

# **“HOME AUTOMATION USING IOT”**

This project report has been submitted in partial fulfilment of the  
requirement for the Bachelor of Technology degree

In

**Computer Science and Engineering/Information Technology**

By

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# Certificate

## Candidate's Declaration

I hereby declare that all the work that has been presented in this report entitled "HOME AUTOMATION USING IOT" which is in partial fulfilment of the requirements of **Bachelor of Technology degree in Computer Science and Engineering/Information Technology** submitted to the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology Wagnaghat is an absolutely authentic record of our own work which has been carried out over the time period from January 2017 to May 2016 under the supervision and able guidance of **Dr. Vivek Sehgal** (Associate Professor in the Department of Information and Technology).

All the matter that has been embodied in this report has not been submitted, for the award of any other diploma or degree.

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This declaration is to certify that all the above statements made by the candidates are true to the best of our knowledge.

Dr. Vivek Sehgal  
Associate Professor  
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Dated:

## **ACKNOWLEDGEMENT**

We owe our profound and sincere gratitude to our project supervisor and guide Dr. Vivek Sehgal, who showed avid interest and guided us throughout in our project work that has been titled —“HOME AUTOMATION USING IOT” till the culmination of our project by giving us all the requisite information for establishing the project. The project advancement aided us in our research and we were able to know and find out many new things in this domain.

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## **ABSTRACT**

The main and basic intent of our project is to create and develop a system that will render us with a remote control for our home appliances and would also provide us with security against the mishaps that occur when the house host is not present at home. Our project basically deals with the automated control of all the appliances that we use at home with the help of the internet. It is mainly meant to save human energy and the electrical power. Our project has been made with the aid of a controller and a device called raspberry pi. All the appliances are connected with the micro controller and a sensor is connected using a wireless network.

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## **CHAPTER 1 – INTRODUCTION**

## **INTRODUCTION**

Houses in the 21st century are becoming more and even more automated and self-controlled because of the comfort they provide, especially when they are installed inside a private house. A house automation system provides us with resources that would let the customers to access and be in charge of for electric appliances of various kinds. A lot of the active as well as well-established house automated systems have been based on interaction through wires. This will not be a difficulty until and unless the system has been designed properly in advance and has been installed at the time of the production of our building. Also in case of the already existing buildings, implementation costs can go pretty high. On the contrary, Wireless systems have been of a large help for the automation systems. In recent times due to the improvement that has been shown by wireless technologies like cloud networks, Wi-Fi in quite near past, these wireless system have been in use almost everywhere every day.

### **The Internet of Things:**

These days the devices that we are using are becoming smarter and smaller. They are linking comparatively without difficulty, and they are showing up in almost each and every aspect of our daily lives. This new reality that is there in the technology—is known as the Internet of Things—it is all about managing and collecting the huge amount of data that we can get from a rising network of all the tools and sensors, which process all that data, and also share it with all the other inter related things. It is a futuristic technology, but we probably have it with us now— present in smart meters from our utility companies, in the security systems and in the environment control systems in our homes, and also in our car's capabilities for self monitoring.

In any case, that is today. For once envision every one of the open doors that would exist for making new items and furthermore for administrations in future. Gartner has assessed the aggregate esteem include (financial in nature) from this Internet of Things which crosswise over enterprises would reach upto US\$1.9 trillion around the globe in 2020.

For instance, very nearly a couple of years from today, our morning schedules may be truly extraordinary and well because of the Internet of Things innovation. Our caution would go off sooner than its typical time on the grounds that our home savvy center point would have recognized activity conditions which would propose a surprisingly moderate drive for that day. The sensor for climate cautions us of a high dust include persistently, so simply instance of your sensitivities, you could choose whether to wear a suit



with sensors that would track the nature of air and after that ready you to conceivable allergens that may trigger an assault.

You would have room schedule-wise to check every one of your messages on the kitchen e-screen. All your test comes about because of late therapeutic checkups that you got are in, and there is additionally a message from the specialist that rehashes every one of his proposals for you about a more advantageous eating regimen. You send this data onto the home brilliant center point of your home. It would naturally show an outline contrasting every one of your outcomes with those which are of the populace when all is said in done which lies in your age run, and would request that you change to equivalently more beneficial choices on all your online basic need orders. The e-screen on your fridge entryway would propose crisp foods grown from the ground yogurt for breakfast.

The carport entryway has been left open, and—with some additional hypersensitivity drug that is there in your folder case—you choose to slide into your auto (that has been turned on by your keen center by squeezing the catch that is there on the key coxcomb). The radio has been playing all your most loved morning appears, the security framework for your home is furnished, and furthermore your GPS has followed the best course for you to work. Every one of the subtle elements for the morning will clearly fluctuate starting with one individual then onto the next, however this sort of situation would not be exceptionally far away. Amazing advances in sensors, gadgets and (M2M) or machine to machine network have made the Internet of Things promising and encapsulate an unparalleled open door for business that would get it going. Boss advances in Machine-to-Machine interchanges indicate unrealistic change. The regular tolerating of how things would chip away at the web lies as an unmistakable example: people associate all through a program to acquire the data or play out the demonstration they wish for to complete on the web. In Internet of Things, gear converse with hardware and procedures demonstrate a two-way interconnectivity to make sure they could interoperate similarly both locally and all around. Choices can be made as per prearranged controls, and the resultant occasions occur without the requirement for human intercession. These new interchanges are lashing fantastic open doors for some fresh out of the plastic new administrations.



Figure 1(1)

A worldwide, immersive, imperceptible, ambient networked computing setting built throughout the sustained creation of smart sensors, smart cameras, database, soft wares, and enormous data centres in a world-spanning foundation of information which is known as “Internet of Things”.

