year 2019-2020.

SUPERVISOR	HEAD OF THE DEPARTMENT
Mrs.T.Suba Nachiar	Dr.P.Alli
Assistant Professor	Head of the Department
Dept. of CSE	Dept. of CSE

Velammal College of Engineering

Viraganoor, Madurai-625009.

Submitted for the Project viva-voce held on

_____

INDEX

CHAPTER 1 :INTRODUCTION

1.1 BACKGROUND:

- The energy saving has been one of the key issues in our everyday lives. In fact, energy control for some appliances is an effective method to save energy at home, since it prevents users from consuming too much energy.

- Which is developed based on wireless smart socket and Internet of Things technology to minimize energy consumption of home appliances without deploying sensors.

- The RECoS provides four control modes, including peak-time control, energy limit control, automatic control, and user control. The former two are operated for all smart sockets in a house, while the latter two are used by individual smart sockets, aiming to enhance the functionality of energy control.

- The experimental results show that the proposed scheme can save up to 43.4% of energy for some appliances in one weekday.

1.2 KEYWORDS:

- **Keywords**—Internet of Things (IOT) ,Residence Energy Control System (RECOs), Air-conditioner (AC) , Programmable Logic Controllers,(PLC) Graphical User Interface (GUI), Analog-to-digital converter (ADC), Pulse-width modulation (PWM)

1.3 MOTIVATION:

- The greenhouse effect energy saving is the one of the critical issue in designing the electronic appliances. The smart houses it is the house equipped with highly advanced automatic light systems, temperature controlling systems, security controlling

mechanism and some other functions can seen everywhere in world.

- The Residence Energy Control System (RECOs) is basically based on wireless smart sockets and technology as Internet of Things (IOT) technology, not only to monitor and control the power consumptions but also to manage the energy consumption of controllable appliances.

- The fast development of electrical makes our lives become more and more convenient. Social demand for power supply capacity is becoming more and more strictly.

- On one hand is how to save power; On the other hand is how to meet the need of the society of electricity ,this area has being one of The most intractable problem throughout the world, under the environment of internet of things intelligent socket realizes to consume capacity and feedback to the client's function timely.

1.4 **OBJECTIVE:**

The main aim is to create a WIFI socket that has the capacity to operate devices connected to it from anywhere at any place, anytime and at price lower than the market.

1.5 **SCOPE:**

- To provide a good field of Wi-Fi fidelity and connectivity to the users.
- To produce a low cost Socket compared to other sockets available in the market.
- To connect various home appliances with an help of a Smartphone which acts as an switch.
- Various home appliances can be connected at anyplace, anywhere and at anytime.

1.6 **FUNCTIONAL REQUIREMENTS:**

A Functional requirement defines a function of a system or its component, where a function is described as specifications of behavior between the outputs and inputs.

Functional requirements are usually in the form of “System shall do requirement “, an individual action or part of the system, perhaps exactly in the sense of mathematical functions, a black box description of input, output, process and control functional model or IPO model.

1.6.1 **SOFTWARE REQUIREMENTS**

Tool Used/ Software - Smartlife App
Electronic Platform - Arduino

1.6.2 **HARDWARE REQUIREMENTS:**

1. NODEMCU V1.0 : 1
2. RELAY 1 MODULE : 3
3. AC-DC 5V 700mA : 1

1.7 **NON FUNCTIONAL REQUIREMENTS:**

- A non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. The plan for implementing non- functional requirements is detailed in the system architecture, because they are usually architecturally significant requirements.

- Non-functional requirements are in the form of "system shall be <requirement>", an overall property of the system as a whole or of a particular aspect and not a specific function. The system's overall properties commonly mark the difference between whether the development project has succeeded or failed. Non-functional requirements are often called "quality attributes" of a system. Other terms

for non-functional requirements are "qualities", "quality goals", "quality of service requirements", "constraints", "non-behavioral requirements", or "technical requirements". Informally these are sometimes called the "utilities", from attributes like stability and portability. Non-functional requirements are those requirements which elaborate the performance characteristic of the system and define the constraints on how the system will do so.

- Defines the constraints, targets or control mechanisms for the new system. Describes how, how well or to what standard a function should be provided. They are sometimes defined in terms of metrics (something that can be measured about the system) to make them more tangible. Identify realistic, measurable target values for each service level. These include reliability, performance, service availability, responsiveness, throughput and security.

1.7.1**PERFORMANCEREQUIREMENTS**

Performance requirements define how well the system performs certain functions under specific conditions. Examples are speed of response, throughput, execution time and storage capacity.

The service levels comprising performance requirements are often based on supporting end-user tasks. Like most quality attributes, performance requirements are key elements when designing and testing the product. Performance means system throughput under a given workload for a specific timeframe.

Performance is validated by testing the scalability and the reliability of hardware, software and network. It is an ongoing process and not an end result. Performance requirements undergo massive changes as features and functionalities get

added and eliminated to accommodate evolving business requirements.

Performance requirements need to be considered along with other types of quality attributes (e.g., reliability, robustness, security and usability as well as availability, interoperability, safety, efficiency and flexibility.

1.7.1.1**AVAILABILITY**

High availability is when the application remains available and accessible without any interruption and serves their intended function seamlessly. HA is achieved when the end product web application continues to operate, for example, even if one or more servers are blown up, shut down, or simply disengaged unexpectedly from the rest of the network.

Availability is the ratio of time a system or component is functional to the total time it is required or expected to function. This can be expressed as a direct proportion (for example, 9/10 or 0.9) or as a percentage (for example, 90%). It can also be expressed in terms of average downtime per week, month or year or as total downtime for a given week, month or year. Sometimes availability is expressed in qualitative terms, indicating the extent to which a system can continue to work when a significant component or set of components goesdown.

1.7.1.2**RESPONSETIME**

Response time is the total amount of time it takes to respond to a request for service. That service can be anything from a memory fetch, to a disk IO, to a complex database query, or loading a full web page. Ignoring transmission time for a moment, the response time is the sum of the service time and wait time. The service time is the time it takes to do the work you requested. For a given request the service time varies little as the workload

increases – to do X amount of work it always takes X amount of time.

The wait time is how long the request had to wait in a queue before being serviced and it varies from zero, when no waiting is required, to a large multiple of the service time, as many requests are already in the queue and have to be servicedfirst. Here,itismeasured as the time taken to processing input calculating the price prediction and displaying the output. Training the data is yet another module or process that takes a lot of time for completion but it is a one-time process.

1.7.2 **SAFETY REQUIREMENTS**

Safety is the degree to which a software system prevents harm to people or damage to the environment in the intended context of use. Safety requirements address the user concern for how well the system protects people and the environment from harm. When eliciting safety requirements, consider aspects related to hazard avoidance, hazard detection and removal, and minimizing the damage if an accident occurs. This project serves no threat the users. The dataset is obtained from the Scikit datasets and is issued for practice andusage.

1.7.3 **SECURITYREQUIREMENTS**

Concerns of security are defined in terms of confidentiality (protection from disclosure); integrity (protection from unauthorized modification); and availability (protection from destruction). Due to potentially sensitive information being contained within the database, the system should facilitate security and privacy.

The end users should not have access to the database. They can access the regression parameters calculated for predicting the price but not the dataset. AAA stands for Access, Authentication and Authorization. Authentication is a process by which you

verify that someone is who they claim they are. This usually involves asking the user for a username and a password, but it can include any other method of demonstrating identity, for example a smart card, a PIN number, a secret code sent in a letter in the post, a fingerprint scan, and so on.

Authorization is the process of establishing if the user (who is already authenticated), is permitted to have access to a resource. Authorization determines what a user is and is not allowed to do. The level of authorization to give a user is determined by examining the additional properties (metadata) associated with the user's account. Access Control is the process of enforcing the required security for a particular resource.

1.7.4 **SOFTWARE QUALITY ATTRIBUTES**

Quality can be defined in a different manner. The quality definition may differ from person to person. But finally, there should be some standards. Quality Assurance activities are oriented towards prevention of introduction of defects and Quality control activities are aimed at detecting defects in products and services.

Reliability

Measure if product is reliable enough to sustain in any condition. Should give consistently correct results. Product reliability is measured in terms of working of project under different working environment and different conditions.

Maintainability

Different versions of the product should be easy to maintain. For development it should be easy to add code to existing system, should be easy to upgrade for new features and new technologies time to time. Maintenance should be cost effective and easy. System be easy to maintain and correcting defects or making a change in the software.

Usability

This can be measured in terms of ease of use. Application should be user friendly. Should be easy to learn. Navigation should be simple.

Portability

This can be measured in terms of Costing issues related to porting, Technical issues related to porting, Behavioral issues related to porting.

Correctness

Application should be correct in terms of its functionality, calculations used internally and the navigation should be correct. This means application should adhere to functional requirements.

Efficiency

To Major system quality attribute. Measured in terms of time required to complete any task given to the system. For example, system should utilize processor capacity, disk space and memory efficiently. If system is using all the available resources, then user will get degraded performance failing the system for efficiency. If system is not efficient, then it cannot be used in real time applications.

Integrity or Security

Integrity comes with security. System integrity or security prevent unauthorized access to system functions, preventing informationloss,ensure that the software is protected from virus infection, and protecting the privacy of data entered into the system.

Testability

System should be easy to test and find defects. If required should be easy to divide in different modules for testing.

Flexibility

Should be flexible enough to modify. Adaptable to other products with which it needs interaction. Should be easy to interface with other standard 3rd party components.

Reusability

Software reuse is a good cost efficient and time saving development way. Different code libraries classes should be generic enough to use easily in different application modules. Dividing application into different modules so that modules can be reused across theapplication.

Interoperability

Interoperability of one system to another should be easy for product to exchange data or services with other systems. Different system modules should work on different operating system platforms, different databases and protocols conditions.

1.8**REPORTORGANIZATION**

Chapter 1 Introduction

Chapter 2 Exploration

Chapter 3 WIFI- Socket

Chapter 4 Design Considerations

Chapter 5 Conclusion and References

Chapter 6 Code Snippets

INTRODUCTION

Introduction is the beginning section of the project report and it gives an idea about the project goals, objectives, scope, functional – hardware and software requirements and non-functional requirements. The introduction typically describes the scope of the project and gives the brief explanation or summary of the project.

EXPLORATION

Exploring data sets and developing deep understanding about the data is one of the most important skills every developer should possess. People estimate that the time spent on these activities can go as high as 80%of the project time in some cases. It consists of Literature review.
A literature review or narrative review is a type of review. A literature review is a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic.

WIFI SOCKET SYSTEM

The WIFI Socket generally deals with the connection ability to connect various home appliances with the help of an socket by using an Smartphone as a switch to operate the appliances to turn on or off wirelessly.

DESIGN CONSIDERATIONS

The design considerations are formulated to bring to the attention of the designers in applying the universal accessibility design principles and requirements to buildings and facilities.

CONCLUSION

The conclusions of the project are listed down in this part.

The overall benefit of the project is stated.

The overall benefit of the project is stated.

It is inferred for further improvements and investigated if any other modules or features can be added to the project.

CODE SNIPPETS

Code is set of instructions forming a computer program which is executed by computer. A snippet is defined as a small piece of something and provides the user with the output screen.

CHAPTER 2 : LITERATURE REVIEW:

Wi-Fi based home automation system mainly consist three modules, the server, the hardware interface module, and the software package. The figure shows the system model layout. Wi-Fi technology is used by server, and hardware Interface module to communicate with each other. The same technology uses to login to the server web based application. The server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser.

Software of the latest home automation system is split to server application software, and Microcontroller (Arduino) firmware. The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and preprogramed in the server. Another job is to report the and record the history in the server DB. The server application software package for the proposed home automation system, is a web based

application built using asp.net. The server application software can be accessed from internal network or from internet if the server has real IP on the internet using any internet navigator supports asp.net technology. Server application software is capable of, maintain the whole home automation system, setup, configuration. Server use database to keep log of home automation system components, we choose to use XML files to save system log.

