IoT Based Load Control System From Multiple Source



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DECLARATION OF AUTHENTICATION

We certify that the research/project based thesis titled, "**IoT based load control system from multiple source**" is completely our group work. All sources and knowledge for this paper which were found by other researchers are acknowledged by reference. Materials of work such as images, figures, tables and citations in this paper are accepted by our Supervisor. We hereby declare that this thesis has not been previously submitted either in whole or in part, for any other degree or publication.

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ABSTRACT

Internet of Things (IoT) is the network of interconnected devices, digital machines, vehicles, Home appliances and other objects embedded with sensors, software, switches and connectivity which enable these things to connect to a network and collect and exchange data. The system creates the scope of connecting the non-internet-enabled physical devices and machines to be connected over the internet and remotely monitored and controlled. This research intends to propose architecture for home automation using near field and mobile communication along with a mobile application. The basic architecture or framework consists of connecting devices which will use protocol (Modbus or Zigbee) to connect Edge gateway; and cloud stores the data information using backend storage system. Along with smart control of the appliances, Will be focusing on energy consumption management system through which consumers can reduce excess energy consumption by remotely controlling the devices. The two sources used here are the solar systems and wind systems will collect power through these save it in the battery and from that electricity will be connected to all the devices. Used as multiple sources will reduce our power deficit.

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List of Abbreviations

IoT	Internet of things
SGS	Smart Grid System
LED	Light Emitting Diodes
ISP	In System Programming
EEPROM	Electrically Erasable Programmable Read-Only Memory
PWM	Pulse Width Modulation
USB	Universal Serial Bus
ICSP	In-Circuit Serial Programming
AC	Alternating Current
DC	Direct Current
IDE	Integrated Development Environment
SRAM	Static Random Access Memory
UART	Universal Asynchronous Receiver/Transmitter
SPP	Serial Port Protocol
AFH	Adaptive Frequency Hopping Feature

CHAPTER 1
Introduction

1.1 Introduction

The Internet-of-Things (IoT) is a vision for an internetwork of intelligent,communicating objects such as home appliances, vehicles, factory machines, wearable devices and various types of sensors. The convergence of technologies like ubiquitous wireless communications, machine learning, real-time analytics and embedded systems has made novel IoT applications possible in a multitude of domains. A combination of commercial interests and government initiatives have made smart homes, smart healthcare, smart cities, and smart transport primary areas of focus for IoT application development. Internet-of-things-enabled personal healthcare applications will require sensors to collect data in smart spaces, such as smart homes or healthcare environments, and from wearable or implanted RFID tags. Data from RFID devices will provide insights into people's diurnal activities, help detect abnormal events, and possibly alert caregivers to problems. The idea of using an IoT to create smart cities may have originated with a 1990's era nationwide coalition, Smart Growth America (SGA). SGA sought to address issues related to urban environments, including resource management, transportation, and public administration. Recent government support for information and communication technology systems may finally allow the SGA's vision to be realized.The Internet-of-Vehicles (IoV) is a subfield of IoT that uses wireless technology to enable vehicles to communicate with their environment. IoV creates opportunities for developing novel applications in intelligent traffic control and management, road safety and vehicular safety such as online diagnosis, anti-theft systems and tracking. IoV enables vehicles to communicate utilizing multiple modes of communications including vehicle-to-vehicle, vehicle-to-network-to-vehicle, and vehicle-to-infrastructure communications. Smart home is a section of the IoT paradigm that aims to integrate home automation and security. Enabling objects in a typical household to be connected to the Internet allows homeowners to remotely monitor and control

them. From lamps that are set on timers to turn off at a specific time of the day, to smart thermostats that will regulate the temperatures in a house and generate detailed reports about energy usage, smart homes have found its niche in the consumer market. The availability of affordable smartphones, micro-controllers and other open-source hardware along with the increasing use of cloud services, has made it possible to develop low-cost smart home security systems. With families having busier lives than ever, smart home automation and security systems can also cater to household members with limited mobility such as the handicapped and the old. The purpose of this paper is to present a low-cost architecture using RF based communication in a household to create an IoT-enabled smart home security system. Smart home devices that typically consume low power such as smart bulbs and door or window sensors use RF transceivers to communicate with each other. In this.

1.2 Internet of Things (IoT) Basic Concept

The intercommunication between device to device or machine learning connected through the internet with embedded technology systems using wireless sensors, actuators which is remotely controlled, monitor and optimized by the user for automation is referred as Internet of things (IoT). Here the term "Things" means physical devices such as chips, cameras, sensors and other such devices. These physical devices are responsible to communicate, collect information and exchange data by connecting a network. The embedded technology of these physical devices makes this exchange of information each other possible. There are an assortment of home robotization includes that can help making life at home increasingly advantageous and simpler to oversee, particularly for occupied, huge families.

Suppose you could consequently manage and control the gadgets that you ordinarily turn on and off each day. With a home computerization framework, you can manage appliances when you're out of the house and wondering if you remembered to turn off light or not, smart system will be there to answer the question. The developing nearness of the Internet of Things in individuals lives has made development and advancement in the savvy home space, enabling clients to associate their gadgets through the web to their phones and tablets, and make better than ever benefits for family units. In addition, as house owner are adjusting their gadgets to one focal application, gadget or center, they further understand the worth these home

robotization items can bring to a family. It is the connectivity apart from the conventional devices using internet such as desktop, laptops, Smartphone, tablets etc.

