M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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ISO 9001:2015 & ISO 14001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

On

IOT BASED HOME APPLIANCES CONTROLLER

Submitted in partial fulfilment of requirements for the award of the

Degree of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

Under the guidance of

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M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this project report " IOT BASED HOME APPLIANCES CONTROLLER" is the bonafide work of "MIDHUN.R(927621BEC120), KAVINESH. A.S(927621BEC081), BALAKUMAR.A(927621BEC302), MOHAMED ANAS. S (927621BEC121)" who carried out the project work under my supervision in the academic year 2022-2023.

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This project report has been submitted for the **18ECP103L - Minor Project I** Viva Voce Examination held at M.Kumarasamy College of Engineering, Karur on _____

PROJECT COORDINATOR

Vision and Mission of the Institute and Department

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

- Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

Department of Electronics and Communication Engineering

Vision of the Department

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission of the Department

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives (PEOs):

PEO1: Core Competence: Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering.

PEO2: Professionalism: Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: Lifelong Learning: Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

PROGRAM OUTCOMES(PO'S)

Program Outcomes (POs):

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

MAPPING OF PROJET WITH POs AND PSO

Abstract	**Matching with POs, PSOs**
IOT Based Home Appliances Controller	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2

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ABSTRACT

Due to the rapid development in the field of the Automation industry, human life is becoming more advanced and better in all aspects. Home automation is based on multimodal application that can be operated using voice recognition command of the user using the Google Assistant or through a web-based application. Thus, main objective of this work is to make our home automation system more secure and intelligent. In the present scenario, Automated systems are being preferred over the non-automated system. The access to the whole system is given by its admin only to different users. The proposed system consists of a hardware interface and software interface. In the hardware interface, the integration of ESP8266 Wi-Fi technology for controlling home appliances and sensors is manifested, and an application is provided for controlling to multiple users of home, with smart phones, tablets, and laptops. This system is also expandable for controlling various appliances used at home and also for the security and safety purpose of the home through sensors as long as it exists on Wi-Fi network coverage. This system is one of the best methods for controlling home devices with ease with multiple users and one of the best methods for an energy management system. With the rapid growth in the number of consumers using the internet over the past years, the Internet has become an important part of life, and IoT is the newest and emerging internet technology. Internet of things plays an important role in human life as well as in the educational field because they are able to provide information and complete the given tasks while we are busy doing some other work.

1.INTRODUCTION

Due to the rapid development in the field of the Automation industry, human life is becoming more advanced and better in all aspects. In the present scenario, Automated systems are being preferred over the non-automated system. With the rapid growth in the number of consumers using the internet over the past years, the Internet has become an important part of life, and IoT is the newest and emerging internet technology. Internet of things plays an important role in human life as well as in the educational field because they are able to provide information and complete the given tasks while we are busy doing some other work. The proposed system consists of a hardware interface and software interface. In the hardware interface, the integration of ESP8266 Wi-Fi technology for controlling home appliances and sensors is manifested, and an application is provided for controlling to multiple users of home, with smart phones, tablets, and laptops. This system is one of the best methods for controlling home devices with ease with multiple users and one of the best methods for an energy management system. The access to the whole system is given by its admin only to different users. This system is also expandable for controlling various appliances used at home and also for the security and safety purpose of the home through sensors as long as it exists on Wi-Fi network coverage. Home automation is based on multimodal application that can be operated using voice recognition command of the user using the Google Assistant or through a web-based application. Thus, main objective of this work is to make our home automation system more secure and intelligent.

2.LITERATURE SURVEY

In this system user send signal to IOT board by using an android application and a WIFI module connected to that IOT board receives these signals and further sent to IOT for controlling of smart appliances using relay board. IOT device is used as the controlling hub for this system. To perform the operations" ON" and "OFF" we use the relays. This system is use full for the peoples who could not move frequently from one place to another for the controlling of home appliances. A Survey on an Efficient IOT Based Smart Home proposes an efficient implementation for IoT for monitoring and automation system and it uses the portable devices as a user interface. Portable devices can communicate with home automation network through an Internet gate, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling home appliances via Smartphone using Wi-Fi as communication protocol and Arduino uno. The user here will move directly with the system through a web-based interface over the web whereas home appliances like lights, fan etc. are remotely controlled through easy website.