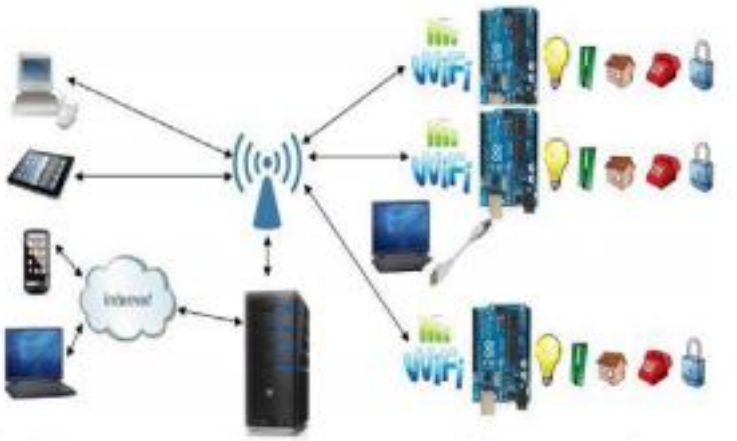


Fig. The proposed home automation system layout

Wireless Home Automation system using IOT

This system uses mobiles or computers to control basic home control and function automatically through internet from anywhere around the world globally, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The proposed system is a distributed home automation system, consists of server i.e. Wi-Fi module, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors).

The Arduino board, with built in Wi-Fi module acts as web server. Automation System can be accessed from the web browser of any local PC using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP). Wi-Fi technology is selected to be the network infrastructure that connects server and the sensors. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability.

COMPARISON:

Serial no.	System	Communication Interface	Controller	User Interface	Applications	Merits
1	Wi-Fi based using Arduino microcontroller through IOT	Wi-Fi	Arduino	Web Application and android App	Temperature and motion detection, monitoring and controlling appliances	Low cost, Secure, Remotely controlled
2	Smart Task Scheduling Based using Arduino and Android	Wired X10 and Wireless Zig bee	Arduino	Android Application	Energy Management and task scheduling with power and cost	Energy-efficient and Highly scalable
3	Web service and android app Based using Raspberry pi	Web server and interface card	Raspberry pi	Android application	Controlling shutter of window	Autonomous, and Quite scalable
4	Cloud Based Using Hadoop System	Cloud based data server uses Hadoop technology	Home gateway and router	Smart device	Monitoring and Controlling Home Appliances	Effectively manage Semi structured and unstructured data, Reduce computational burden of smart devices
5	Cloud Based Using Zig Bee Microcontroller	Zig bee wireless Network	Smart Socket	PC or Android Phone	entrance control management, monitoring the power consumption, temperature and humidity	Convenience, safety, and Power-saving
6	Wireless Sensors Based with mobile Technology	cloud-based data server	PCB circuits	Mobile Application	monitor the home conditions and power consumption of appliance	Low power consumption And system cost efficiency.
7	Android based using Arduino	Micro Web Server	Arduino Mega 2560 and the Arduino Ethernet shield	Android App	Light switches, Temperature, Humidity sensors, Intrusion detection, Smoke/Gas sensor	Feasibility and Effectiveness

- The various literature review for the Wi-Fi socket is generally discovered and implemented by many authors with various set of titles and similarly they obtained various drawbacks to discover based on their invention. Some of the latest review of literature based on our topics are discovered below:

TITLE	AUTHOR	METHODOLOGIES USED	DRAWBACK	YEAR
Design and implementation of smart plug: An Internet of Things (IoT) approach	Ahmed S. Musleh ; Mahdi Debouza ; Mohamed Farook	electrical power monitoring and managing problems. Smart Plug is a power monitoring and management system.	NO MONITORING OF HEATING EFFECT	2017
Design of Intelligent Socket Based on WiFi	Yan-Rong Tong ; Zuo-Bin Li	paper introduces a design of intelligent home control system based on Wi-Fi.	HIGH COST	2017
A low-cost Wi-Fi smart plug with on-off and Energy Metering functions	Yaowaluk Thongkhao ; Wanchalerm Pora	a Wi-Fi smart plug which is able to switch on/off remotely electrical appliances connected.	NO SCHEDULING OF USAGE	2016

TITLE	AUTHOR	METHODOLGY USED	DRAWBACK	YEAR
The wireless smart socket control system design	ANAN XU SHUPING HE	paper introduces a design of intelligent home control system based on Wi-Fi	No proper coordination of wifi socket	**2017**
Design of smart socket based on LiFi	Wanchalerm Pora	to switch on/off remotely electrical appliances connected.	More data usage Incuring lot of expenses	**2018**
A Multi-Functional Smart Socket Design	LEI LIU	smart socket with high power protection power off and low power energy saving.	High cost,complex	**2019**

CHAPTER 3 : THE WIFI SOCKET

What does it do?

Controlled by an app, a smart plug lets you turn on and off any appliance that plugs into a standard wall socket. As part of a solution like Alarm.com, you can actively control it, or automate it so that it reacts to schedules .

Simply plug it into any wall socket, then plug your chosen appliance into it. You can use it with a lamp, a TV, a cable box, a coffee machine—whatever you like.

What's its role in the smart home?

Smart plugs are a versatile building block of the smart home, with many uses:

Security:

When you plug a lamp into a smart plug, it becomes a smart light with home security benefits.
You can schedule the lamp to come on at certain times, or when you're on your way home, or even when triggered by another device, such as a motion sensor. If there's an alarm event at your home, it can turn on automatically to deter an intruder.

Convenience:
Smart plugs are great for automating everyday kitchen devices. You can start your day with your coffee machine already working, or your tea kettle already boiled. If you like to slow-cook, you can load up your Crock-Pot in the morning and switch it on with your smartphone from work.

Energy Savings:
Smart plugs can put a dent in your energy bills by automatically turning off appliances like your TV and cable box, which consume energy in standby mode, when you're not home. With Alarm.com, you can have them switch off when you arm your security system, in the same way that your smart thermostat sets back.

Can Sockets used only on indoors?

There are certain plugs on the market designed specifically for outdoor use. The iHome ISP100, for example, is $40 and is marketed for use outside. That makes it the perfect plug to use for controlling things such as your porch lights or elaborate holiday displays. Weather-resistant outdoor smart plugs are designed to withstand the elements, whether that's pouring rain or frigid snow, so be sure to look for smart plugs that are specifically designed for use outside the home.

Can a smart plug lower my electricity bill?

Yes. One of the reasons more people are adopting smart home devices is so they can save on electricity bills. With lights that automatically shut off when you leave the house, you're bound to lower your energy bill. Some smart plugs, such as Belkin's $45 WeMo Insight, will take things a step further and provide you with information about your energy consumption. You can use the companion app to see a running total of how much energy your devices are using. This way, you can see which lamps should probably be installed with energy-saving lightbulbs, and which appliances just aren't worth the amount of electricity they use.

How Does a Wifi Socket Work?

- Go to the app store on mobile device and download an app called Smart Life.
- Once app is downloaded, open the app and select .
- The app should automatically detect country code. Please select the country code for country of residence.
- Please enter the verification code that was sent to phone and your desired password, then select confirm .
- Setting up using an email address 10 please enter desired password, and select .
- Select the Plus (+) in the top right corner to add a device.

- Enter either email address or phone number
- Select lighting devices. Connect your Smart light to a power source. 12 13 To enter pairing mode,
- Turn the Smart light on and then off for 3-5 seconds at a time. Do this 3 times.
- The Smart light will begin blinking rapidly once in pairing mode.
- Connect to desired Wi-Fi network, enter password, then select .confirm.
- Once our Smart light successfully connects to the app, the below screen will pop up and we can change the name of our Smart light/device the select done.
- We can now Smart light in the Smart Life app.
- Select the circle(White change the color and brightness of your lighting device
- And we can set preferred schedule for on and off the light.

What is a Wi-Fi range extended socket?

Range extenders take your existing internet wireless signal and rebroadcast it to areas in your home and garden where Wi-Fi is weak or non-existent.

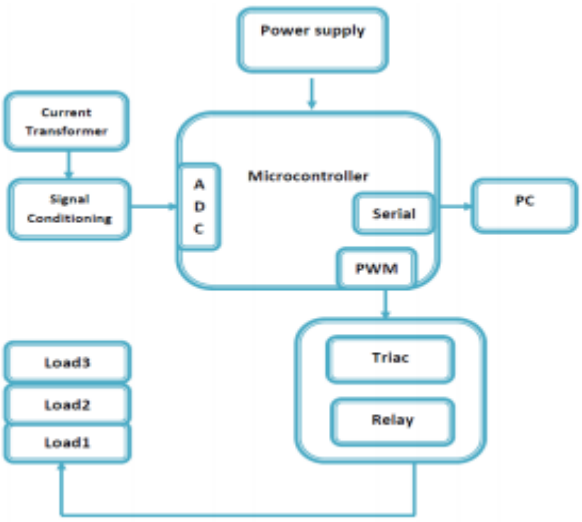
Why do I need a range extender?

If you suffer from patchy speed and stability in your home and garden, a range extender will increase the reach of your Wi-Fi signal.

How do they work?

By positioning the Wi-Fi socket halfway between your router and the area of poor reception, the range extender will relay the signal to further spread coverage. Wi-Fi socket will work with any wireless broadband router, whether your internet comes through the phone line (ADSL) or from Fibre (Fibre Optic).

CHAPTER 4: DESIGN CONSIDERATIONS



Block diagram of SMART SOCKET Module

A.Microcontroller:

First unit consists of microcontroller AT91SAM3X8E along with current transformer, loads, and triac, relay and power supply. Loads are interfaced with microcontroller through relay and triac.The SAM3X8E also features a 12-bit ADC/DAC, temperature sensor, 32-bit timers, PWM timer and RTC. The 16-bit external bus interface supports SRAM, PSRAM, NOR and NAND Flash with error code correction. Based on the ARM® Cortex®-M3 processor, the Microchip's SAM3X8E runs at 84MHz and features 512KB of flash memory in 2 x 256KB banks and 100KB of SRAM in 64KB +32KB banks, with an additional 4KB as NFC (NAND Flash controller) SRAM. Its highly-integrated peripheral set for connectivity and communication includes Ethernet, dual CAN, High Speed USB MiniHost and device with on-chip PHY, high-speed SD/SDIO/MMC, and multiple USARTs, SPIs, TWIs (I2C), and one I2 S.

B. Current transformer:

Current transformer is used to check the current passing through it and gives total watt of power used by loads. Output of current

transformer is monitored using ADC channel of microcontroller. A current transformer (CT) is a type of transformer that is used to measure alternating current (AC). It produces a current in its secondary which is proportional to the current in its primary.Current transformers, along with voltage or potential transformers, are instrument transformers. Instrument transformers scale the large values of voltage or current to small, standardized values that are easy to handle for instruments and protective relays. The instrument transformers isolate measurement or protection circuits from the high voltage of the primary system. A current transformerprovides a secondary current that is accurately proportional to the current flowing in its primary.

C. SignalConditioning:

In electronics, signalconditioning means manipulating an analog signal in such a way that it meets the requirements of the next stage for further processing. Most common use is in analog-to-digital converters.

D. Power Supply:

A powersupply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power.