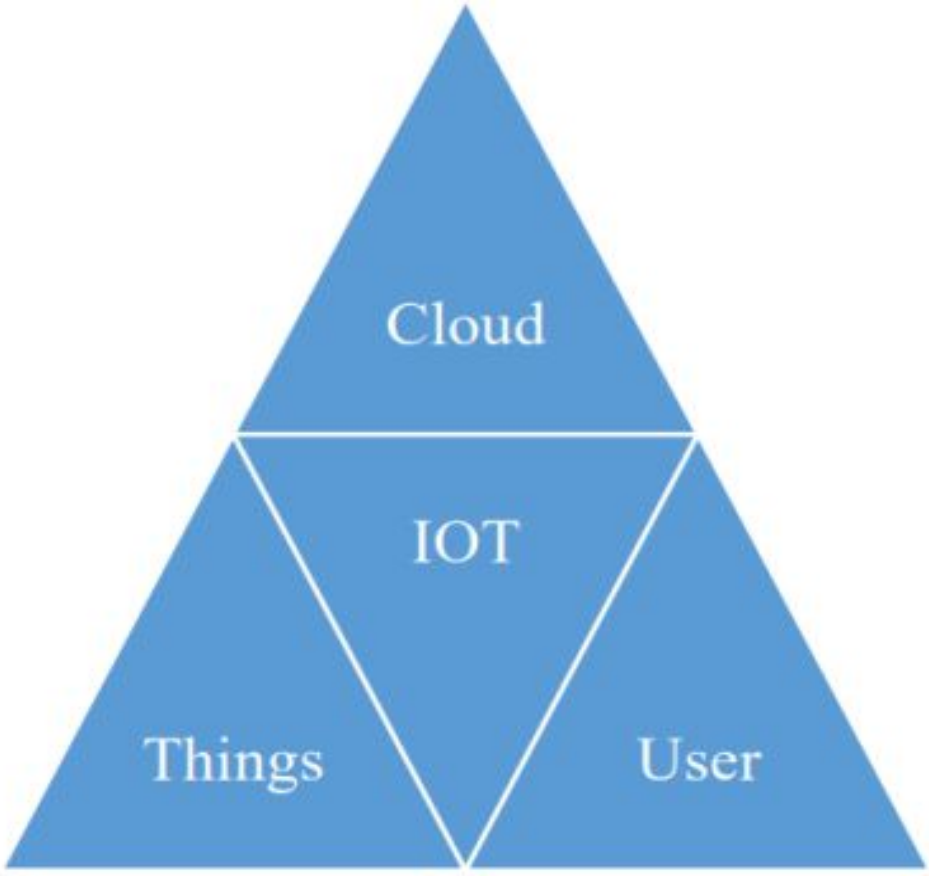


Figure 1.1: IoT Basic Concept

3. Objective

- Authors develop a remote control of lights, fans other home appliances. A pc based program develop for control the remote devices. It is a low cost system or control various devices.
- Proposed Android software for Arduino platform these both are open source software. This system is used to control various home appliances. The system available for less cost.
- Authors developed smart home system to control and manage home appliances of daily life for comfortable life for human being.

4. Project Outline

Chapter 2 shows a study of the literature review of related work which was used to develop the project.

Chapter 3 describes the block diagram, working procedure, connection diagram and explanation.

Chapter 4 describes all the hardware devices and power supply to the project.

Chapter 5 reviews the results found through the project and provides a discussion on the findings.

Chapter 6 specified the limitations of the project, provides the future works that may be approached and conclusion.

5. Summary

Firstly, Discuss about home automation. Also discuss about Benefits of Smart and Advantages, Disadvantages of the security system. Then discuss about problem statement, methodology and objective of this project. Lastly, Discuss about project outline in this chapter.

CHAPTER 2

LITERATURE REVIEWS

2.1 Load Control System

Today the world is moving very fast, everything is getting easier than before. People are considering automatic devices instead of manual devices. Just want a simple method for some devices. This field of automation is growing very fast. The Internet is a fundamental part of communication in the world. It is also being used to communicate between devices to work accordingly. Internet usage has grown exponentially over the past few decades. The Internet of Things is a field where you can share all the information you need from a specific file, even when you're busy. It can access every piece of information from a mini gadget to the entire industry. The Internet of Things-based home automation and security system is a system where you can control every object in the house from any part of the world and collect related information using the Internet via mobile phone or personal computer. Atmospheric conditions of the house such as temperature, humidity, etc. And with that, there is another application to protect the home from any theft or danger. Automate things for comfort from a small house to the whole industry. Yet there is a existence of technologies for home automation in which the communication between the devices is controlled through the wired communication. It is too much costly if it is not installed while the home is under construction. So the easier way to access the easiness of home automation is by using internet of things based home automation.

2.2 Mechanism of Security Access System

In the proposed home automation system various sensors will be kept at various places that can gather real time continuous data to the central micro-processors. The home automation system contains various sensor devices are sensing, communicating and collect data from various appliances in the home. The sensors are continuously

collect real-time data and send to micro-processors. The microprocessor having a code which execute the functions automatically control the home appliances like fans, tube lights, gas leakages, air conditioners etc monitor remotely and notifying time-to-time and record the information gathered to the cloud. In the cloud the actual data processing will be happened and results can be viewed by end user for taking decision. The relay tool is analyze the matching of power supply of the connect the home appliances to home automation system. As well as the sensor devices are also connect to various ports of NodeMCU. Also observe the data uploading in gauge on thinger.

2.3 Types of Security Access System

This Data collection unit module consists of sensor used for Home Automation system. The sensors connect, communicate and collect the different types of sensor data like environmental condition of a particular room in which system is implemented and shows this information to the third party server such as thinger.io(to monitor and visualize the data) and also send it to the microprocessors so the processors can take decisions based on the data now what is the next activity.

2.4 History of IoT Applications

IoT application changes our life and made our life easy, comfortable and simple. The sector and area that IoT covers are huge. IoT have extensive applications in different sectors for instance commercial, industrial, and medical and consumers. In all these cases IoT left its footprint and in future it surprises more. Here some of its real world application irradiates, which are smart home, smart city (parking, waste management), utilities (smart grid, smart metering), wearable gadgets,
Transports & logistics (connected cars, fleet management, goods tracking), industrial (process monitoring & control, manufacturing, maintenance), agriculture (agriculture monitoring, climate, livestock tracking), telemedicine and healthcare, elder care, and environment(environment monitoring.
Smart home among them is the most wanted sector that people are trying to get in more modernized way day by day. Focusing on smart home automation system to

manage extra consumptions of energy and monitoring. A smart home means automated home which could manage and control smart device and other home appliances automatically or manually by the user. A smart home consists of so many things like as lighting, heating, air conditioning, domestic robot, thermostat, wireless speaker, home security and monitoring, smoke detector, water detector, washing machine, and refrigerator. The power consumption of smart home electrical device certainly change demand response (DR) to consumer and find good match not only demand for power but also for supply. DR actually responsible for finding better match by adjusting power against supply helps consumer to redeem auxiliary outlay. Consumer plays very vital role to reduce extra power consumption by participating and conducting their household.

At this present stage, human beings are consuming more and more energies like electrical or other sectors. The rapid growths of human beings are needed of these energies which is a part of their life. This unlimited consume of energies are in question as these energies are also in loss. Directly or indirectly, people are misusing energy like switching on electricity in a vacant room for several times etc. IoT is trying to reduce this energy loss that can make this more efficient. By using IoT devices, easily control the energy of a home automatically from a distant place. Our presence is not mandatory but an internet connection can make it possible with automation to reduce the excess energy loss and consume more effective energy. Like in the official hour, don't need to switch on the devices of our home always. Control it from our office by using an IoT system or device only via internet or wireless connection. That will save the energy definitely.