3.METHODOLOGY

The proposed system consists of a hardware interface and software interface. In the hardware interface, the integration of ESP8266 Wi-Fi technology for controlling home appliances and sensors is manifested, and an application is provided for controlling to multiple users of home, with smart phones, tablets, and laptops. The main objective of this study was to develop an Internet of Things (IoT) based such as turning on and off the home appliances so that they can live independently. The proposed solution is an embedded scheme that support physically challenged elderly with controlled automation that control and operates various home electrical appliances such as lights, fans and televisions based on the measurement of pulse rate and instructions – assuming that the individual is in awake or sleep condition. The limitation of this proposed system is limited into certain age group individuals with range of heartbeat rate. WIFI is used to set up wireless communication between the cell phone and the IOT board. The IOT application is developing to provide a convenient graphical user interface for remote control on any device. Even if WIFI are not connected, it can control through the Remote controller, and even if the remote is also misplaced, it is always fixing to the wall; hence it will not be possible to lose because it is internally connected through wires. If the end-user desires any changes, it will provide much more freedom and easier access. This design platform has been developing to automatically build a system for all home appliances operations remotely and manually. It can control and monitors various devices such as Light, Fan, TV, AC, Window Curtains from anywhere such as home, building, or office. At home, handicapped, elders, sick people, or kids can also control them through various controllers like Capacitive Touch Sensor, Bluetooth, Keypad, Pushbutton, Remote, or WIFI.