E.Triac: Triac from triode for alternating current, is a generic trademark for a three terminal electronic component that conducts current in either direction when triggered

F.Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and retransmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

G.Analog-to-Digitalconverter:

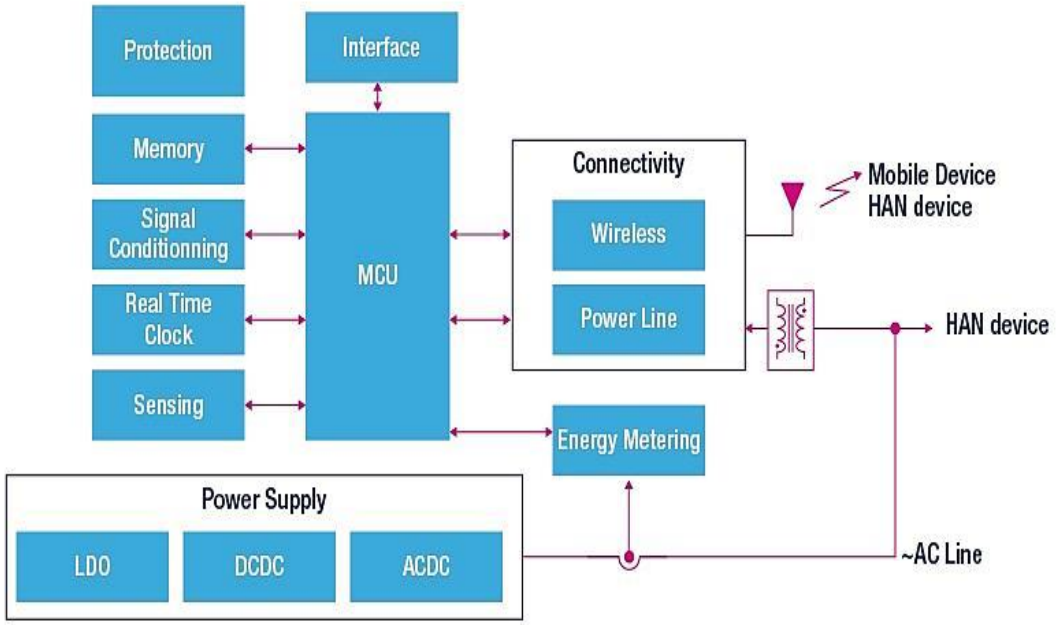
In electronics, an analog-to-digitalconverter (ADC, A/D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities

H.Pulse-widthmodulation:

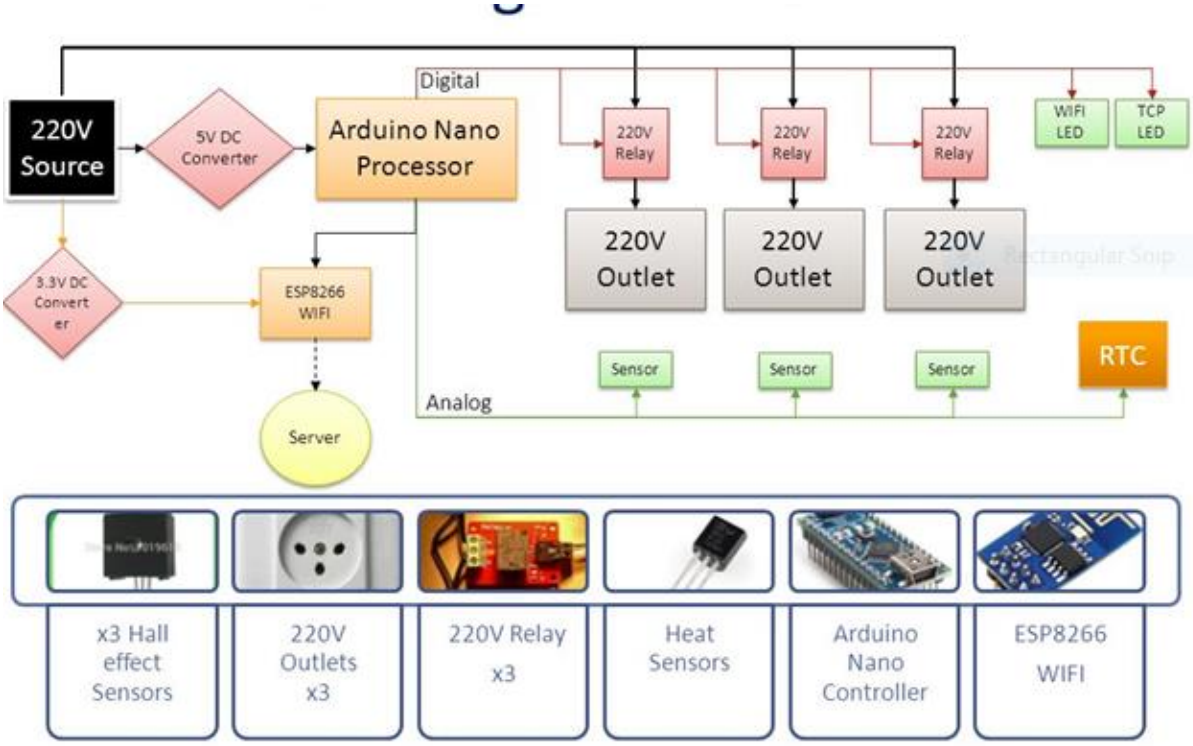
Pulse-widthmodulation (PWM) is a modulation technique used to encode a message into a pulsing signal. Although this modulation technique can be used to encode information for transmission, its main use is to allow the control of the power supplied to electrical devices, especially to inertial [definition needed] loads such as motors. In addition, PWM is one of the two principal algorithms used in photovoltaic solar battery chargers,[1] the other being maximum power point tracking. The HMI is designed to have up to two communication ports. Each of the ports can be defined as Modbus slave or can connect to various third party devices such as PLC’s, Drives, PID Controllers, etc. The Inside the same slots, the user can be used communication port for programming the PLC. The USB

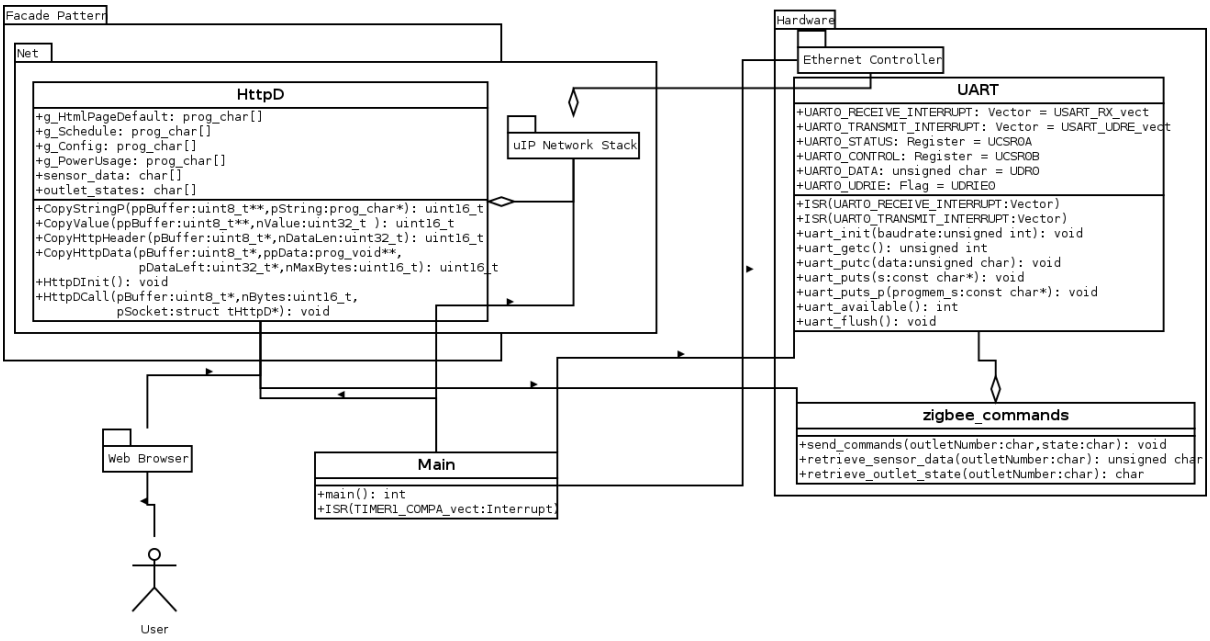
serial communication port will be provided as the input unit to the system programme.

ARCHITECTURE OF THE PROJECT:

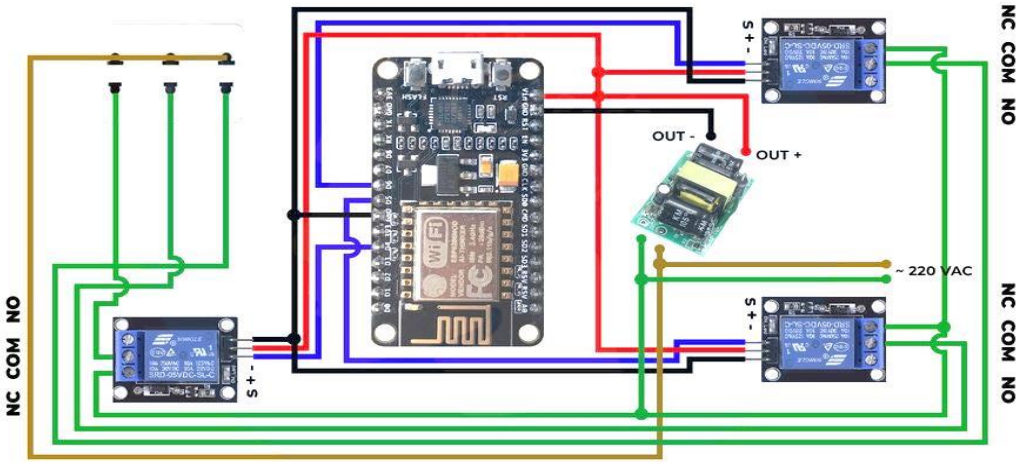


DETAILED DESIGN:





WIRING DIAGRAM:



SCOPE:

- The smart plug is an easy-to-use self-service device which enables the user operate appliance connected online and informs the usage of power through message.

- Users will register as a member if they want to create switch in the application before they use switch.

- User can perform the operation of on/ off device using smart life application over wifi from anywhere

IMPLEMENTATION STEPS AND PROCEDURE:

- Go to the app store on mobile device and download an app called Smart Life.

- Once app is downloaded, open the app and select .

- The app should automatically detect country code. Please select the country code for country of residence.

- Please enter the verification code that was sent to phone and your desired password, then select confirm .

- Setting up using an email address 10 please enter desired password, and select .

- Select the Plus (+) in the top right corner to add a device.

- Enter either email address or phone number

- Select lighting devices. Connect your Smart light to a power source. 12 13 To enter pairing mode,

- Turn the Smart light on and then off for 3-5 seconds at a time. Do this 3 times.

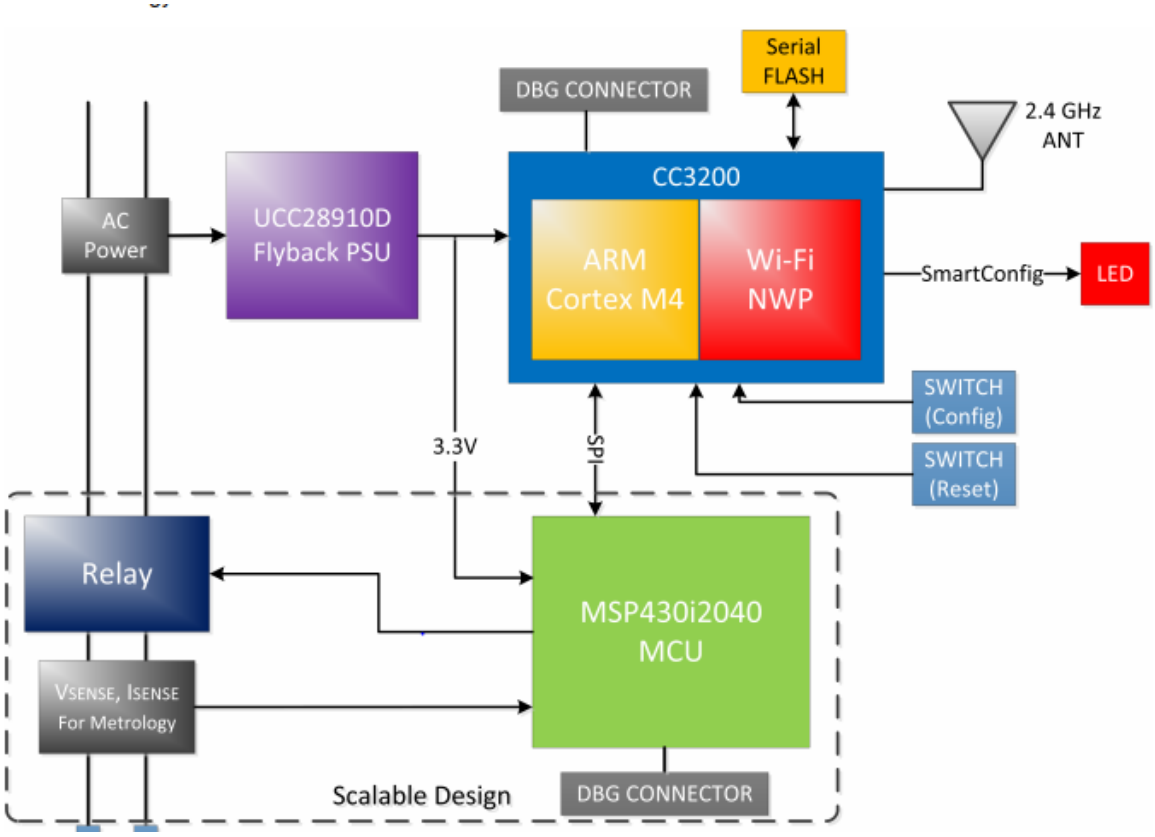
- The Smart light will begin blinking rapidly once in pairing mode.