By doing optimal scheduling skill, user can save more energy and their extra expense of money at the same time. IoT home energy management system gives user maximum satisfaction against minimum cost. The demand model using demand response gives higher gratification using time interval optimization. Sometimes scheduling is not applicable for all users so need balance. This type of advantages not only can save the energy but also make our time more efficient for thinking about more things. Thus, Find the concept IoT based energy saving home automation system which is discussed in this paper in an easy and expense consuming way. Focusing on price response, time of use pricing (TOUP), real time pricing (CPP), critical peak pricing (CPP) and demand side management (DSM).

2.5 Summary

After reviewing all these and some more papers and journals, the concept of home automation system on IoT, its energy management system, scheduling energy management system and some alternate automation method to consume power in an effective way are mostly cleared. To establish a little project and paper for this thesis, those are quite enough to enlarge and fix vision at our work. Thus, the review of these papers and journals also point on the future works of the paper.

CHAPTER 3

THEORETICAL MODEL

1. NodeMCU Libraries Used

1.Software Serial

The NodeMCU hardware has built-in support for serial communication on pins 0 and 1 (which also goes to the computer via the USB connection). The native serial support happens via a piece of hardware (built into the chip) called a UART. This hardware allows the NodeMCU chip to receive serial communication even while working on other tasks, as long as there room in the 32 byte serial buffer.

2. Functions Used

Software Serial (rx Pin, txPin)

Software Serial is used to create an instance of a Software Serial object, whose name you need to provide as in the example below. The inverse logic argument is optional and defaults to false. See below for more details about what it does. Multiple Software Serial objects may be created, however only one can be active at a given moment.
Rx Pin: The pin on which to receive serial data Tx Pin: the pin on which to transmit serial data.

Begin (speed)

Sets the speed (baud rate) for the serial communication.

Read ()

Return a character that was received on the RX pin of the software serial port. Note that only one Software Serial instance can receive incoming data at a time.