3.1BLOCK DIAGRAM

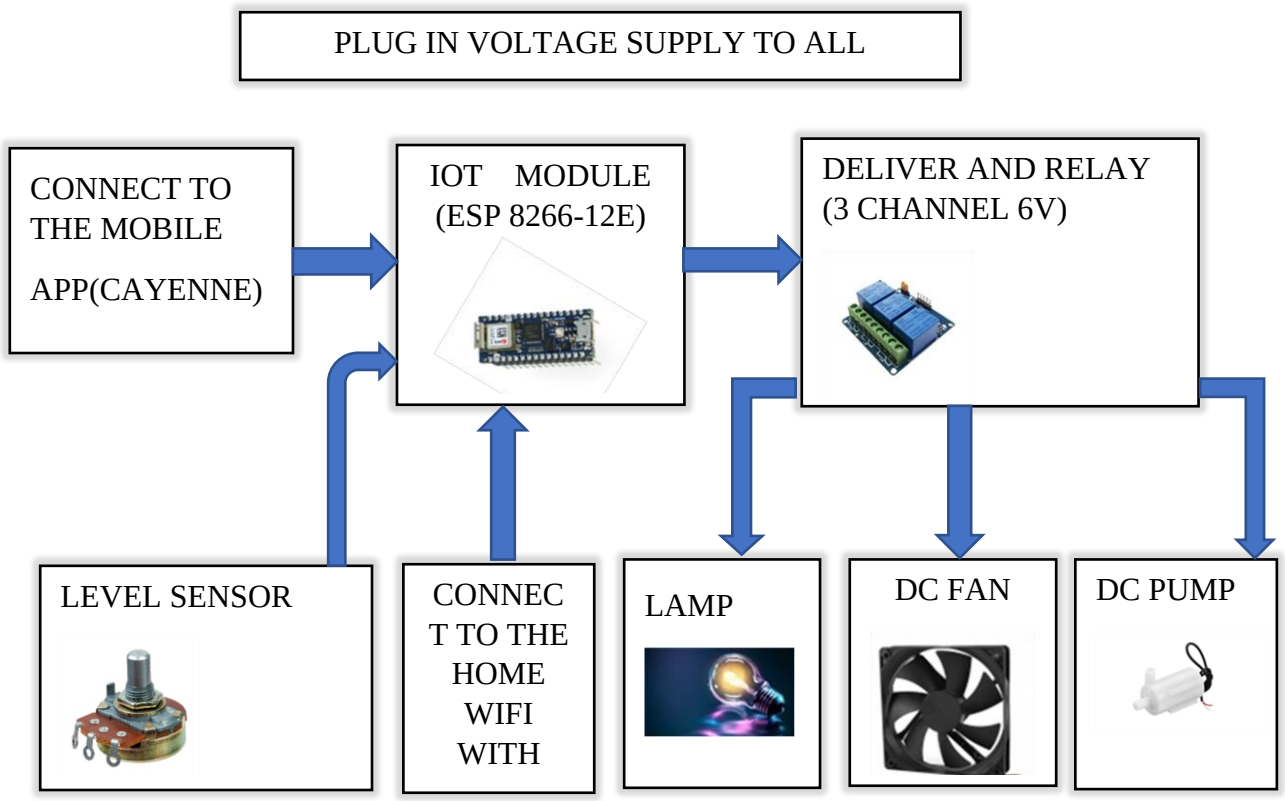

Fig. 3.1 Block Diagram of Proposed Method

4.TOOLS USED

HARDWARE REQUIREMENT

- POWER SUPPLY COMPONENT AND TRANSFORMER
- IOT MODULE (ESP 8266-12E) NODE MCU
- LEVEL SENSOR
- DRIVER AND RELAY BOARD
- LAMP LOAD
- DC FAN
- WATER PUMP

SOFTWARE REQUIREMENT

- SKETCH IDE – IOT MODULE PROGRAMMIN SOFTWARE
- EMBEDDED C – PROGRAMMING LANGUAGE

4.1POWER SUPPLY

The operation of power supply circuits built using filters, rectifiers and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, then filtering to a DC level, and finally regulating to obtain a desired fixed DC voltage. The regulation is usually obtained from an IC voltage regulator unit, which remain the same if the input DC voltage varies or the output load connected to DC voltage changes. A diode rectifier that provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. A regulated circuit can use this DC inputs to provide a DC voltage that not only has much less ripple voltage but also remains the same DC value even if the input DC voltage varies somewhat or the load connected to the output DC voltage changes this voltage regulation is usually obtained using one of a number of popular voltage regulation IC unit. In this circuit 230v AC is given as input to the primary windings of the transformer, which step-down's the 230v into 12v Ac supply. Then the 12v Ac supply is converted into the 12v dc supply using bridge rectifier.1000uf capacitor is used to change the pulsating dc into pure dc. 5v dc output is taken from the voltage Regulator-7805, which consists of 3 pins. First pin is given input 12v dc and center pin given ground supply, output 5v dc is taken from the third pin.

