

# HOME AUTOMATION USING IOT

A Project report submitted in partial fulfilment of the requirements for the award of the degree of

***BACHELOR'S OF TECHNOLOGY***

in

***Computer Science and Engineering***

by

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# BONAFIDE CERTIFICATE

This is to certify that the project report entitled “**HOME AUTOMATION USING IOT**” submitted by **AMAN** bearing the **MIS No:112015011**, in completion of his project work under the guidance of **NAGENDRA SIR** is accepted for the project report submission in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Science and Engineering in the Department of Computer Science and Engineering , Indian Institute of Information Technology, Pune, during the academic year 2020-22.

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## Abstract

—In order to help maintain comfortable living conditions within a home, home monitoring and automation are utilized. The standards of human's comfort in homes can be categorized into several types. Among these categories, the most significant ones are the thermal comfort, which is related to temperature and humidity, followed by the visual comfort, related to colors and light, and hygienic comfort, associated with air quality. A system can be set to monitor these parameters to help maintain them within an acceptable range. Additionally, making the house smart is to allow for intelligent automatic executing of several commands after analyzing the collected data. Automation can be accomplished by using the Internet of Things (IoT). This gives the inhabitant accesses to certain data in the house and the ability to control some parameters remotely. This paper presents the complete design of an IoT based sensing and monitoring system for smart home automation. The proposed design uses the EmonCMS platform for collecting and visualizing monitored data and remote controlling of home appliances and devices. The selected platform is very flexible and user-friendly. The sensing of different variables inside the house is conducted using the NodeMCU-ESP8266 microcontroller board, which allows realtime data sensing, processing and uploading/downloading to/from the EmonCMS cloud server. .

**Keywords :** IoT (Internet of Things), Home Automation System, Sensors Nodes, EMONCMS, Smart Home

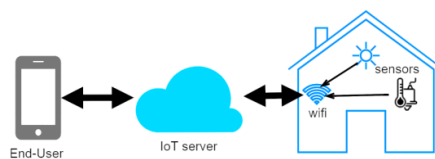
# TABLE OF CONTENTS

<b>Abstract</b>	<b>i</b>
<b>List of Figures</b>	<b>1</b>
<b>List of Tables</b>	<b>1</b>
<b>1 Introduction</b>	<b>1</b>
<b>2 Motivation</b>	<b>2</b>
<b>3 Literature Review</b>	<b>4</b>
<b>4 Methodology</b>	<b>8</b>
<b>5 Results and Discussion</b>	<b>16</b>
<b>6 Conclusion and Future Work</b>	<b>18</b>
<b>7 References</b>	<b>20</b>

# Chapter 1

## Introduction

Developing energy efficiency and renewable energy technologies is becoming a priority and increasing the interest for many countries around the world. Universities have been involved in this technological development through student competitions, which aim at enhancing student awareness. Solar Decathlon is one these competitions which have been running in the United States and other countries around the world. The Solar Decathlon Middle East (SDME) is a newly established competition in the Middle East region that is intended to take place in Dubai in 2018. Qatar University's entry to the SDME 2018 competition has enabled it to form a multidisciplinary of students who will collaborate in the design and construction of a green, smart, portable and affordable solar house. An energy efficient house that is fully monitored and automated using the internet of things (IoT) technologies. The increase in the popularity of IoT has widely spread to simple in-home applications and everyday tasks. The employment of IoT in homes is for the purpose of energy monitoring and saving while achieving and maintaining a certain level of comfort. Home automation systems using IoT consists of three major parts as shown in Fig. 1. The first part is the sensing and data acquisition part. This is done by placing sensors or devices, also called things, at several locations throughout the home to measure and gather desired information such as temperature, humidity, or lux.



# Chapter 2

## Motivation

### 2.0.1 Objective

The main objective of this project is to build a smart home device which can be used to control the home appliances via internet. The home automation device that you build can be integrated with almost all the home appliances and can be used to control them remotely from any part of the world.

To facilitate the wireless connectivity with the system, the Arduino Uno , NODEMCU will be embedded with a WiFi module. This establishes the internet connection to the system and all the home appliances can in turn be connected and controlled by internet.