3.2 Connection Diagram of Load Control System

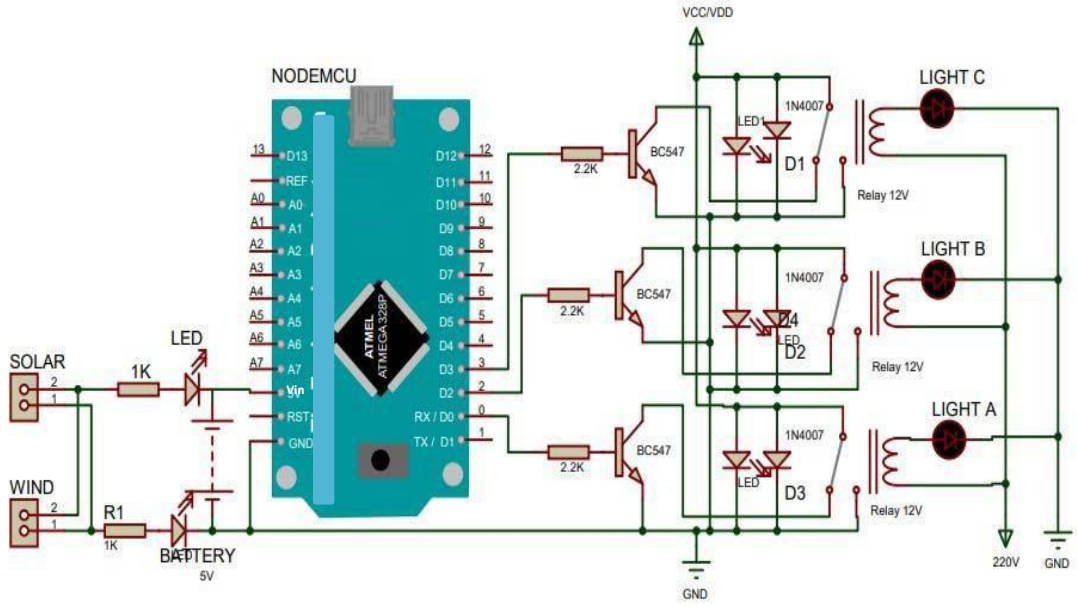


Figure 3.1: Connection Diagram of Load Control System

3.3 Block diagram of Load Control System

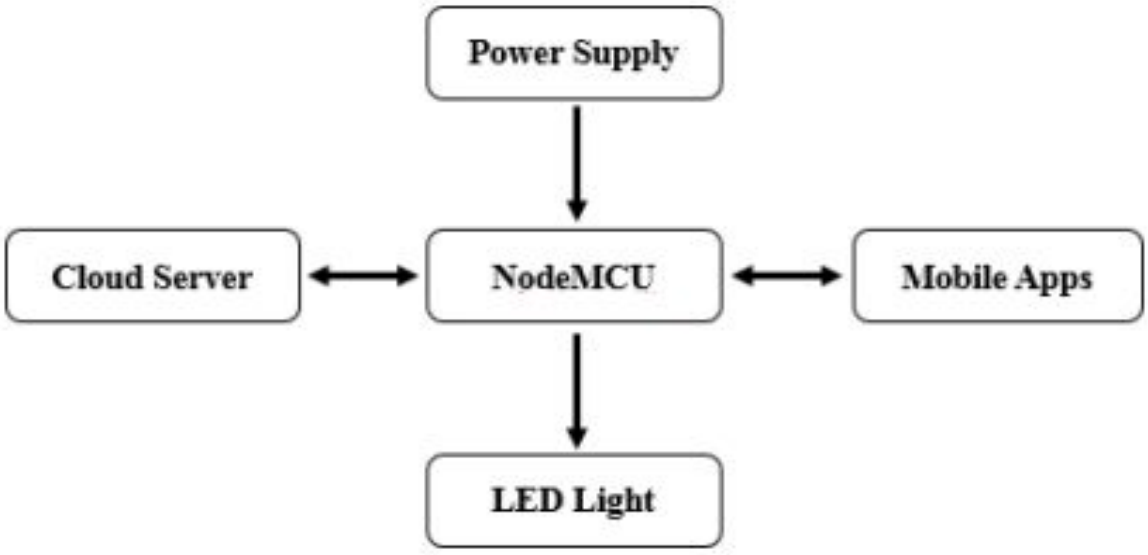


Figure 3.2: Block diagram of Load Control System

3.4 Flowchart of Load Control System

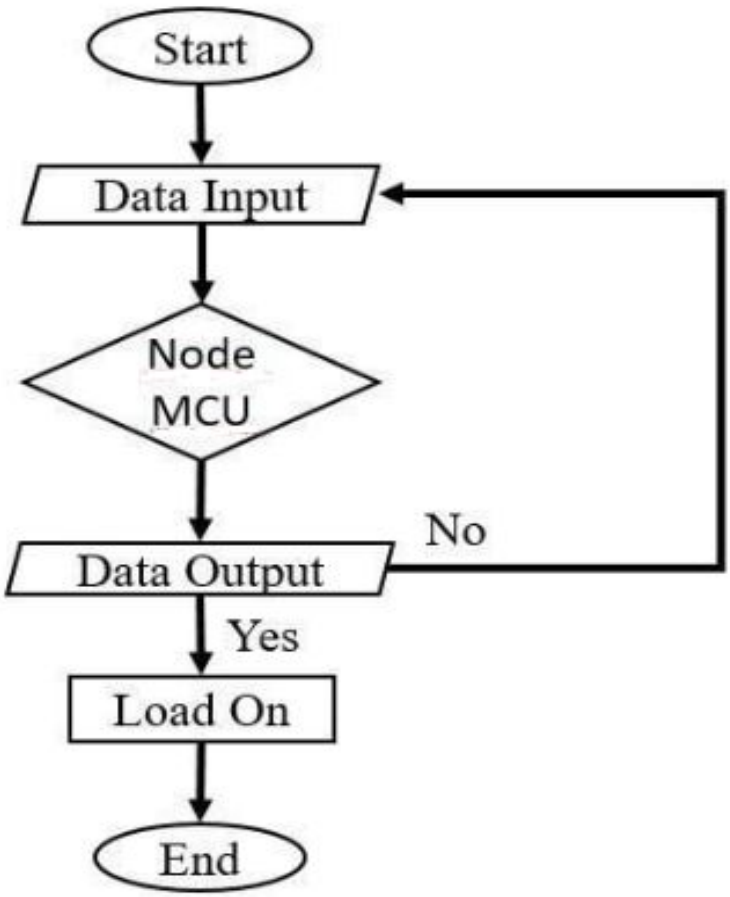


Figure 3.3: Flowchart of Load Control System

Table No 3.1: The function of this project

System Block	Function
NodeMCU Microcontroller	As data processing center
Adaptor (5V)	As the power supply
LED	As indicator
LED Light	Mechanical working

The system required a program that must be implemented to the microcontroller. Programming language for the Arduino microcontroller is C language. To run the program and incorporate the program to the microcontroller needed software i.e. NodeMCU. Microcontroller NodeMCU has been equipped with an internal

EEPROM, Flash memory, etc. This section will examine the input, and give orders to the LED, so that the program can be done without removing control. Power supply circuit is used to supply power throughout the series; the power needed for the whole series is equal to 5 Volts DC. LED circuit serves as indicator for electric current. LED will turn on when current is 5V DC in LED Lamp condition, so the LED will be off when the passed from system current is not passed in the locked state.

3.5 Working Procedure

A socket with three lights has been used here, which is controlled android mobile. It can be controlled from anywhere via the internet. 5v DC power supply to the NodeMCU by using an adapter. Used smartphone and Apps to control home appliance system. Here, also used a WiFi. When put the cloud inside the signal, this work has presented an intelligent home automation system based on IoT technologies, cloud computing, and a machine learning algorithm. The home automation system allows remote and local control of the home via an Android based mobile application. The system controls electrical home appliances, monitors environmental conditions. The system makes intelligent decisions to automatically turn ON or OFF lights.

Table No 3.2: Power Sources in project

Power Sources	Output Power
Solar Panel	5V- 1W- 200mA
Motor	(3V~6VDC)- (70 mA- 250mA)
Battery	(6.75V-6.90V)- 4.5Ah

3.6 Summary

Firstly, showed the connection diagram. Discuss the Block Diagram and explanation. And lastly briefly discuss about working procedure in this project.

CHAPTER 4

Hardware Development

4.1 Components Name and Quantity

Table No 4.1: Components Name and Quantity

SL	Equipment Name	Quantity
1	NodeMCU	1
2	LED Light	3
3	Solar panel	1
4	Motor	1
5	5V Battery	1
6	Relay	3
7	Light Holder	3
8	Diode	3
9	Transistor	3
10	Resistor	3
11	Varo board	1
12	White board	As necessity
13	LED	3
14	Glue	1
15	Wire	As necessity

4.2 NodeMCU

The NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

However, as a chip, the ESP8266 is also hard to access and use. Solder wires, with the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the “computer” on the chip. Program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects. But, what about Arduino? The Arduino project created an open-source hardware design and software SDK for their versatile IoT controller. Similar to NodeMCU, the Arduino hardware is a microcontroller board with a USB connector, LED lights, and standard data pins. It also defines standard interfaces to interact with sensors or other boards. But unlike NodeMCU, the Arduino board can have different types of CPU chips (typically an ARM or Intel x86 chip) with memory chips, and a variety of programming environments. There is an Arduino reference design for the ESP8266 chip as well. However, the flexibility of Arduino also means significant variations across different vendors. For example, most Arduino boards do not have WiFi capabilities, and some even have a serial data port instead of a USB port..