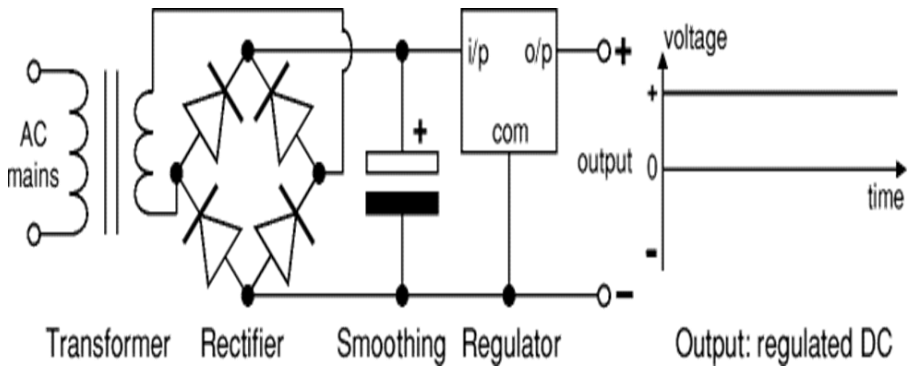

Fig. 4.1 Power Supply

4.2 IOT MODULE (ESP 8266-12E) NODE MCU

Node MCU is an open source IoT platform. Its operating voltage is 5v dc supply. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif if Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the ELUA project, and built on the Espressif Non-OS SDK for ESP8266. In our Project IOT is used to monitor the agricultural Land parameters (soil quality and water level) from far distance or from anywhere. We can control all the home appliances by using IOT module from remote places likewise programmed for the NODE MCU which consists of inbuild WIFI Shield, and transmitted to the Cayenne Server which works on the MQTT protocol. Wi-Fi controller board Node MCU has a 32-bit Tensilica Xtensa LX106 core clocked at 8 MHz's It is a self-contained Wi-Fi networking solution that acts as a bridge between existing microcontrollers to Wi-Fi and is capable of running self-contained applications. Node MCU can easily connect to components, such as sensors and actuators, through its integrated built-in 20 kb of RAM, 10 GPIOs, 4 megabytes of on-board storage, and TCP/IP. A built-in USB connector links to the computer using a USB cable to upload the codes, which is similar to other development boards available in the market, such as Arduino and Raspberry Pi. Compared with Arduino UNO, Node MCU has many other good features, such as low cost, simplicity, smartness, a built-in power regulator, and a powerful processor.

4.3ULN 2003

Loads are controlled (switched ON or OFF) using microcontroller block. But, for this purpose the circuit requires relays, acting as controlled switches (for different circuits different types of relays are used). Depending on the signals received from the microcontroller or other control circuits the relay controls the load. The relay consists of continuous power supply and whenever it gets driven or gets control signal then the relay gets activated and loads can be turned ON or OFF. The ULN2003A/L and ULN2023A/L have series input resistors selected for operation directly with 5 V TTL or CMOS. The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-

cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA.

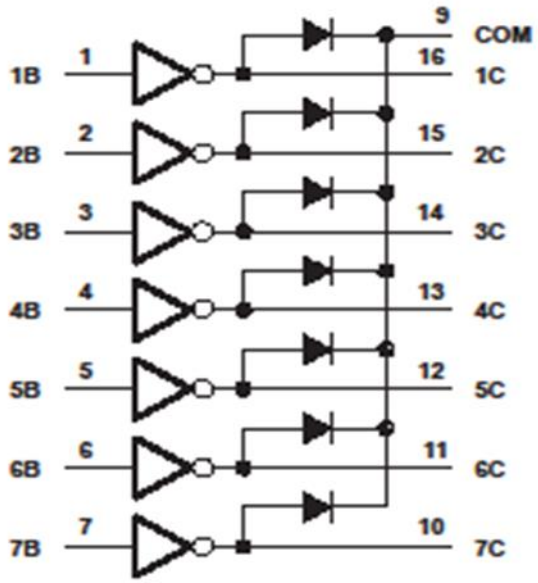

Fig. 4.3 ULN 2003

4.4 RELAY

A relay is an electro-magnetic switch which is useful to switch a low voltage to switch on and off a light bulb (or anything else) connected to the 220v mains supply. Relay and pump motors operating voltage is 12v dc supply. Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relays are available in various configurations of operating voltages like 6V, 9V, 12V, 24V and so on. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF. The red colour wire denotes the + VE supply, black colour wire denotes the – VE supply in the diagram. NO is directly supplied with 12

volt dc supply and NC is connected with –VE supply (GND).The current needed to operate the relay coil is more than can be supplied by most chips (op. amps Etc), so a transistor is usually needed. In our project we use relay driver to switch the pumps and motors. Pump and motors operates on 12v dc, but the output of the IOT module will be 5v dc. So to switch the lamp, fan and water heater using that low voltage dc, relay driver is used.