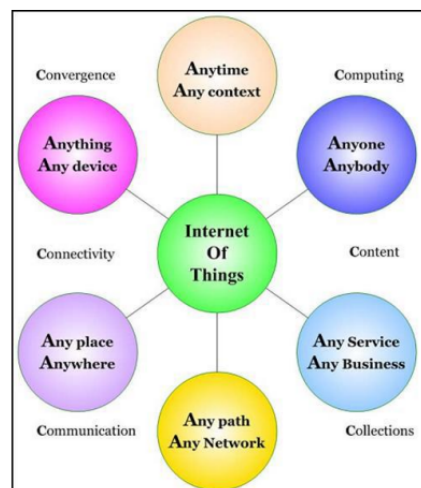


Figure:1. Objective of IOT

### **2.0.2 Motivation**

To enhance the standard of living, the appliances need to be wholly automated without any user intervention in any form whatsoever. This enables the end user hassle-free interaction with the appliances as the appliances learn and react as per the user's requirements without him physically pressing a button. Home computerization brings about a more astute home and is utilized to give a higher and more beneficial way of life. The magnificence of a home computerization framework is that it is very versatile, adaptable and its abilities are constrained just by our creative ability. With the IOT unrest practically around the bend, it's about time that we move towards boundless selection of such a prototype.



# Chapter 3

## Literature Review

### 3.0.1 Literature Review

Door Automation system for smart Home Implementation: In this paper is presented the design and the prototype implementation of a pneumatic door automation system intended to be used for access control in smart homes. The structure of the developed application is realized around the PIC 16F877A microcontroller which operates together with a pneumatic actuator based on a double acting cylinder controlled through an air distributor with solenoid valve. In the basic mode, the door opening and closing actions can be initiated manually by the user, through password authentication. The main parameters of the system can be configured locally, but an indepth diagnoses and reconfiguration can be performed only through the serial interface which ensure the communication between the main module of the system and an external PC. Compared with other similar systems, the proposed implementation solution allows a high operation speed and very good reliability due to the pneumatic actuation. In addition, the door automation module can be integrated in a centralized access control system dedicated to the smart homes that has all the appliances and other electricity based equipments connected into a local network. The door automation module presented in this paper can be integrated in any centralized access control system dedicated to the smart homes.

Equipment for power line communication based on single carrier system for Home Automation System: Systems for more automation into buildings (home, workplace or industrial) are in terms of communications primarily solved systems with external lines or wireless systems. Installing an external line may require greater intervention in parts

of building. In the case that such intervention is not allowed and place of deploying, or part thereof is ineligible for wireless coverage, is the possibility of using data communication over the power-line for this communication section. The transmission channel thus forming copper lines of the built-in infrastructure of power-line. This paper describes prototype of smart-home system with intelligent features with manufactured devices.

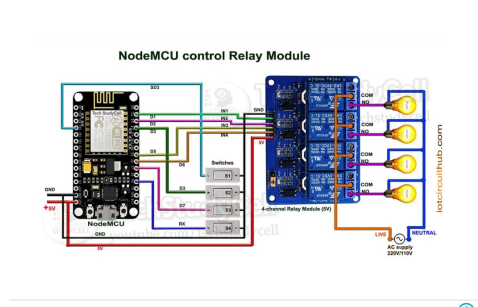
**Solar Assisted Advanced Smart Home Automation:** This paper proposes design and implementation of smart home automation using solar power. Solar Power has been interfaced with microcontroller and other house hold appliances. All these appliances can be controlled by the user with only one tap on mobile phone and wastage of energy can be curbed. Hence, an intelligent and smart control unit has been built with low energy consumption. The novelty of this work is development of a password oriented and a solar assisted smart home automation system. PROTEUS software has been used for simulation. The proposed technique has been implemented on hardware model and tested to control the loads with a wireless telephone.

**A Safe approach using Virtual Devices to evaluate Home Automation Architecture prior installations:** This paper presents a solution based on virtual devices to evaluate home automation architectures without the need of deploying the corresponding physical devices. Our approach is focused on the specific situation of improving an existing installation, which consists of these steps: virtualize the installation and generates a software architecture, include the new elements as virtual devices, evaluate the behavior of the whole architecture, test the new components with the physical installation, and incorporate the new devices to the installation. The approach is validated using a case study of a real installation that must be updated.