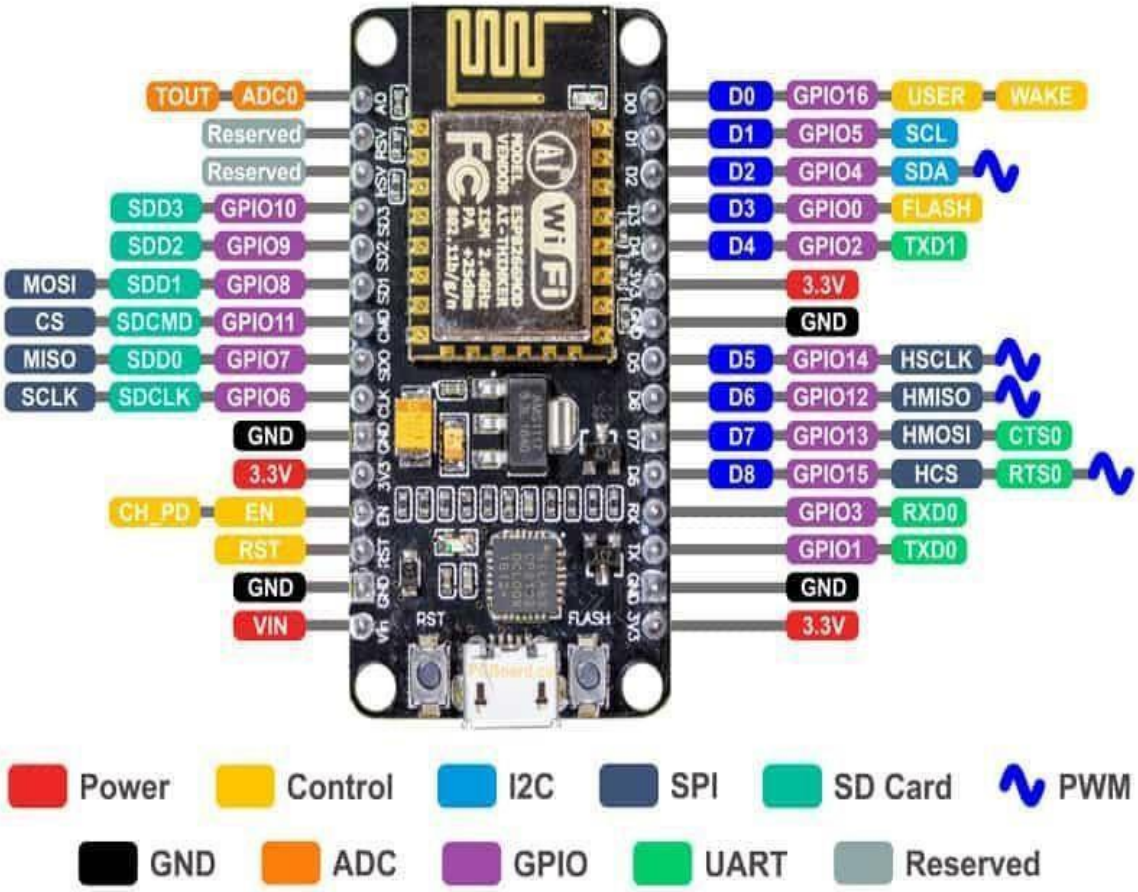


Figure 4.1: Identification NodeMCU

4.2.1 Different Models of the NodeMCU

The NodeMCU is available in various package styles. Common to all the designs is the base ESP8266 core. Designs based on the architecture have maintained the standard 30-pin layout. Some designs use the more common narrow (0.9″) footprint, while others use a wide (1.1″) footprint – an important consideration to be aware of.

The most common models of the NodeMCU are the Amica (based on the standard narrow pin-spacing) and the LoLin which has the wider pin spacing and larger board. The open-source design of the base ESP8266 enables the market to design new variants of the NodeMCU continually.



(i)





(ii) Figure 4.2: NodeMCU (iii)

4.2.2 Power

The power pins are as follows:

•VIN: The input voltage to the NodeMCU board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source).

•5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

• GND: Ground pins.

3. Memory

The ESP-8266 32-bit has 4 MB / 64 KB of flash memory for storing code. It has also 2 KB of SRAM and 64 KB of EEPROM.

4. Inputs and Outputs

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ESP-8266 USB-to-TTL Serial chip.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write() function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.

LED: 13, there is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the on the board.

4.3 LED Light

Stands for "Light-Emitting Diode." An LED is an electronic device that emits light when an electrical current is passed through it. Early LEDs produced only red light, but modern LEDs can produce several different colors, including red, green, and blue

(RGB) light. Recent advances in LED technology have made it possible for LEDs to produce white light as well.

LEDs are commonly used for indicator lights (such as power on/off lights) on electronic devices. They also have several other applications, including electronic signs, clock displays, and flashlights. Since LEDs are energy efficient and have a long lifespan (often more than 100,000 hours), they have begun to replace traditional light bulbs in several areas. Some examples include street lights, the red lights on cars, and various types of decorative lighting. You can typically identify LEDs by a series of small lights that make up a larger display. For example, if you look closely at a street light, you can tell it is an LED light if each circle is comprised of a series of dots.

The energy efficient nature of LEDs allows them to produce brighter light than other types of bulbs while using less energy. For this reason, traditional flat screen LCD displays have started to be replaced by LED displays, which use LEDs for the backlight. LED TVs and computer monitors are typically brighter and thinner than their LCD counterparts.



Figure 4.3: LED Light

4.4 Lamp Holder



Figure 4.4: lamp holders

Lamps are usually inserted in lamp holder sockets which provide electrical connections to the lamp and support it in the lighting fixture. The use of sockets allows lamps to be safely and conveniently replaced at the end of life, or to change power, color, lighting technology or etc. There are many different standards for these lamp holders, created by de facto and by various standards bodies. A general coding system is a letter or abbreviation followed by a number. Some miniature lamps have wire leads suitable for direct connection to wires; some reflector lamps have screw terminals for wire connections.

4.5 LED

Light Emitting Diode is abbreviated as LED. They are used at different places such as street lighting; home LED lighting, commercial LED etc. LED lights are small light bulb which fits into the electrical circuit. Working mechanism of LED lights is

depending upon the electrons in the semiconductor. LED lights have more lifespan then other ordinary lights.



Figure 4.5: LED

4.6 Resistor

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor



Figure No 4.6: Resistor

4.7 Vero board

Vero board is a brand of stripboard, a pre-formed circuit board material of copper strips on an insulating board. which is the generic name for a widely used type of electronics prototyping board characterized by a 0.1 inch (2.54 mm) regular (rectangular) grid of holes, with wide parallel strips of copper cladding running in one

direction all the way across one side of the board? It is commonly also known by the name of the original product Vero board, which is a trademark, in the UK, of British company Vero Technologies Ltd and Canadian company Pixel Print Ltd. In using the board, breaks are made in the tracks, usually around holes, to divide the strips into multiple electrical nodes. With care, it is possible to break between holes to allow for components that have two pin rows only one position apart such as twin row headers for IDCs.

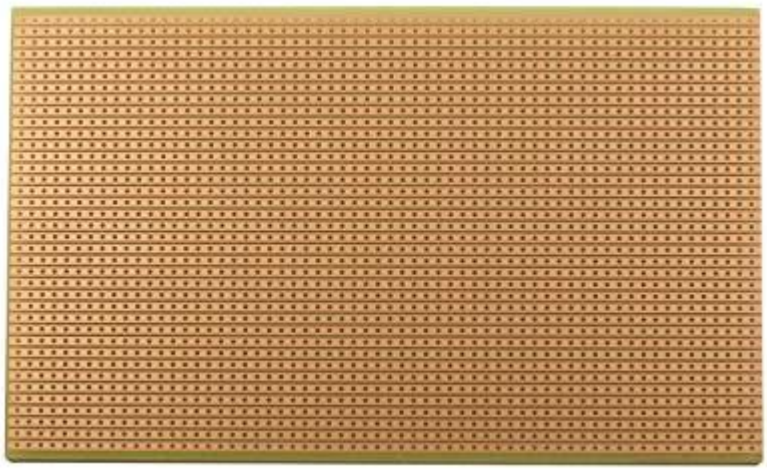


Figure 4.7: Vero Board

4.8 Connector

An electrical connector, a device for joining electrical circuits together. Audio and video connector, electrical connectors (or optical connectors) for carrying audio signal and video signal, of either analog or digital format. Gender of connectors and fasteners. Power connector, devices that allow electrically operated equipment to be connected to the primary alternating current (AC) power supply in a building. RF connector, an electrical connector designed to work at radio frequencies in the multi-megahertz range.