- Connect to desired Wi-Fi network, enter password, then select .confirm.

- Once our Smart light successfully connects to the app, the below screen will pop up and we can change the name of our Smart light/device the select done.
- We can now Smart light in the Smart Life app.

- Select the circle(White change the color and brightness of your lighting device

- And we can set preferred schedule for on and off the light.



STEP:1: Declaring The Component list:

1. ESP8266-12E Module

2. DC5V Adapter

3. 3.3V Regulator IC

4. Triac (BT134)

5. Opto-isolated triac driver (EL3021)

6. Temperature Sensor (DS18B20)

7. Current Sensor (ACS712)

8. A generic AC Plug

9. Some Resistors and jumper wire from your parts box.

Tools Required

1. Soldering Iron

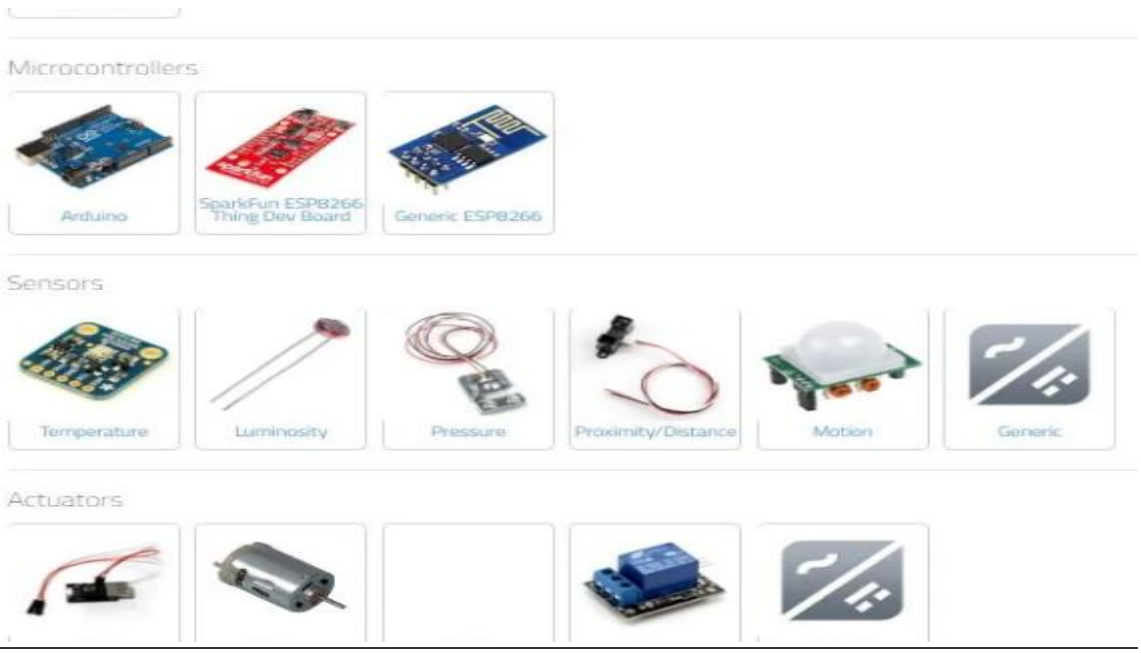
2. Multimeter

3. Cutter

4. Glue Gun

5. Screw Driver

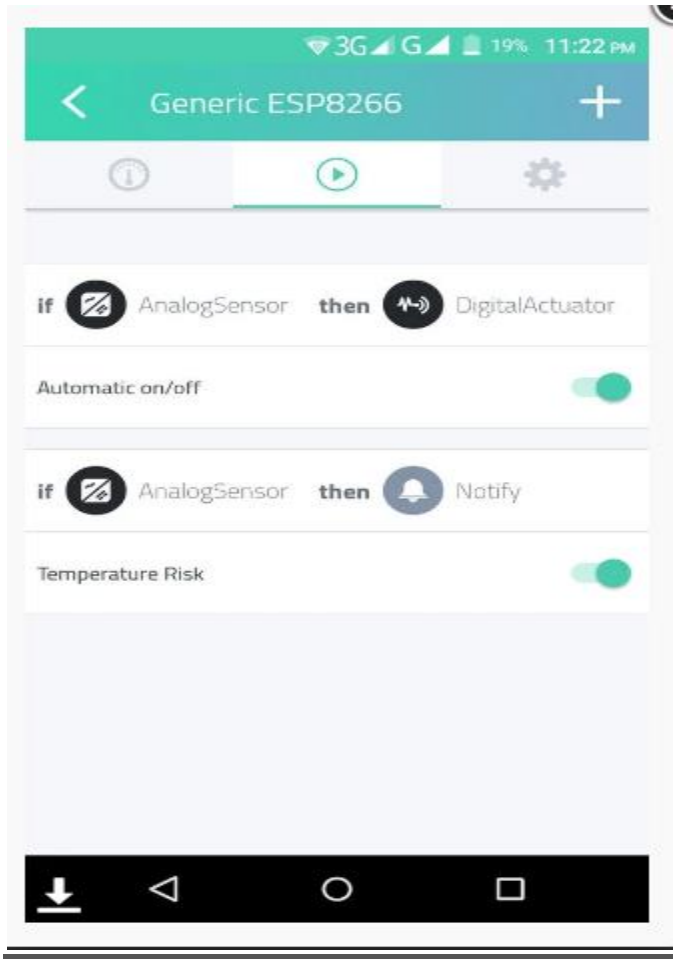
STEP:2: Preparing Cayenne Environment



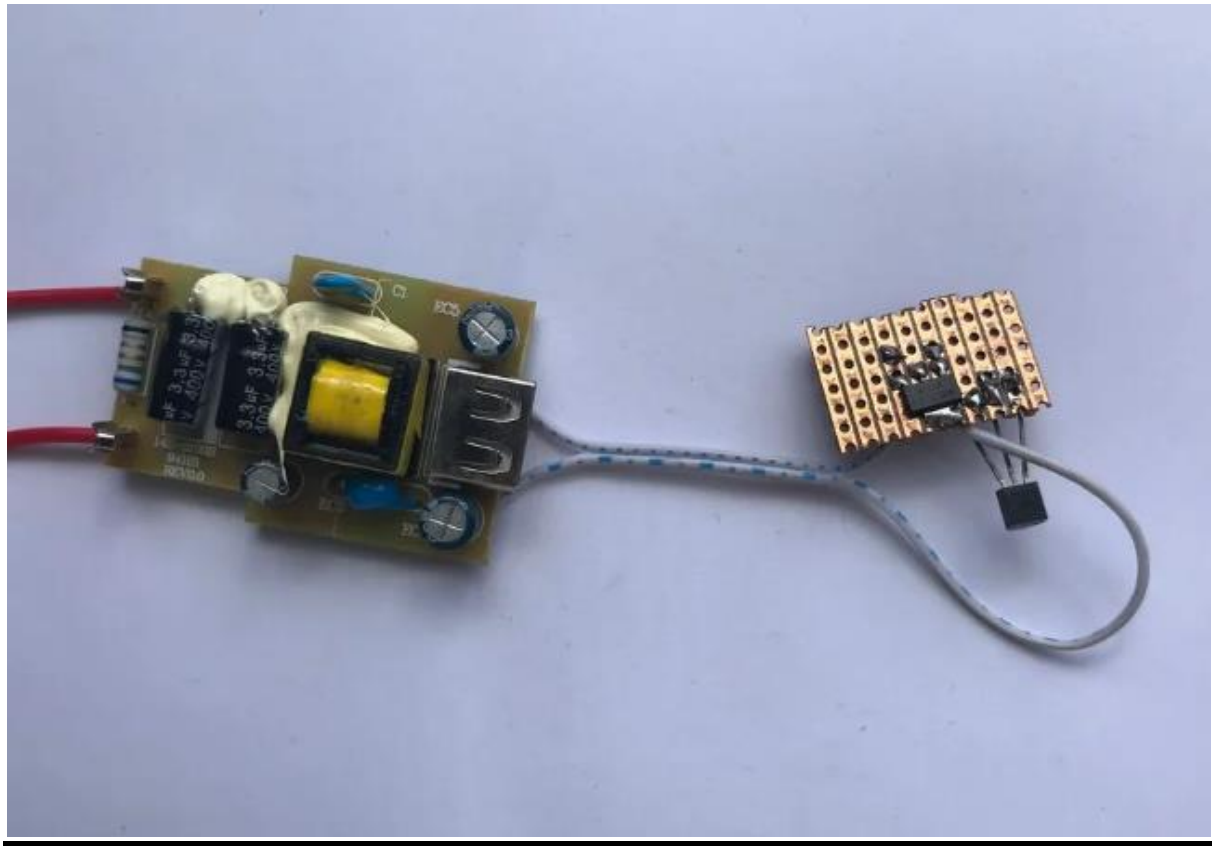
In my case I added:

- Two Value Display Widgets for showing Current and Temperature.
- One Gauge Display Widget for showing Voltage.
- One 2 State Display Widget for monitoring the state of the Plug
- Three Button Controller Widget for turning On and Off the plug, Enabling/Disabling proximity, and Enabling/Disabling timer.
- One Slider Controller Widget to set the time.
- One Line Chart Display Widget to show the energy consumption rate.
- Two triggers, one for automatic off if overheats and another for email and SMS notification.