.

**Smart Home Automation with a unique door monitoring system for old age people** using python, opencv, Android, RasperryPi, NODEMCU

Overview :-



: In this paper, smart home automation system particularly for old age people is proposed based on python, OpenCV, raspberry pi and android application. The appliances are controlled by the Raspberry pi server, which operates according to the user command (touch or voice) received from the mobile phone. A unique door monitoring system is designed based on face detection and recognition from a camera installed outside the main door, which can be accessed from the phone using android application. One interesting feature that has been added is that, all the appliances can also be controlled through the voice of user. For energy efficiency user can analyze the usage of each appliance from their phone. Moreover, user can also control the intensity of light as well as the speed of the fan. With all this features incorporated in a single system with good and simple user interface, this system is cost effective and perfect for old age people living alone in their houses. Smart Home Automation using Internet of Things: This paper describes the use of various open source hardware such as Arduino, Raspberry Pi, etc. to build smart and secure homes. The hardware is open source and hence cost efficient. This home automation system allows the end user to monitor his home or office with a smartphone, tablet, or any computer. This paper also explains the use of the security system for fire hazards that may occur due to a gas leakage and can be detected using a smoke sensor. It uses a low power NRF24L transceiver at each node around the house to create a mesh network that connects to a Linux based central hub. Users can monitor the house from anywhere and get periodic alerts. In the proposed work, the house can also be controlled using voice commands to Alexa , GOOGLE Assistant.

Bluetooth based Home Automation system using cell phone: This paper presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a stand- alone Arduino BT board and

the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorised users from accessing the appliances at home.

Design and Implementation of an Automated security system using Twilio Messaging service: This paper focuses on designing and developing a model of an IOT-Based security system for homes, banks and offices in need of security. The proposed system has provision for theft and fire detection and sends alerts to the user through a text message. It also captures a number of snapshots of the intruder and mails it to the user. This system also consumes less power as the camera is activated and takes snapshots only in the presence of an intruder, unlike the CCTV system, where live feed is recorded round the clock. This system not only notifies the user but also the neighbour so that immediate action could be taken.

# Chapter 4

## Methodology

### 4.0.1 Methodology

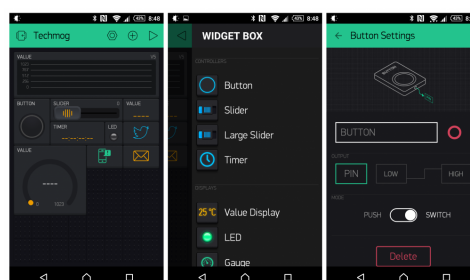
In this working framework, the locally situated keen Automation framework which assesses the improvement of a Low-cost security framework utilizing Motion sensor and IOT. the human development is distinguished utilizing the Motion sensors. This very receptive approach has low computational necessity. Accordingly it is appropriate for home robotization framework. Every one of the items with a temperature above supreme zero discharge warm vitality as radiation. Typically this radiation is not unmistakable by human eye since it emanates at infrared wavelengths, yet in this infrared can be identified by electronic gadgets intended for identifying the human development. The Distance Sensor has a scope of around 20 feet (6 meters). The sensor is intended to distinguish the gradually changing conditions that would happen typically as the everyday advances and the ecological condition changes, yet it reacts by rolling out its yield when sudden improvements happen, for example, when there is movement. This gadget is composed essentially for indoor utilize. Operation outside or in high temperatures may influence security adversely. Because of the high affectability of Distance sensor gadget, it is not prescribed to utilize the some condition like quick ecological changes and solid stun or vibration and furthermore in not working in coordinate daylight or direct breeze from a warmer or aerate and cool. Home/office security frameworks have developed in prominence as of late, a home/office proprietor's search for approaches to ensure their own space and upgrade their home estimations. It is fundamental for each mortgage holder to considering including a home security framework, as robberies, burglaries and homi-

cides have turned out to be normal in enormous urban communities. Separation sensor are minimal effort security framework for home applications in which Distance sensor has been actualized to detect the movement of human through the location of infrared radiation from that human body. Separation sensor gadget does not emanate an infrared radiation but rather inactively acknowledges approaching infrared radiation. Distance sensor see the nearness of human in the home and produces flag which is perused by the Arduino. As indicated by the flag gotten by Arduino, a call is recognized to portable station through an Internet and in this way caution the nearness of human in the home to proprietor occupier.