Figure 4.8: Connector

4.9 Relays

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.

Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts.

Protective relays can prevent equipment damage by detecting electrical abnormalities, including overcurrent, undercurrent, overloads and reverse currents. In addition, relays are also widely used to switch starting coils, heating elements, pilot lights and audible alarms.

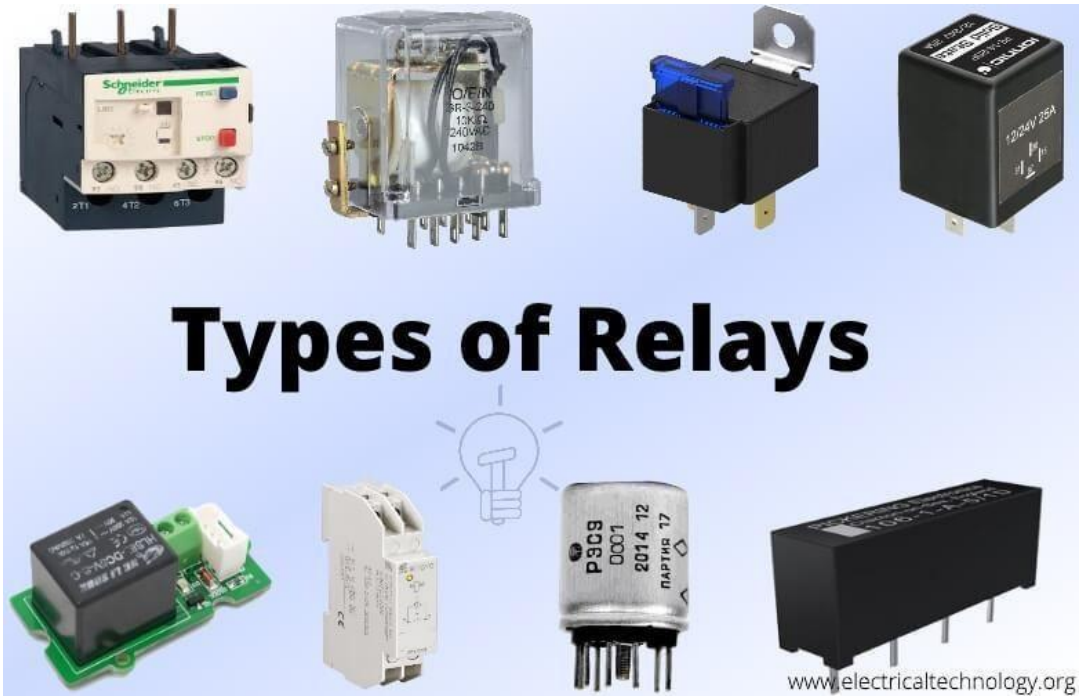


Figure 4.9: Relays

4.10 Battery

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of

the battery to perform work. Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved additionally to include devices composed of a single cell.

Electricity, as you probably already know, is the flow of electrons through a conductive path like a wire. This path is called a circuit.

Batteries have three parts, an anode (-), a cathode (+), and the electrolyte. The cathode and anode (the positive and negative sides at either end of a traditional battery) are hooked up to an electrical circuit.

The chemical reactions in the battery cause a buildup of electrons at the anode. This results in an electrical difference between the anode and the cathode. You can think of this difference as an unstable build-up of the electrons. The electrons want to rearrange themselves to get rid of this difference. But they do this in a certain way. Electrons repel each other and try to go to a place with fewer electrons.

In a battery, the only place to go is to the cathode. But, the electrolyte keeps the electrons from going straight from the anode to the cathode within the battery. When the circuit is closed (a wire connects the cathode and the anode) the electrons will be able to get to the cathode. In the picture above, the electrons go through the wire, lighting the light bulb along the way. This is one way of describing how electrical potential causes electrons to flow through the circuit.

However, these electrochemical processes change the chemicals in anode and cathode to make them stop supplying electrons. So there is a limited amount of power available in a battery.

When someone recharge battery, and then change the direction of the flow of electrons using another power source, such as solar panels. The electrochemical processes happen in reverse, and the anode and cathode are restored to their original state and can again provide full power.

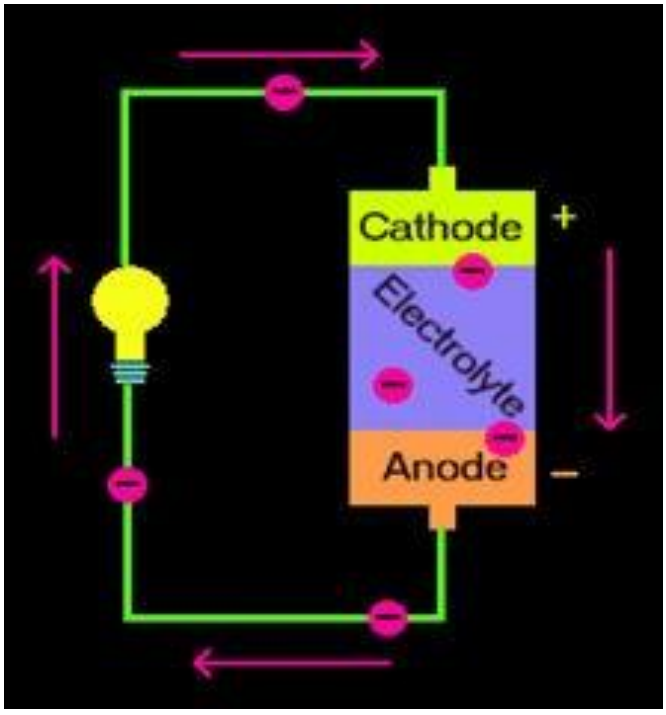


Figure 4.10: working principle of battery

4.11 Solar Power

It is a radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power.



Figure 4.11: Solar Power

4.12 Transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals.

Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits. The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems.