STEP:3 : MOBILE VIEW



STEP:4 : MAKING POWER SUPPLY:

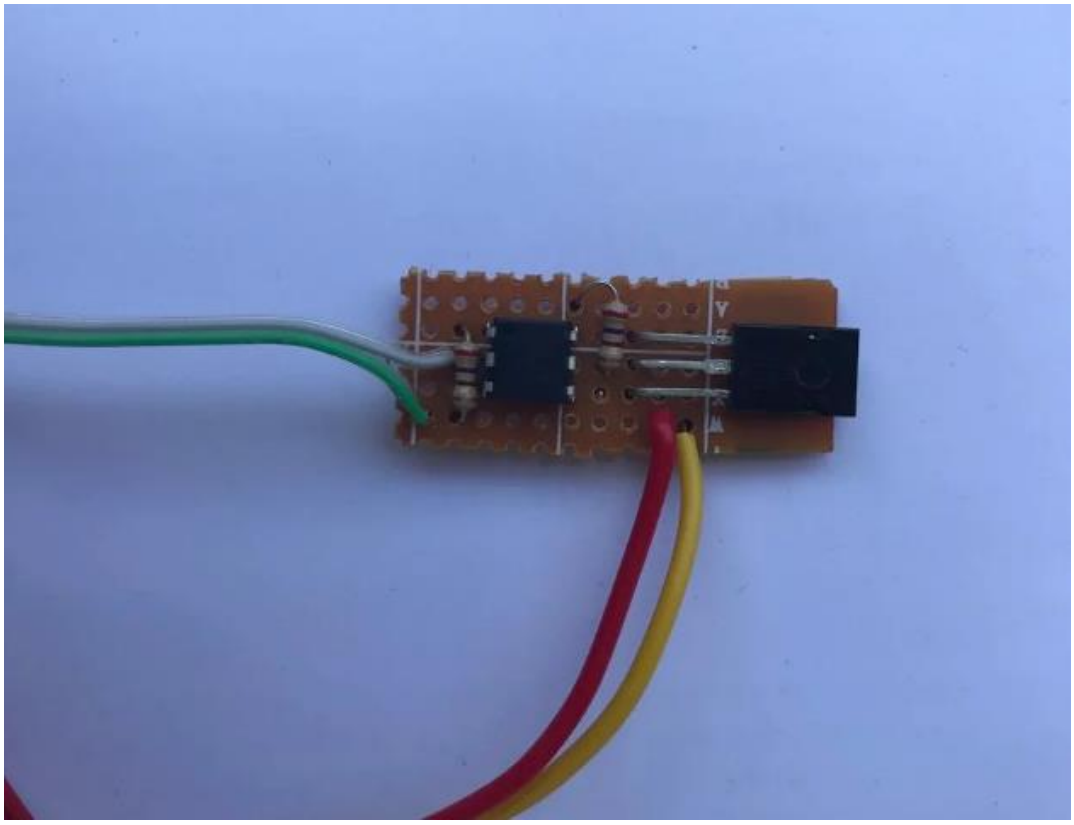


The power supply is a very important thing for your device and the operation of your device depends on the performance of the power supply. I used ESP8266-12E as a main controlling unit for my smart plug. The esp module requires 3.3V regulated supply for stable operation. A 3.3V power supply is very uncommon but you can easily manage a 5V power supply. All smartphone charger has a 5V output with enough current capacity. You can easily use one but required a 3.3V regulator.

I used an old mobile phone charger. For converting 5V to 3.3V I made a regulator circuit using AMS1117 regulator IC. As I have a plan to measure the inside temperature of the plug so I soldered a DS18B20 temperature sensor on the regulator board.

After making the regulator circuit I connected the output of the charger board to the input of the regulator circuit.

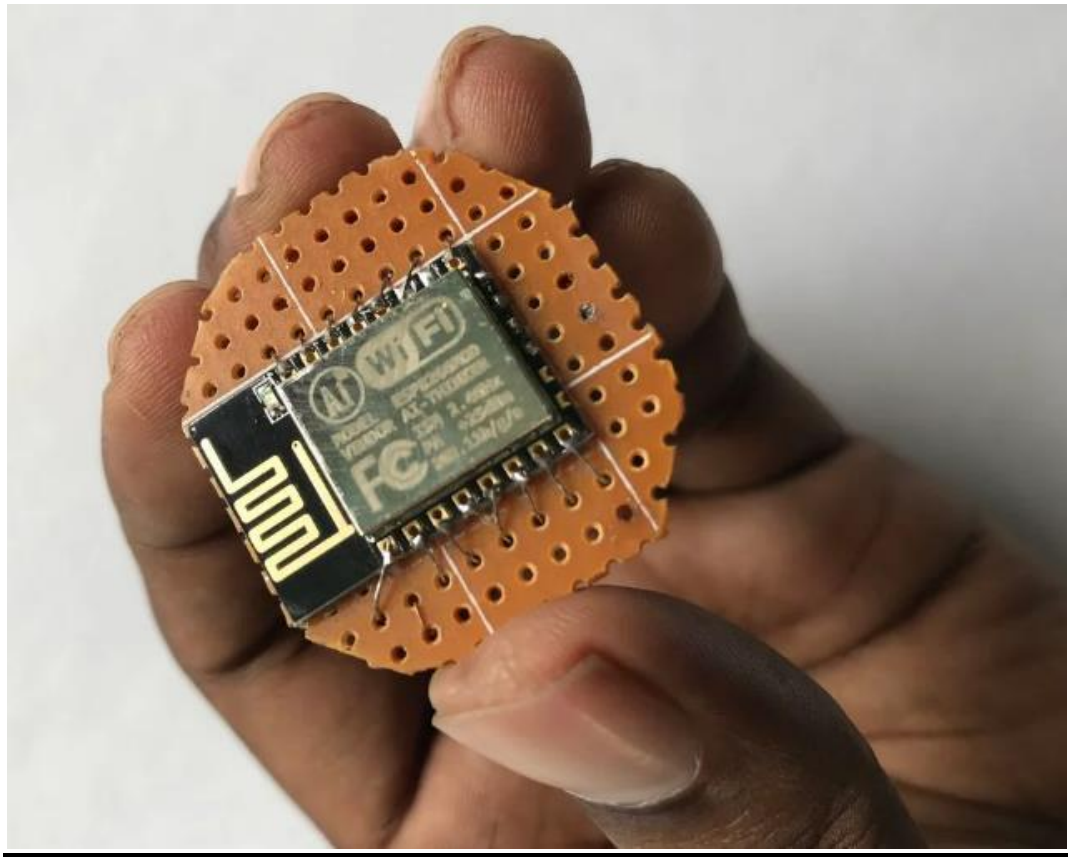
STEP:5: Making Solid State Relay



Solid state relay has some advantages over mechanical relay. They require much lesser current and operate for a wide voltage range compare to mechanical relay. As solid state relay required less current they can be driven directly from a microcontroller pin without using any transistor. This is the reason I am using solid state relay fro my smart plug.

To make one I used a triac (BT134) and an optoisolated triac driver (EL3021). The schematic is added with the step. I don't use any snubber circuit but if you like to drive a high inductive load using the relay it is highly recommended.

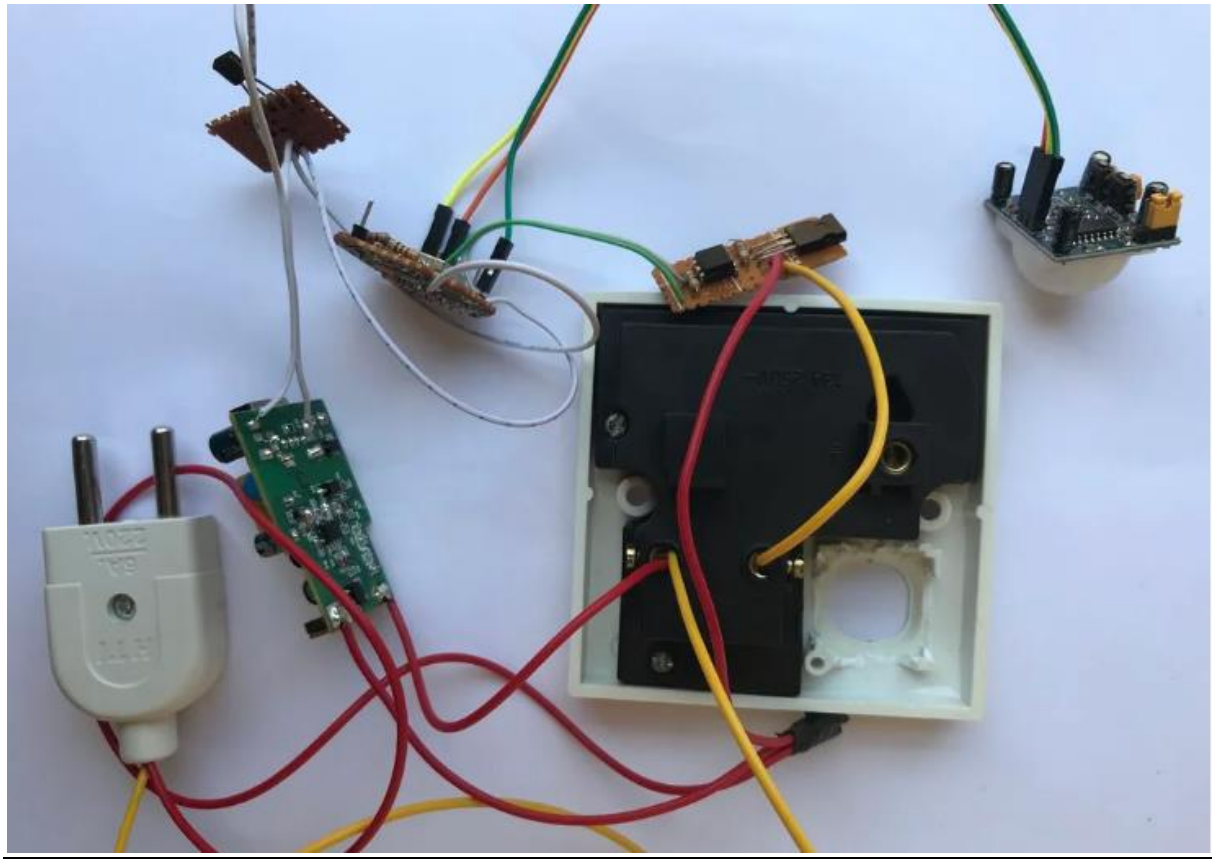
Step 6: Soldering ESP Module and Uploading Program



The esp8266-12e board has no header pin, so it is hard to solder in PCB board or connecting sensors. For the reason, I use a thin jumper wire from an HDD IDE cable to solder the board in PCB. Then I added some basic resistor and 5 header pin with it. The FTDI board will be connected to the esp module using this header at the time of programming.

After making it ready upload the following sketch into the esp module. Don't forget to select "NodeMCU 1.0(ESP8266-12E" board before uploading the sketch.

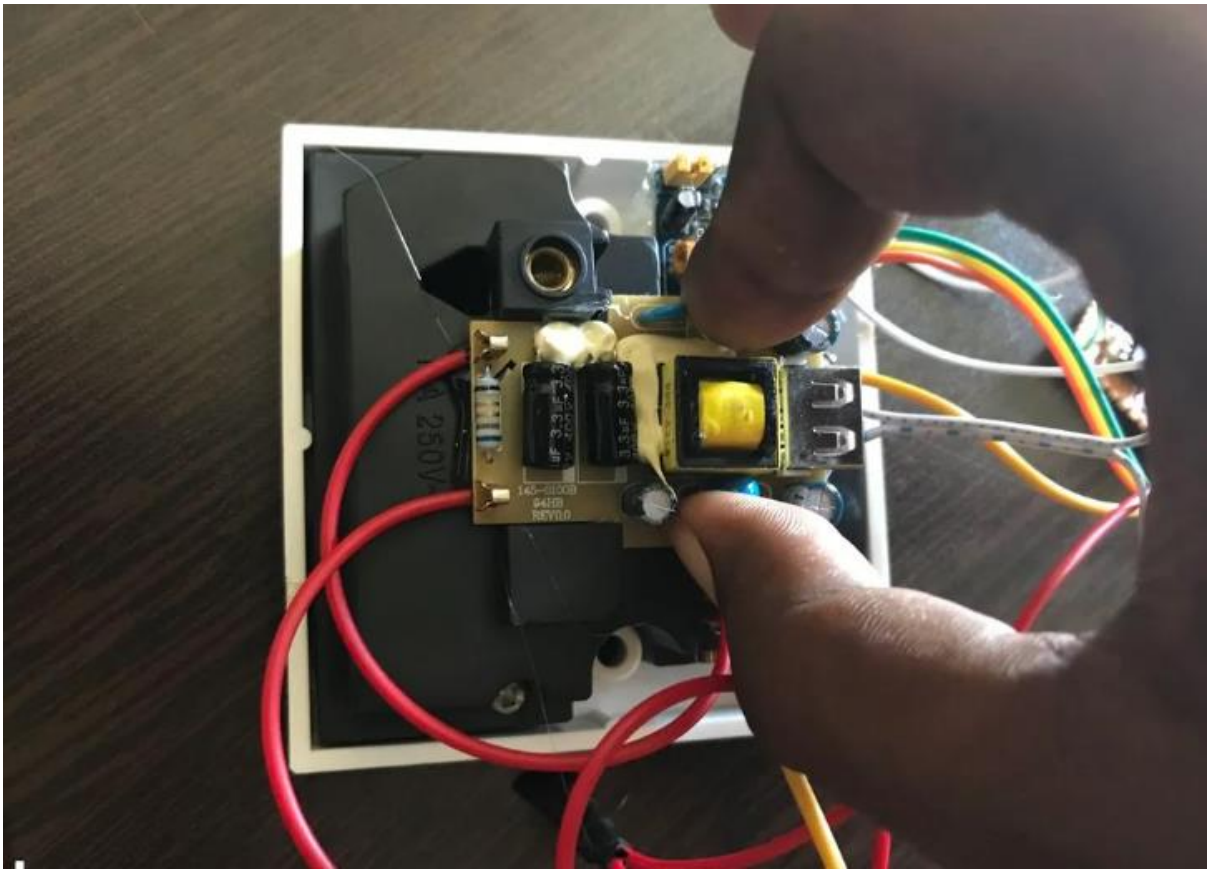
Step 7: Connecting Altogether



After making all the circuit I connected altogether according to the schematic. The schematic was designed in Fritzing and I use Sparkfun ESP Thing Dev Board instead of ESP8266-12E module. The pinout for both the board is same. So, you can easily replace it with ESP module. Relay and the current sensors are connected in series with between supply and the plug.