The arranged framework could be a circulated home robotization framework, comprises of server, sensors. Server controls and screens the differed sensors, and might be basically intended to deal with extra equipment interface module (sensors). The Intel space expert improvement board, with in-manufactured neighborhood card port to that the cardboard is embedded, goes about as web server. Mechanization System will be gotten to from the net program of any local PC inside the same localareanetwork abuse server science, or remotely from any PC or versatile hand-held deviceconnect-edto thenet with worthy applicationsprogrammer throughserverreal science (internetIP). Localareanetwork innovation is been the system foundation that associates server and furthermore the sensors. Localareanetwork ischosen toenhance framework security (by abuse secure neighborhood connection),and to xtend framework quality and adaptability

#### Configuring Blynk APP:

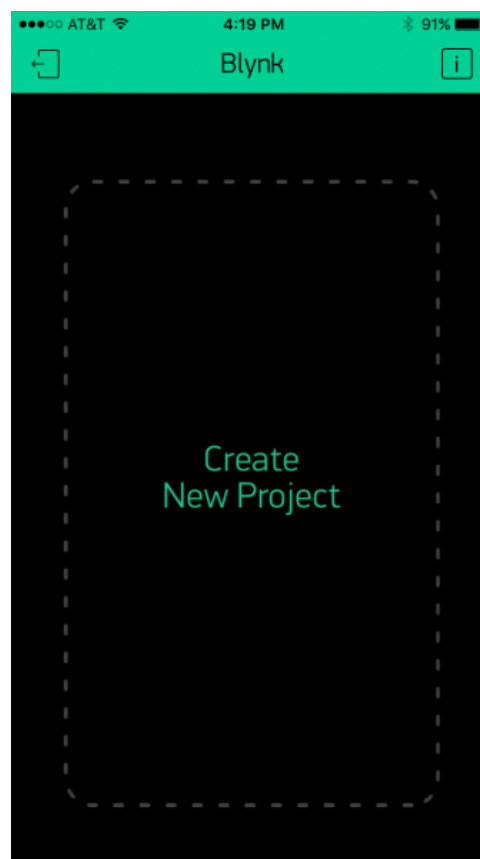
The Blynk app is available for both iOS and Android devices. Click one of the buttons below to get started downloading the app:



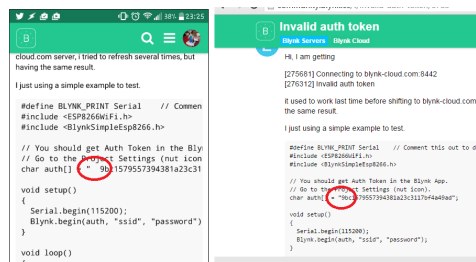
After downloading the app, create an account and log in. Welcome to Blynk!



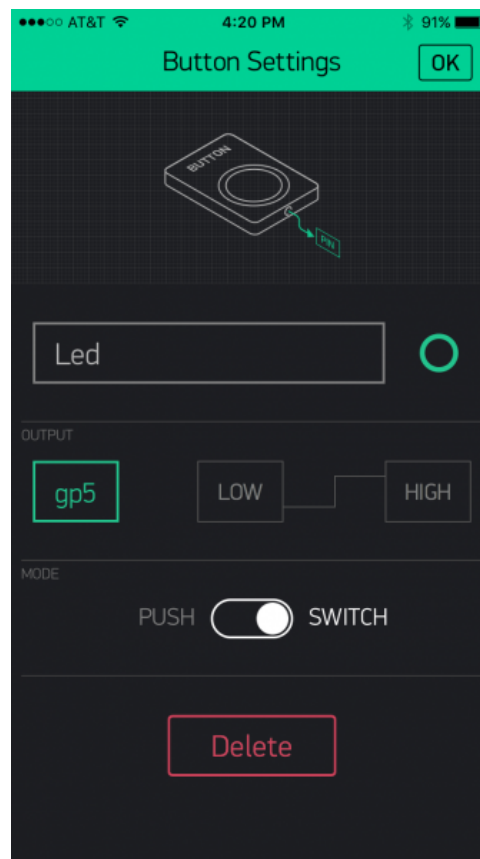
You'll also need to install the Blynk Arduino Library, which helps generate the firmware running on your ESP8266. Download the latest release from Blynk's GitHub repo, and follow along with the directions there to install the required libraries. Create a Blynk Project Next, click the "Create New Project" in the app to create a new Blynk app. Give it any name you please, just make sure the "Hardware Model" is set to ESP8266.