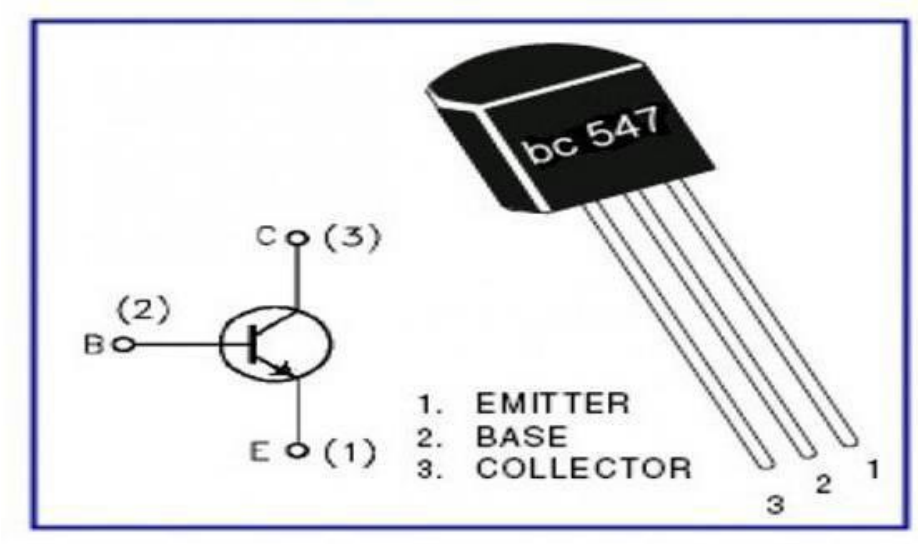


Figure 4.12: Transistor

4.13 Holder

A device for securing a lamp to its support; specifically, a socket or holder fitted with electric terminals, into which the top of the glass globe of an incandescent lamp is fitted, or from which it hangs.



Figure 4.13: Holder

4.13 Summary

Firstly discuss about components name which are used in this project. Discuss about NodeMCU where are briefly discuss about why NodeMCU, technical specification, power, inputs outputs, memory, communication etc. Then we briefly discuss about LED Light, Relay, Light Holder, resistor and 5 volts adapter in this chapter.

CHAPTER 5

RESULT AND DISCUSSIONS

5.1 Apps control using home appliance

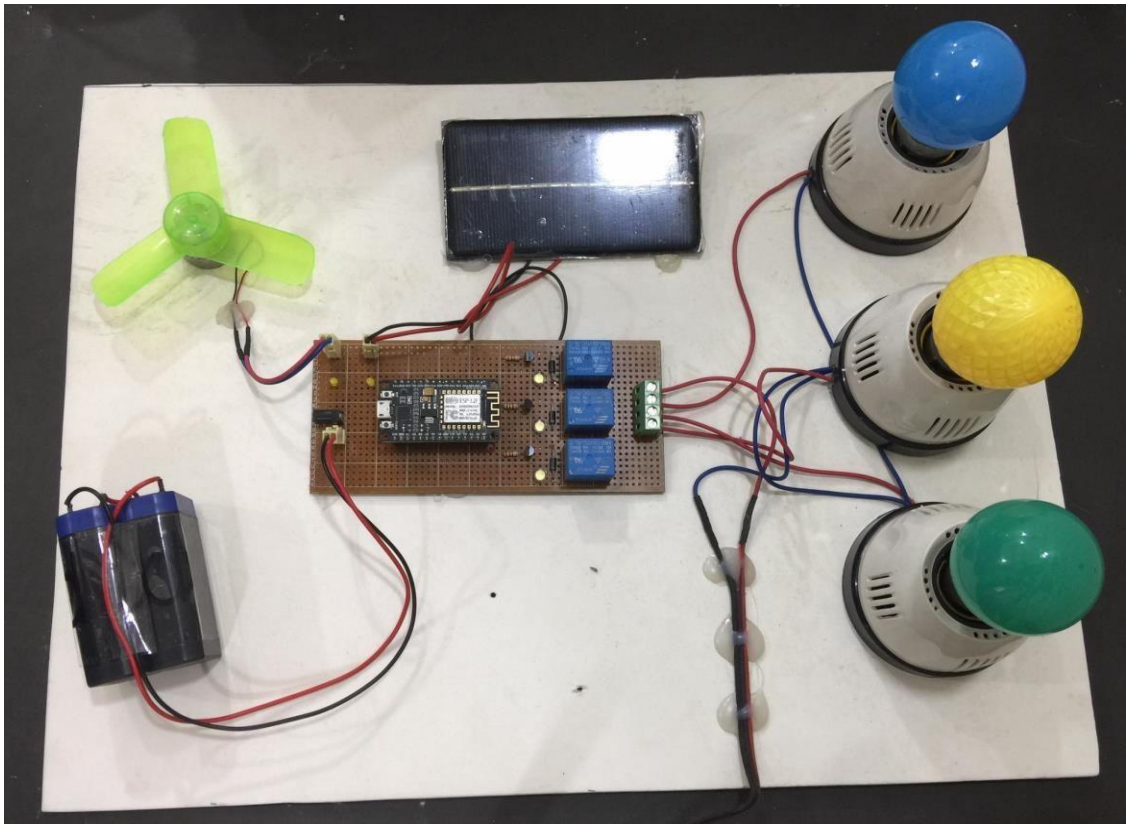


Figure 5.1: Project image

5.2 Result

After the NodeMCU gets connect with WiFI. We need to connect this with our phone. A blue light will lit up when the NodeMCU gets a WiFi Signal. After that, we need to open the app (arduino IDE 1.6) from our phone. When the phone and NodeMCU are connected a little sound will be heard from NodeMCU. Then we can easily control the load with our phone.