5. SOFTWARE REQUIRMENT

5.1 SKETCH IDE – IOT MODULE PROGRAMMING SOFTWARE

Arduino IDE is an application that is used to write codes and uploads them to the Node MCU board. In this project, Arduino IDE is used for coding, debugging, and testing the functionalities of the IoT smart Home Automation system and its components. Arduino IDE has other features, such as a debugging area in case of abnormal conditions to support various Arduino boards, additional libraries, and a serial monitor for communicating with the board. Arduino libraries are usually expressed as dot CPP files based on software abstraction called wiring. Wiring allows the easy control of hardware ports through simple functions without consulting data sheets and being delayed in pin mapping. Arduino uses the bits of C and C++, but the general flow and structure of the code are heavily based around C.

5.2 IOT MODULE (Node MCU ESP8266 -12E)

Node MCU is an open source IoT platform. Its operating voltage is 5v dc supply. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the ELUA project, and built on the Espressif Non-OS SDK for ESP8266. In our Project IOT is used to monitor the agricultural Land parameters (soil quality and water level) from far distance or from anywhere. We can control all the home appliances by using IOT module from remote places likewise programmed for the NODE MCU which consists of inbuild WIFI Shield, and transmitted to the Cayenne Server which works on the MQTT protocol. WIFI controller board Node MCU has a 32-bit Tensilica Xtensa LX106 core clocked at 8 MHz's It is a self-contained Wi-Fi networking solution that acts as a bridge between existing microcontrollers to Wi-Fi and is capable of running self-contained applications. Node MCU can easily connect to components, such as sensors and actuators, through its integrated built-in 20 kb of RAM, 10 GPIOs, 4 megabytes of on-board storage, and TCP/IP. A built-in USB connector links to the computer using a USB cable to upload the codes, which is similar to other development boards available in the market, such as Arduino and Raspberry Pi. Compared with

Arduino UNO, Node MCU has many other good features, such as low cost, simplicity, smartness, a built-in power regulator, and a powerful processor.

6. EXPERIMENT PROCESS

Human-machine interaction (HMI) has become, the more realistic in day-to-day life due to the advancement in the technology. Aim of this application is to connect any things through the Internet that can be accessible from anywhere. IoT application are not limited to one particular field.