The Auth Token is very important – you'll need to stick it into your ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to yourself.



Add Widgets to the Project Then you'll be presented with a blank new project. To open the widget box, click in the project window to open.



Add a Button, then click on it to change its settings. Buttons can toggle outputs on the ESP8266. Set the button's output to gp5, which is tied to an LED on the Thing Dev Board. You may also want to change the action to "Switch."

Upload the Blynk Firmware Now that your Blynk project is set up, open Arduino and navigate to the ESP8266Standalone example in the File  $\downarrow$  Examples  $\downarrow$  Blynk  $\downarrow$  Board-SAndShields menu.

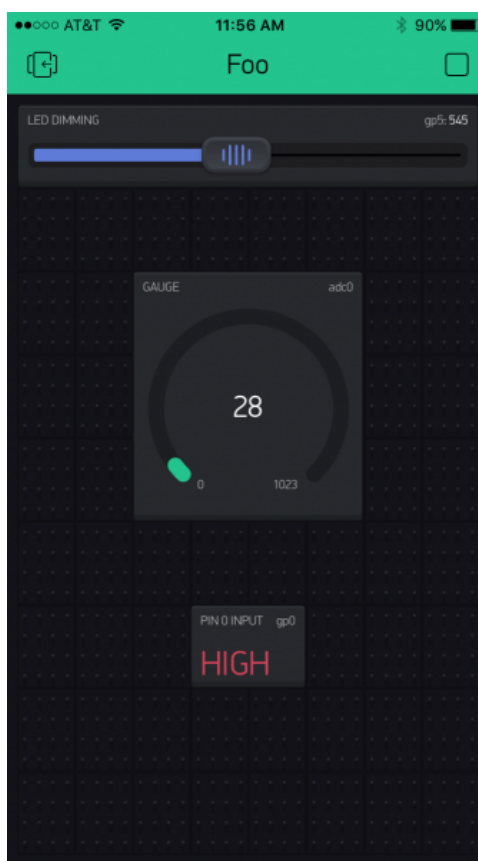
Before uploading, make sure to paste your authorization token into the auth[] variable. Also make sure to load your WiFi network settings into the Blynk.begin(auth,



"ssid", "pass") function.

Then upload!

Run the Project After the app has uploaded, open the serial monitor, setting the baud rate to 9600. Wait for the "Ready (ping: xms)." message.

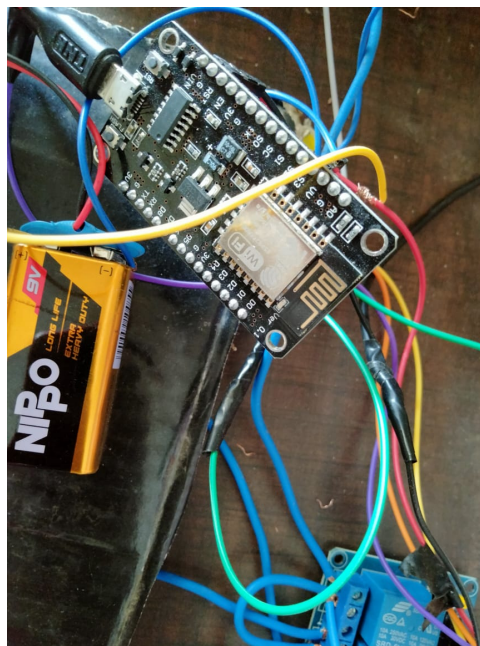


NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name “NodeMCU” combines “node” and “MCU” (micro-controller unit). The term “NodeMCU” strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. Nodemcu ESP8266 and Nodemcu ESP32 are becoming very popular and are almost used in more than 50 perc. IoT based projects today.