I used a PIR motion sensor to activate motion control in the plug. PIR sensor is connected to the pin #4 of the esp module.

Step 8: Placing All Inside the Box



After connecting all the units it is the right time to put all the thing inside a box. The plug I bought was included a switch at the top right corner. I replaced the switch with the PIR sensor because a manual switch is no more required for the smart plug. I attached the sensor with the plug using hot glue. Then I joined the power adapter board and the relay circuit. After that, I fixed the regulator circuit with the plug. Finally, I attached the current sensor and the esp board.

Step 9: Final Product

They’re small devices that look like travel adapters: you plug an appliance into the smart plug and then plug the smart plug into the wall socket. And just like that, they allow you to turn your existing appliances into smart devices**.**

Smart plugs connect to an app on your smartphone via Wi-Fi or Bluetooth, allowing you to control whatever appliance is connected to that plug without the need for a smart hub.

Once connected to an appliance, smart plugs allow users to create “scenes.” Scenes are small IFTTT (If This Then That) programs that can adjust your lighting, coffee maker, washing machine and other appliances based on the time of day, the temperature or anything else your smartphone measures. You won’t sacrifice any wall outlets by using smart plugs, and different plug designs are available to accommodate different space requirements

BENEFITS OF WIFI SOCKET:

By now, you might have some questions: What are smart plugs for, and do smart plugs save energy? Common uses for smart plugs include energy monitoring, easy control of appliances and home security automation. Here are some of the best smart plug uses:

- **Improve your home network connectivity.** While new appliance models and technology often have built-in compatibility with home networks, older models may not. A smart plug can turn any of your existing appliances and electrical devices into smart objects that can communicate with other smart products in your home.
- **Turn appliances on and off with the tap of a button.** Can a smart plug turn on a TV? Absolutely. Using the plug’s app, you can turn appliances on and off remotely and even check to see if you left an appliance running after you’ve left your home. If you’ve ever nervously wondered if you left an iron or hair

straightener on, smart plugs offer peace of mind—just check the app to see if the object is on, and if it is, turn it off.

- **Monitor your energy use from anywhere in the world.** Smart plugs are indispensable tools for anyone concerned with energy use. You can monitor how much energy you're using directly from your smartphone. Smart plugs will even notify you if a device suddenly starts using unusual amounts of energy.
- **Manage your energy use with easy scheduling.** By creating scenes for your appliances, you can schedule when devices should shut down or start up. This way, power-hungry devices don't consume energy when not in use. For example, you can use a scene as a smart-home routine for children by only letting them use gaming consoles and televisions at certain times of day.
- **Eliminate vampire draw from your house.** One of the best things to use smart plugs for is controlling "vampire draw." Vampire draw, or phantom load, is the energy your devices suck up even when they're not in use. Smart plugs can help you identify devices guilty of phantom load so you can save on your energy usage.
- **Appear at home while you're away.** Burglars often target homes by watching for signs that a home is empty, and they're quick to notice when lights, televisions and other appliances aren't on. Smart plugs can be used to improve home security by turning lights and appliances on and off while you're on vacation, making smart plugs a safe and effective way to look like you're home while you're away.
- **Control your devices with voice commands.** One of the best smart plug uses is the ability to turn on hard-to-reach devices remotely. Smart plugs are among the many devices that work with Amazon Echo, Google Home and other smart hubs, so once you link smart plugs to your hub, you can activate and deactivate connected appliances by voice command.
- **Keep your home safe with smart plug temperature control.** If you live in a home with older electrical wiring, you may have safety concerns: Are smart plugs safe to use, or will they encourage wall sockets to overheat? The plugs themselves

won’t increase the chance of overheating, and some smart plug models even monitor wall socket temperatures and will send you an alert if it gets too hot. You can even have the smart plug turn off the appliances automatically to decrease the risk of electrical fires.

THE BEST WIFI SOCKET USES AND IDEAS:

Since socket plugs can control almost any device that uses electricity, they offer hundreds of possible solutions to the inventive homeowner. In fact, there are so many creative ways to use smart plugs that we bet you can add to this list of best things to use smart plugs for. Here are some of the best smart plug uses:

- **Washers and dryers.** Receive notifications of when either appliance finishes a cycle and improve the washer or dryer energy usage.
- **Lights.** Try combining smart plugs with motion detectors to turn on lights when you enter a room, or create scenes to adjust when outdoor or ornamental lights are in use, or decrease the power consumption of your Christmas lights during the holidays.
- **Coffee makers.** Connect your coffee maker to a smart plug and set a time for it to turn on, and you’ll wake up to fresh coffee every morning. Program your smart plug to decrease the coffee maker wattage, or so it turns the pot off after a set amount of time.
- **Televisions and computers.** Use scenes to monitor when computers and televisions receive power to create routines for children or to turn off devices at specific times, and use your smart plug to turn on the TV.
- **Gaming systems.** Gaming consoles are notorious for consuming energy even when turned off. Cutting off power at the plug can save you money.
- **Refrigerators.** Monitor your freezer or refrigerator energy consumption. Be sure to check if the energy rating of your smart

plug is safe to handle the energy needs of your refrigerator or freezer.

- **Security cameras.** Unlock the benefits of security cameras and program them to turn on and off as needed with smart plugs.
- **Lawn sprinklers.** Use smart plug scenes to create a lawn-watering schedule, or use a smart plug to turn off your sprinklers if you're expecting rain.
- **Slow cookers.** A common use for smart plugs is to have dinner ready when you get home by scheduling your slow cooker to turn on at a specific time of day. Check out delicious crock-pot recipes that save time and energy.

CHAPTER 5: CONCLUSION AND REFERENCES

CONCLUSION:

One of the main purposes of constructing a smart house is to automatically control those appliances in the house to achieve the goals of energy saving and smart living. In this paper, energy consumption in a residence through IoT and smart sockets.

The four control modes to control the on/off state of home appliances connected to smart sockets. A simple IoT structure which integrates smart sockets, home gateway, energy controller, ZigBee, and Internet is proposed. Most importantly the experimental results show that up to 43.4% of energy the energy consumption more intelligently. Furthermore, security is an important issue in safely protecting.

CHAPTER:6 : CODE SNIPPETS

SOURCE CODE FOR IMPLEMENTING THE WIFI SOCKET:

```
import Bluetooth


import RPi.GPIO as GPIO   #calling for header file which helps in using GPIOs of PI
BULB=21

GPIO.setmode(GPIO.BCM)    #programming the GPIO by BCM pin numbers. (like
PIN40 as GPIO21)


GPIO.setwarnings(False)


GPIO.setup(BULB,GPIO.OUT)  #initialize GPIO21 (Relay connected at this pin) as an
output Pin


GPIO.output(BULB,0)

server_socket=bluetooth.BluetoothSocket( bluetooth.RFCOMM )

port = 1


server_socket.bind(("",port))


server_socket.listen(1)

client_socket,address = server_socket.accept()


print "Accepted connection from ",address
while 1:

 data = client_socket.recv(1024)


 print "Received: %s" % data


 if (data == "0"):  #if '0' is sent from the Android App, turn OFF the CFL bulb
  print ("AC light OFF")


  GPIO.output(BULB,0)
```

```
 if (data == "1"):  #if '1' is sent from the Android App, turn OFF the CFL bulb
  print ("AC light ON")


  GPIO.output(BULB,1)


 if (data == "q"):


  print ("Quit")
  break


client_socket.close()


server_socket.close()
```

PROGRAM CODE EXPLANATION:

Python Program for **Controlling Raspberry Pi GPIO with Android App** is very simple and self-explanatory. Only we need to learn little bit about the code related to Bluetooth RFCOMM communication. First we need to import the Bluetooth socket library which enables us to control Bluetooth with Python language; we have installed the library for the same in the previous section.

```
import Bluetooth
```

Below is the code responsible for Bluetooth communication:

```
server_socket=bluetooth.BluetoothSocket( bluetooth.RFCOMM )



port = 1

server_socket.bind(("",port))

server_socket.listen(1)
```

```
client_socket,address = server_socket.accept()

print "Accepted connection from ",address

while 1:



 data = client_socket.recv(1024)
```

Here we can understand them line by line:

server_socket=bluetooth.BluetoothSocket(bluetooth.RFCOMM): Creating socket for Bluetooth RFCOMM communication.

server_socket.bind(("", port):- Server binds the script on host " to port.

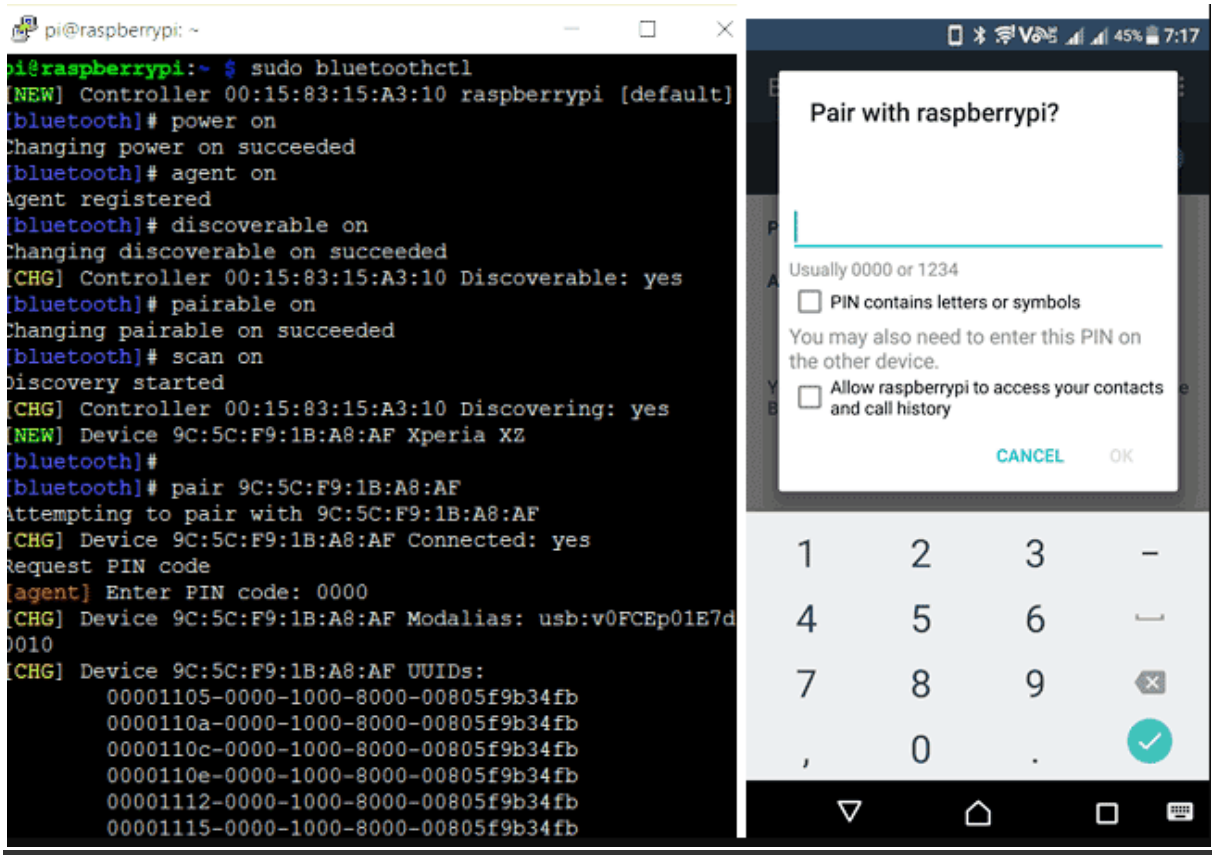
server_socket.listen(1): Server listens to accept one connection at a time.

client_socket, address = server_socket.accept(): Server accepts client's connection request and assign the mac address to the variable *address*, *client_socket* is the client's socket

data = client_socket.recv(1024): Receive data through the client socket *client_socket* and assign it to the variable *data*. Maximum 1024 characters can be received at a time.