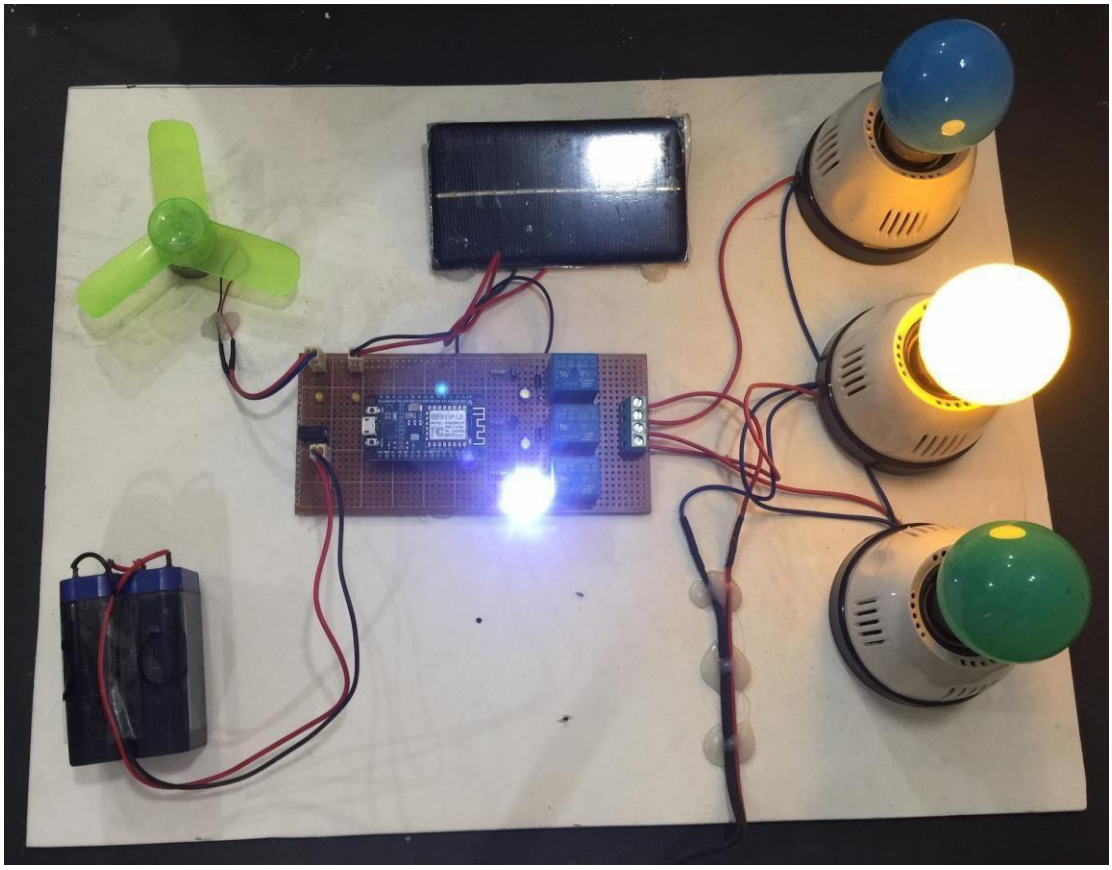


Figure 5.2: Home appliance system

5.3 Discussion

By implementing above systems there are various benefits

- ❏ It is beneficial to older people by providing all care at home.
- ❏ It offers other features to homeowners such as it can be used in automatic opening of the garage door's switch.
- ❏ The smart irrigation systems will make sure that water has been provided to the lawn as per need and saves water resources.
- ❏ Many device such as air conditioner, light, fan, motors etc. can be controlled from long distance.
- ❏ Highly secured and Time saving.
- ❏ This is very low cost system.
- ❏ However, the main disadvantage of this system is this device can't be controlled when there is no internet presence.

5.4 Total Project Cost, Quantity and Price

SL	Equipment Name	Quantity	Price(TK)
1	NodeMCU	1	800
2	LED Light	3	150
3	Solar panel	1	400
4	Motor	1	100
5	5V Battery	1	500
6	Relay	3	150
7	Light Holder	3	110
8	Diode	3	30
9	Transistor	3	30
10	Resistor	3	10
11	Varo board	1	50
12	White board	As necessity	500
13	LED	3	50
14	Glue	1	20
15	Wire	As necessity	200
Total Project Cost = 3,100Tk			

Table No 5.1: Equipment Cost

5.5 Summary

Firstly discuss Control application security using IoT, use Cloud and phone Apps use home appliance. Finally discuss Total Project Cost, Quantity and Price.

CHAPTER 6
CONCLUSIONS

1. Conclusions

The IOTs based home security and automation is very useful for remote users. Any home can be monitored and controlled by using the prototype implemented in this paper. This IOTs based system is the building block of all internet based diverse applications. The system developed in this paper is cost effective solution of IOT applications. The modules used in its formation are light, easy to use and cost effective. It also enables easy operation and quick access of information. It enables user to access file by computer anywhere in the world. It extends internet productivity gain to things not just to people as more data is generated by things than just by people. It is a prototype which provides reliable, cost effective and efficient IOT applications solution to the whole world. The two sources used here are the solar systems and wind systems will collect power through these two sources wind and save it in the battery and from that electricity will be connected to all the devices. Used as multiple sources will reduce our power deficit.

2. Advantages of Load Control System

Following are the benefits or advantages of smart home:

i) It offers peace of mind to homeowners as they can monitor their home remotely which helps them avoid potential dangers of theft as well as accidents. Potential dangers include a smart coffee maker which has been left ON by mistake, the front door has not been locked, and so on.

ii) It is beneficial to elder people by providing all care at home. Moreover, they can be monitored remotely. This avoids extra expenditure for nursing homes.

iii) It offers other features to homeowners such as the automatic opening of the garage door, automatic switching ON of lights when the owner opens the door, automatic playing of favorite music, and so on.

iv).The other appliances such as smart air conditioners will make sure to keep your home ready for you with the desired temperature when you arrive from the office to your smart home.

v) The smart irrigation systems will make sure that water has been provided to the lawn as per need and saves water resources.

vi)Smart electricity systems will make sure to switch off lights automatically which helps in energy savings to a considerable extent.

6.3 Future Scopes

Internet of things based load control system can only work in the presence of internet. The rapid growth of IoT devices brings concerns and benefits. Even though Wifi is not available we can go to 3G or 4G services. This is one big advantage of IOT In this project, the use of a camera connected to the microcontroller might help the user in taking decision whether to welcome the guest after receiving the captured picture of the guest or intruder, If the user identifies he is an unknown person then the user can further forward the same photograph to the police station by explaining his situation. This project can also be implemented by using Raspberry.

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Appendix

The code used in NodeMCU

```
#define LED1 16 //D0
#define LED2 5 //D1
#define LED3 4 //D2

void setup() {
 Serial.begin(9600);

 pinMode(LED1, OUTPUT);
 pinMode(LED2, OUTPUT);
 pinMode(LED3, OUTPUT);

 delay(1500);
}

void loop()
void onLight1Change()
 { if (light1 == 1)

 {
  digitalWrite(LED1, HIGH);
 }
  if (light2 == 1)
  {
   digitalWrite(LED2, HIGH);
  }

  if (light3 == 1)
  {
   digitalWrite(LED3, HIGH);
  }
  else
  {
   digitalWrite(LED1, LOW);
   digitalWrite(LED2, LOW);
   digitalWrite(LED3, LOW);

  }
}
```