The firmware uses the Lua scripting language. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs.

Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

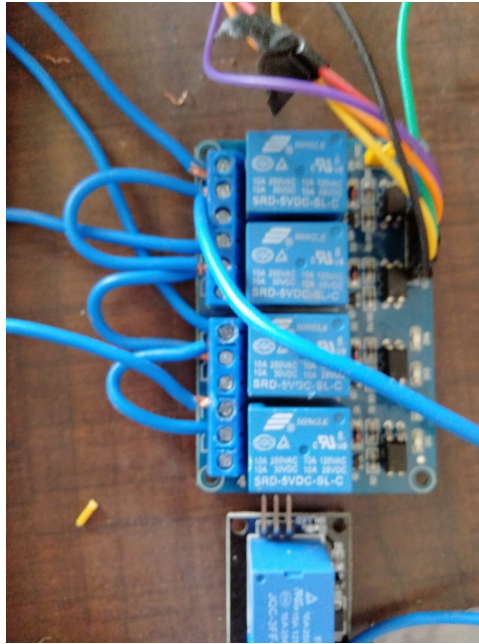


A relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins.

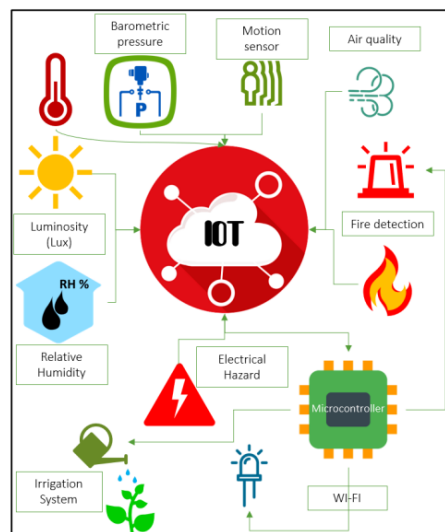
Controlling a relay module with the Arduino is as simple as controlling any other output as we'll see later on.

relay-module

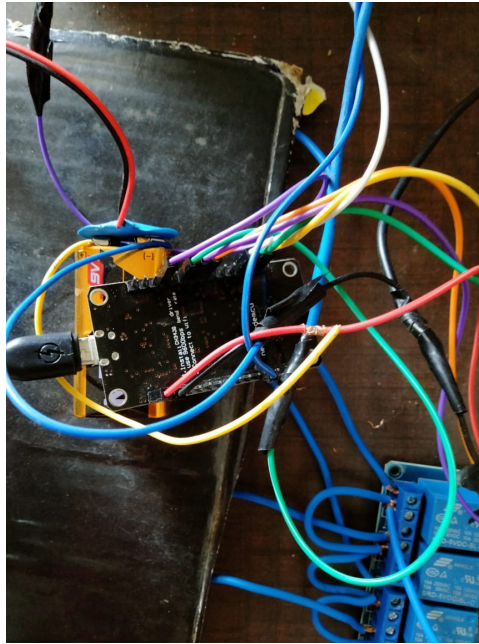
This relay module has two channels (those blue cubes). There are other models with one, four and eight channels. This module should be powered with 5V, which is appropriate to use with an Arduino. There are other relay modules that are powered using 3.3V, which is ideal for ESP32, ESP8266, and other microcontrollers.



system :



connections and wiring



# Chapter 5

## Results and Discussion

### 5.0.1 Results and Discussion

S.No Title Technology Limitations

1. Door Automation system for smart Home Implementation. Pneumatic Control. HAS suffers a certain lack of accessibility .

2. Equipment for power line communication based on single carrier system for Home Automation system. Combination of Wireless and PLC Technology. Advanced measurement series is not available.

3. Power Meter Monitoring for home appliances based on mobile data communication. Current kWh Meter Technology.

4. Design and Implementation of an Automated security system using Twilio Messaging service. Internet of Things. Can't develop for face recognition to restrict access to the enclosed area.