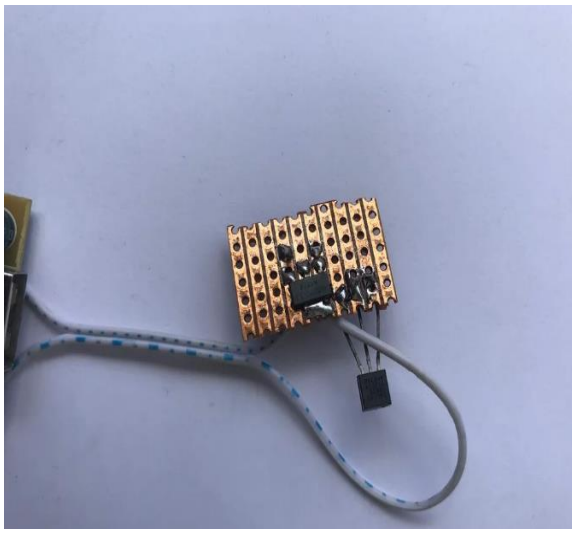
Finally after all the programming, close the client and server connection using below code:

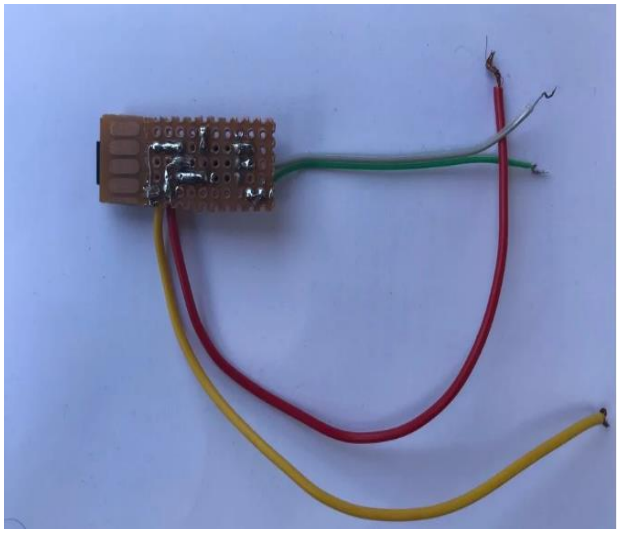
```
client_socket.close()

server_socket.close()
```

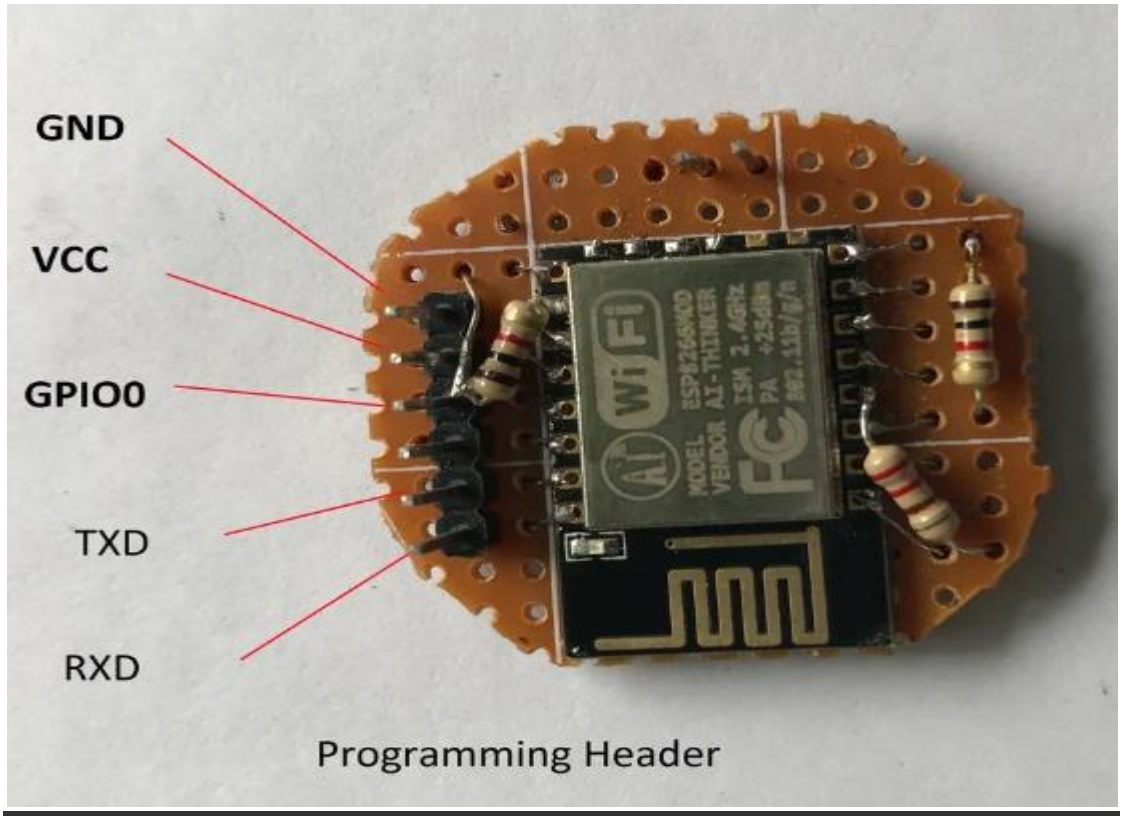


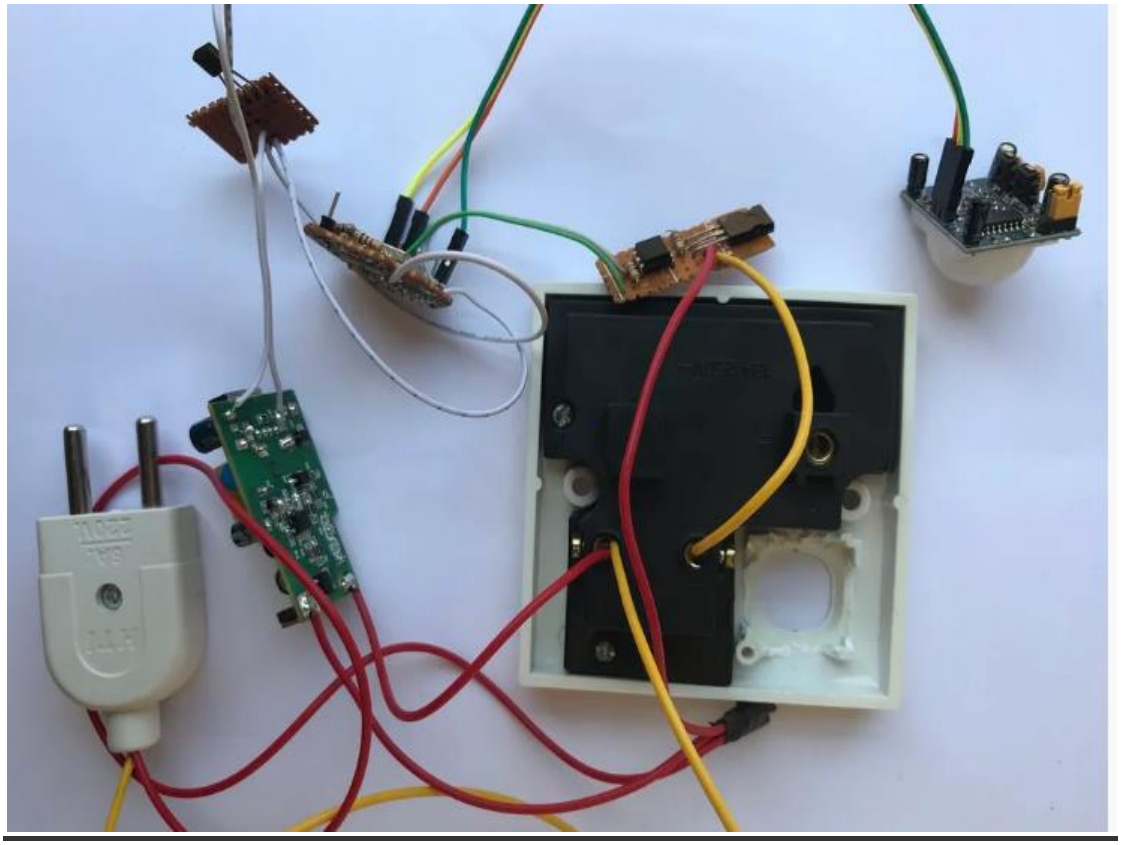
7.OUTPUT AND SCREENSHOTS:

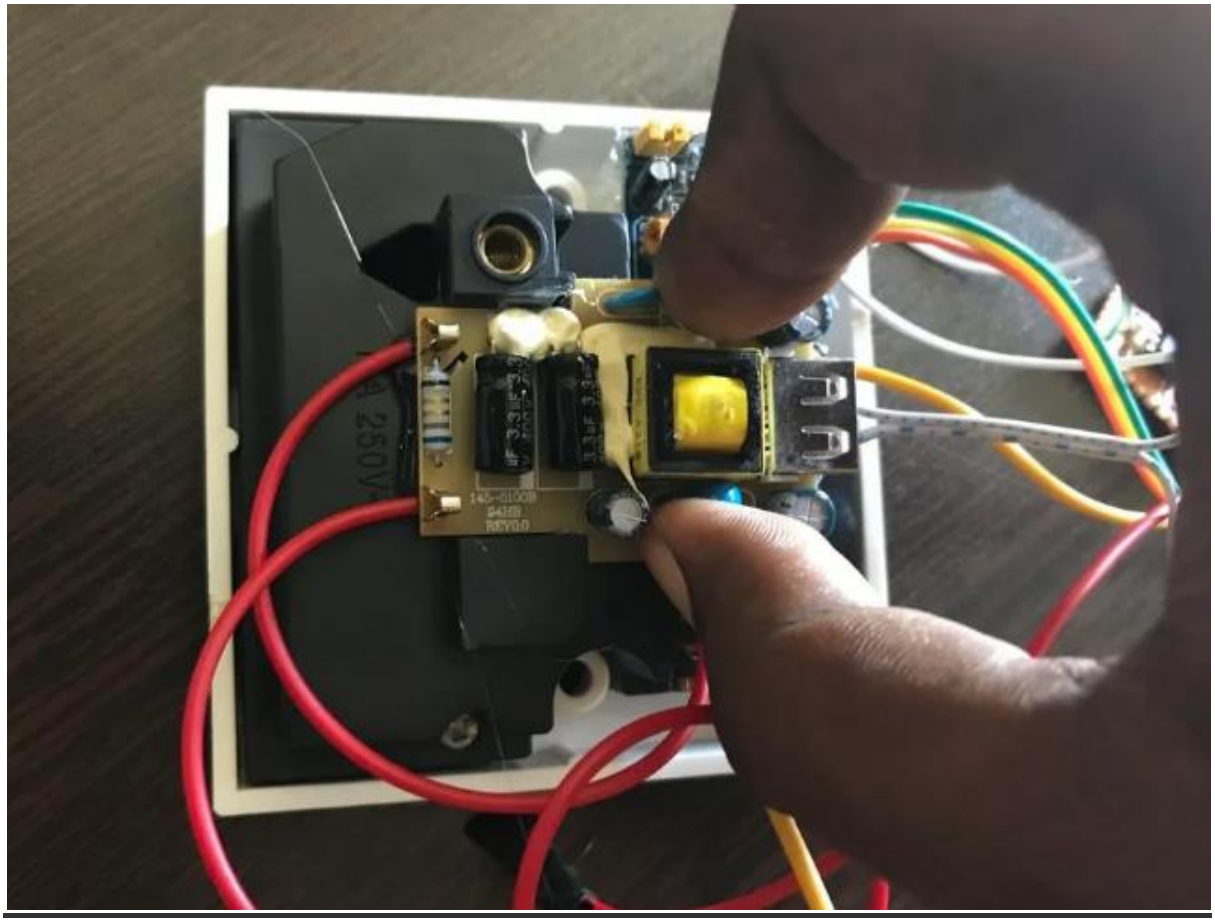
HARDWARE OUTPUTS AND SCREENSHOT:

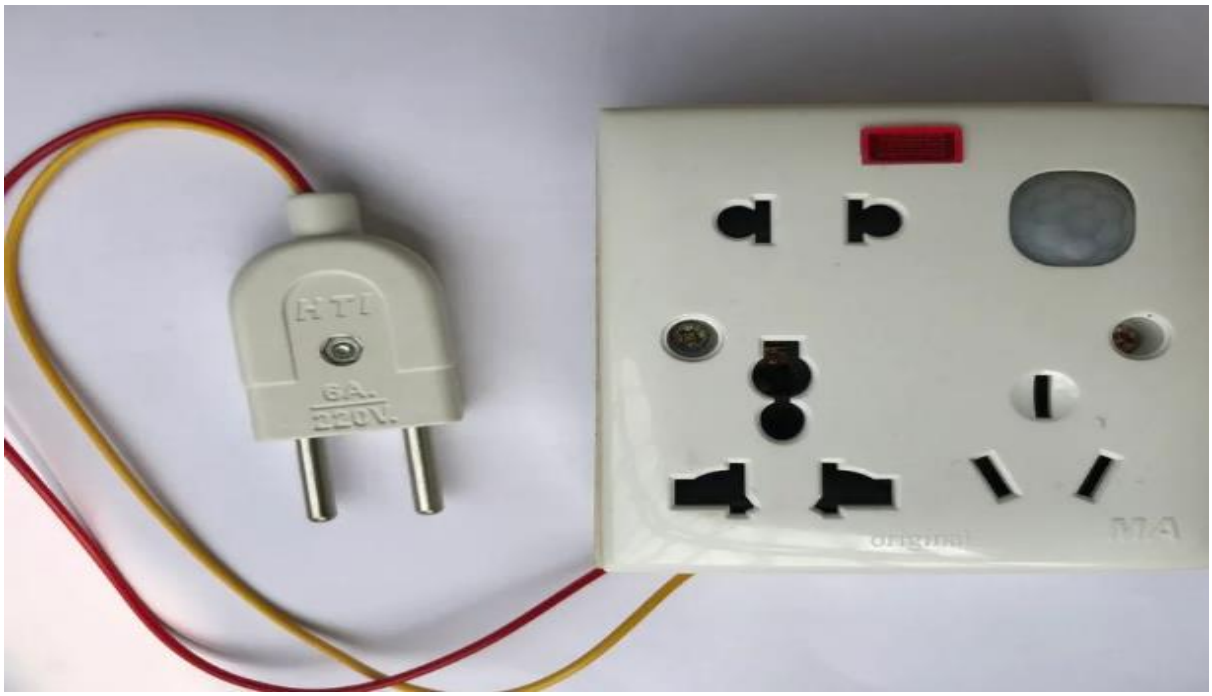




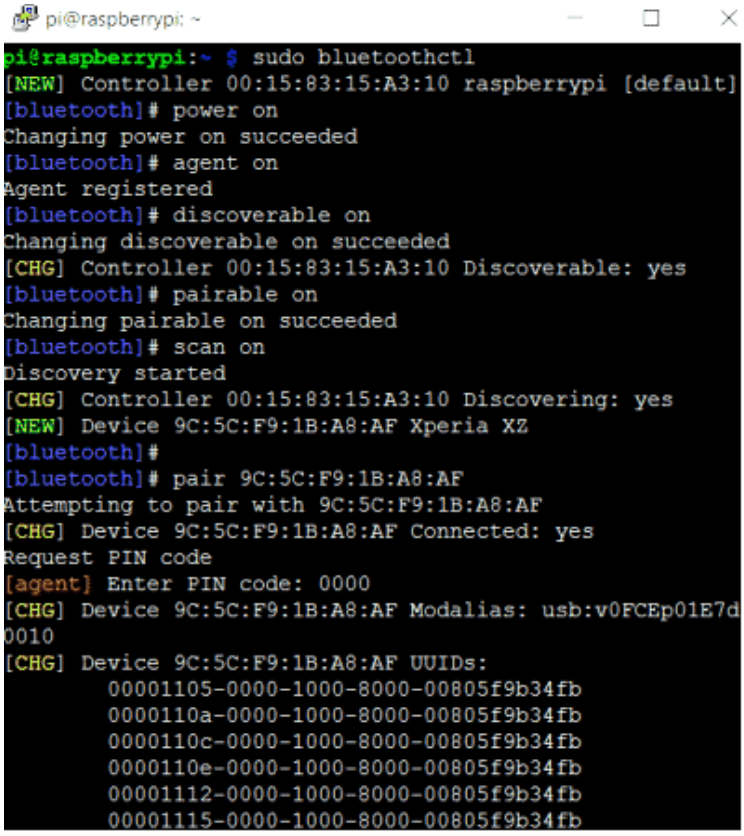

GND
VCC
GPIO0
TXD
RXD
Programming Header

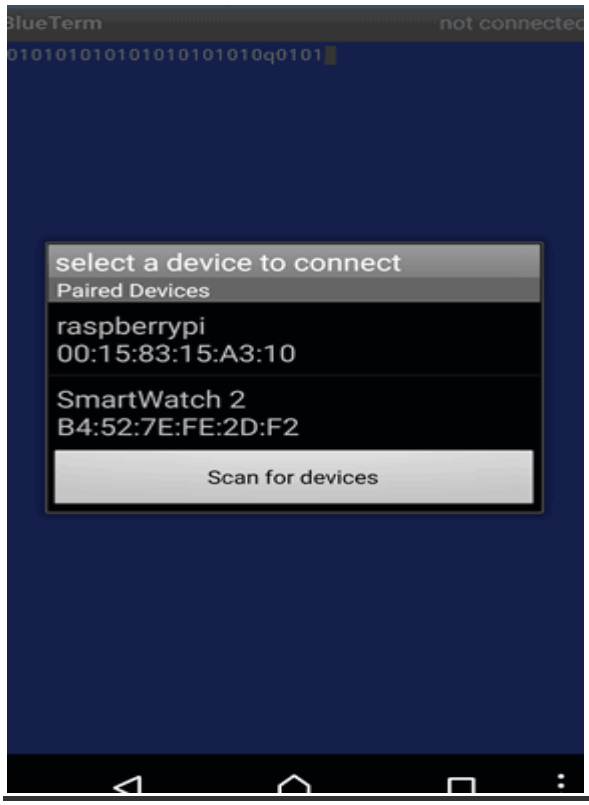


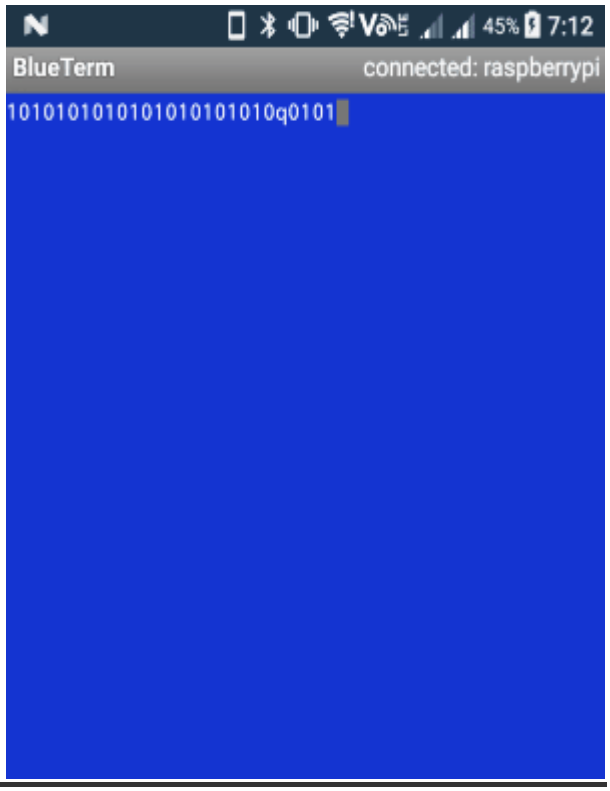



HTI
6A.
220V.

SOFTWARE OUTPUTS AND SCREENSHOT:







REFERENCES:

[1]Koushik Anand, Jayakumar C, Mohana Muthu and Sridhar A, "Automatic Drip Irrigation using Fuzzy Logic and Mobile Technology", Proceedings of Technological Innovation in ICT for Agriculture and Rural Development, 2015.

[2]Poojashri S, Lakshmi R, Shruthi K M, Usha K R,Vijayalaxmi R Patil, "Residence Energy Control System using IoT", International Journal for Scientific Research & Development| Vol. 5, Issue 04, 2017.

[3] Miss.Chetashri Prakash Purandare, Prof D. D. Patil, "SMART AUTOMATION SYSTEM BASED ON WIRELESS AND IoT", IJARIIE, Vol-3 Issue-2 2017.

[4] Jiang Feng Dai Jian Wu Fe ZouYan,"Design of Socket Based on Intelligent Control and Energy Management", International Journal of Advanced Computer Science and Applications, Vol. 6, No. 10, 2015.

[5] Mr.Sagar s karakalmani ,“Residency energy control system (RECOs) using wireless socket and IOT “,International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 6, Issue 5, May 2017.

[6] V.Kandasamy, SindhupriyaParanthaman, “PIC 16F877A based Hostel Automation using Residence Energy Control System (RECOS) Design”, International Journal for Scientific Research & Development| Vol. 5, Issue 01, 2017.

[7] M. Lee, Y. Uhm, Y. Kim, G. Kim, and S. Park, ``Intelligent power management device with middleware based living pattern learning for power reduction," IEEE Trans. Consum. Electron., vol. 55, no. 4, pp. 2081_2089, Nov. 2009.

[8] W. K. Park, C. S. Choi, I. W. Lee, and J. Jang, ``Energy ef_cient multifunction home gateway in always-on home environment," IEEE Trans.Consum. Electron., vol. 56, no. 1, pp. 106_111, Mar. 2010.

[9] Standby Power Annex: Summary of Activities and Outcomes Final Report, MAIA Consulting, Geneva, Switzerland, Apr. 2014.

[10] A. H. Mohsenian-Rad, V. W. Wong, J. Jatskevich, R. Schober, and A. Leon-Garcia, ``Autonomous demand-side management based on gametheoreticenergy consumption scheduling for the future smart grid," IEEETrans. Smart Grid, vol. 1, no. 3, pp. 320_331, Dec. 2010

https://www.youtube.com/watch?v=qKBydUMCB0s

https://youtu.be/eZ__afcGqyo

https://circuitdigest.com/microcontroller-projects/raspberry-pi-smart-phone-home-automation