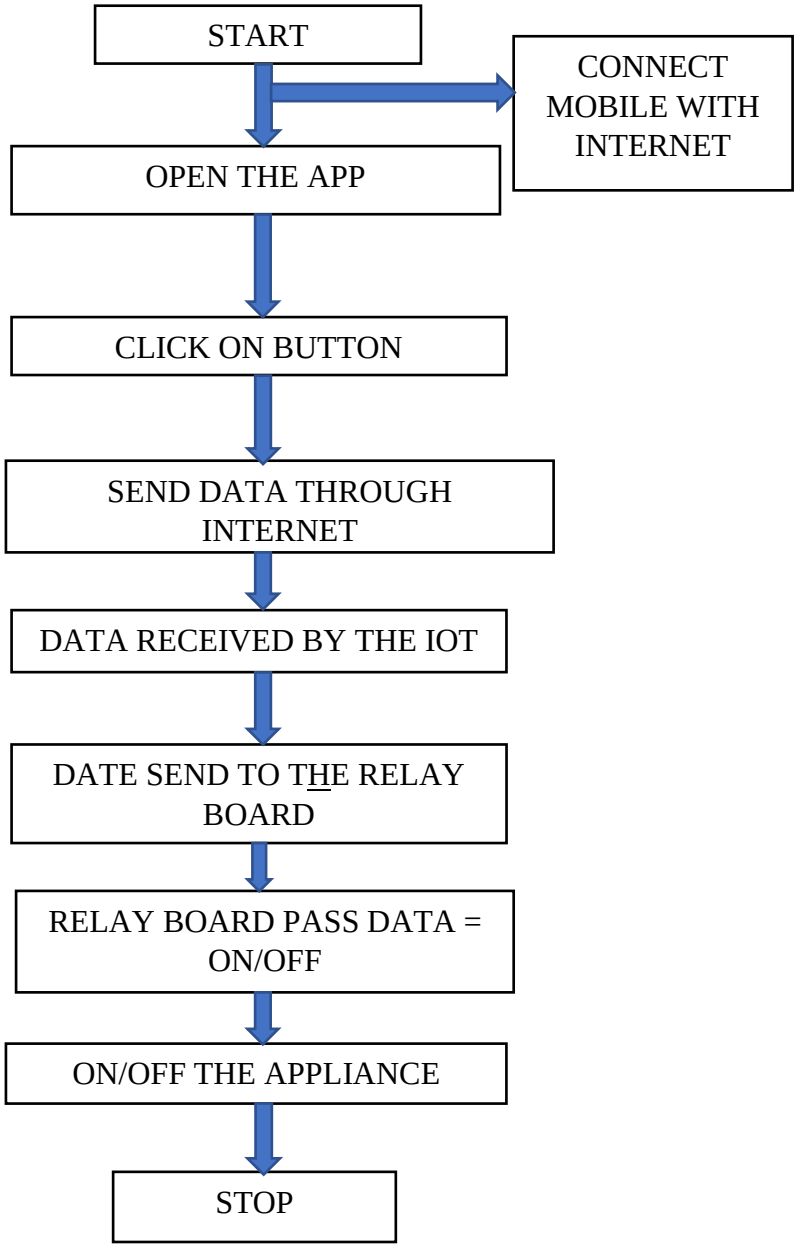

Fig. 6.1 Experiment Process

7. RESULT AND DISCUSSION

Smart home technology allows homeowners to control smart devices with a cellphone or other networked device, providing security, comfort, flexibility, and cost savings. Smart home systems and devices that are parts of the Internet of Things (IOT) often collaborate, sharing customer use data and automated actions based on the choices of the residents. Smart TVs utilize the internet to access applications that provide information like as on movies and music. On certain smart TVs, speech and gesture recognition is also available. Smarter light fixtures, like Phillips Light Holding B.V.'s Aura, can sense when people are present and adjust lighting accordingly, as well as be controlled remotely and Customised. The brightness of clever light bulbs may also be adjusted based on the quantity of daylight available. Smart thermometers with built-in Wi-Fi, like as the Nest from Nest Labs Inc., allow users to control, monitor, and manage home temperatures remotely. These devices also learn from the behaviors of their users and modify settings automatically to provide the best possible comfort and efficiency to their occupants. Smart thermostats may also measure energy use and alert users when filters need to be replaced, among other things. Users may allow or restrict entrance to guests using Garage door openers and smart locks when residents approach, smart locks detect their presence and automatically open the doors. Smart security cameras allow residents to keeping an eye on their homes when they are away or on vacation. Modern motion sensors can tell the difference among residents, visitors, pets, and burglars, and can inform authorities if they notice strange behavior. Pet care might be mechanized with networked feeds. The usage of connected timers may be used to water houseplants and lawns. Smart coffee maker which can brew you a fresh cup as soon as your alarms sets off; smart refrigerators that keeps track of expiration dates, prepare shop lists, and even design recipes based on ingredients already on hand; slowed cooks and toasters; and laundry washers and dryers are also available.

8. CONCLUSION

IOT based Home Automation is a very different concept than what is presently available in the market. This would make automation easier and more intuitive. The people will be able to interact with the system anywhere across the world. It also is an important aspect in the present world where people are so busy, this would help them in easing the basic functionality of their life. The world around us is going digital in every aspect we can imagine and it is happening fast, we also need to move forward with it. Our system is a great initiative step in automation, it would also provide security in the near future. As it is based on IOT we can assign access to our electronic devices being anywhere across the world. The following are the features of our system. IoT technology has great impact in everyone's everyday life. This survey describes various methodologies used in home automation system to control and access the home appliances remotely through Internet services anywhere anytime. Several unlock issues related to privacy and security needs to be focused for future Internet of Things. Securing data, data management and privacy of every user plays a key role in the challenges of Internet of Things.

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