5. Solar Assisted Advanced smart home automation. Smart home automation using solar power, PROTEUS software. Cost Effective.

6. A safe approach using Virtual Devices to evaluate Home Automation Architecture prior Web Technology and Internet of Things. High cost.

7. Smart Home Automation with a unique door monitoring system for old age people using python, opencv, Android, Rasperryypi. GSM/Zigbee module. This system is not to predict Energy utilization in the household.

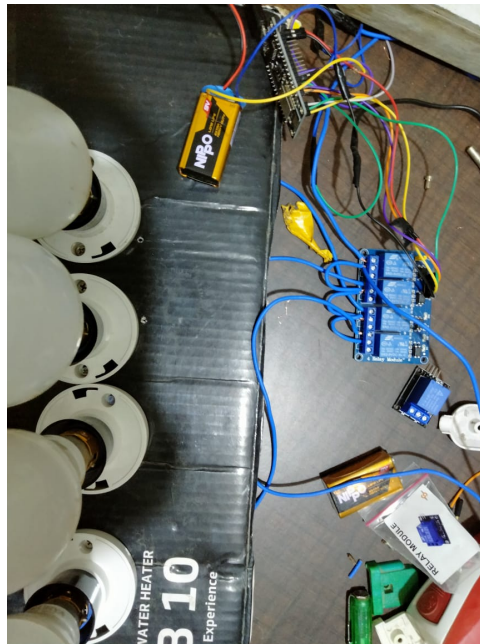
8. Bluetooth based Home Automation system using cell phone. Bluetooth Technology. Cost is not flexible.

9. Eyrie Smart Home Automation using Internet of Things. Internet of Things. Cost

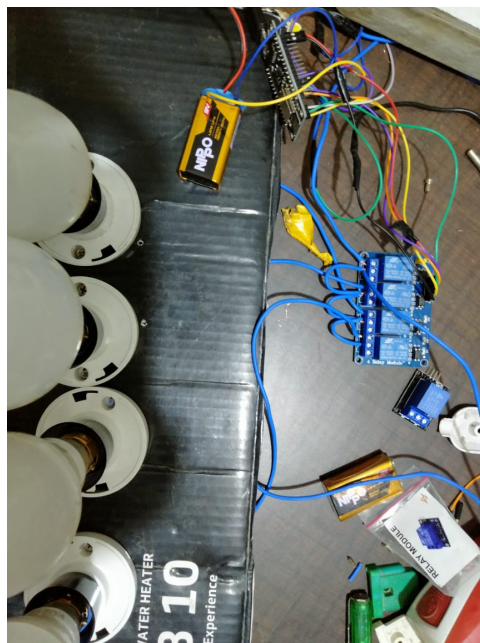
efficient.

10. Embedded System for Home Automation using SMS. Global System for Mobile Communication (GSM). This system is not developed the audio or voice based remote home.

top



final view



# Chapter 6

## Conclusion and Future Work

### 6.0.1 Conclusion and Future Work

According to this survey, we understand that existing system has some problems and requires some of resources that cause system costly. Systems working on different environments and different resources causes user to adjust with the system. It is not as much popular in Asian countries, to increase the scope of these systems needs to be implemented with some user friendly interfaces which will help users and gives more efficient access to system.

The Internet of Things involves an increasing number of smart interconnected devices and sensors (e.g. cameras, biometric and medical sensors) that are often non-intrusive, transparent and invisible. IoT has been bringing new set of technological changes in our daily lives, which in turn helping us to make our life simpler and more comfortable. Though IoT has abundant benefits, there are some flaws in the IoT architecture

and its implementation. So the main observation of the paper is that IoT architecture will probably best be described by a reference model than a single architecture and that there will be many different as yet unknown applications/services that will connect to the IoT applies also to object resolution mechanisms. IoT applications rely on a communication infrastructure for exchanging information so it is important from a public policy point of view to ensure that IoT applications, which include healthcare, energy management, transportation, or any other innovative applications, will benefit from a fair access to this infrastructure.

#### FUTURE WORK

Using this system as a framework, the system can be expanded to include various other options which could include home security features like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disabled people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.



# Chapter 7

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### 7.0.1 References

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