Fundamental design of internet of things is like that, practically all substantial item in this entire world can also be converted into a computer which is related to Internet.

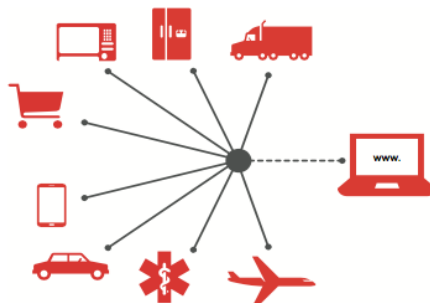


Figure 1(1)

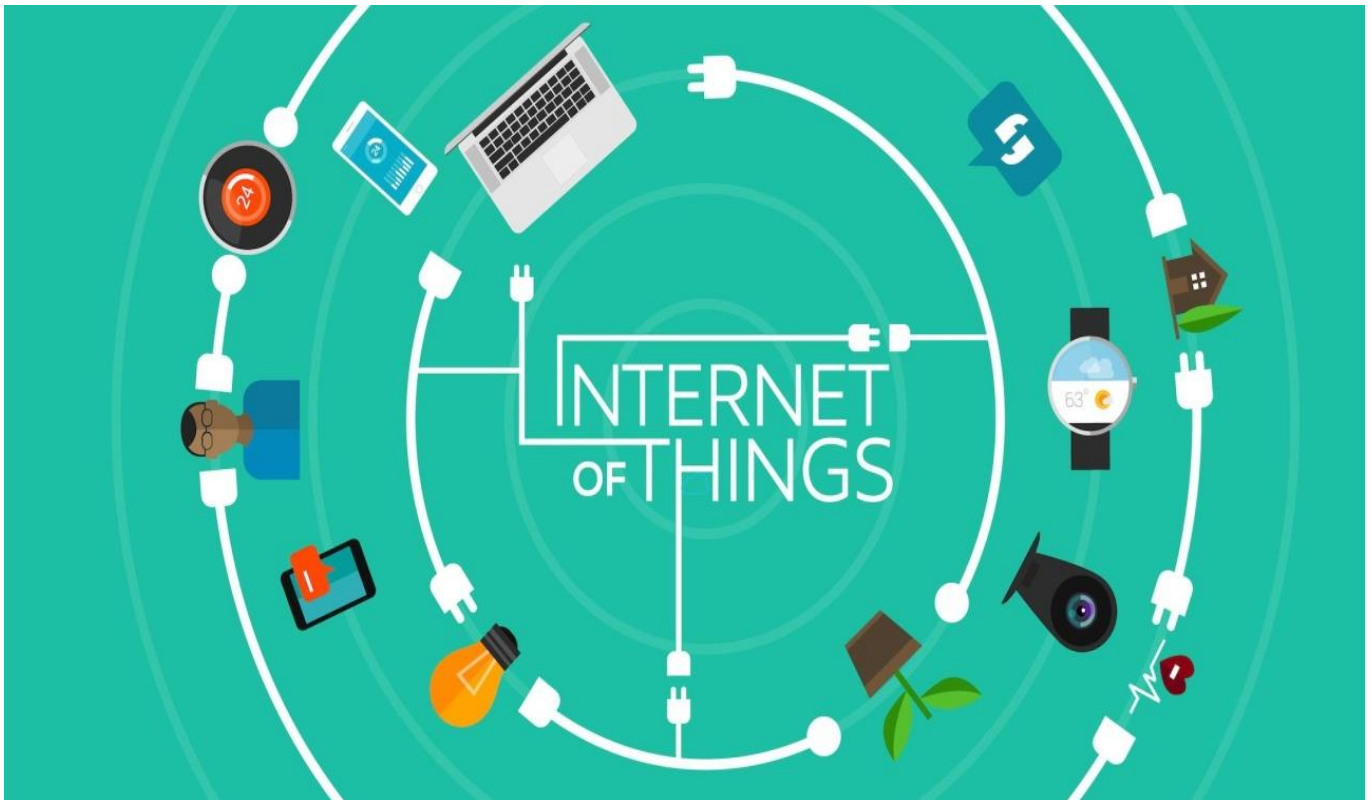


Figure 1(3)

## **1.1 ADVANTAGES OF THE HOME AUTOMATION SYSTEMS OVER OTHER WIRED SYSTEMS**

In current years, remote frameworks, for example, Wi-Fi have ended up being increasingly across the board in living arrangement organizing. Besides in building and house mechanized frameworks, the use of remote advances gives various points of interest which couldn't be achieved by utilizing a wired system alone.

- Abbreviated establishment costs: First and essential, establishment costs are extensively condensed in light of the fact that no cabling is required. Wired arrangements require cabling, where material notwithstanding the particular setting down of links (for e.g. into dividers) is exorbitant.

- Framework versatility and basic studio: arranging a remote framework is especially gainful when, because of new or changed needs, centre of the system required. In divergence to wired establishments, in which a cabling augmentation is troublesome and monotonous. This additionally makes remote establishments a persuasive venture.
- Aesthetical advantages: aside from packaging a liberally proportioned range, this trademark helps to full aesthetical needs too. Illustrations contain delegate structures with finish glass engineering and ordered structures where centre or configuration reasons don't allow us with the laying of links.
- Incorporation of every single cell phone: With remote systems, connecting cell phones like PDAs and furthermore cell phones with robot frameworks winds up noticeably conceivable at whatever time and at wherever, as a gadget's exact physical position is no longer basic for an affiliation (insofar as the gadget is inside the range of the system). For every one of these causes, remote innovation is not only a striking decision in recharging and redesign, however notwithstanding for the new establishments.

## **1.2 PROBLEM DEFINITION**

Many individuals today are continually in a hurry starting with one place then onto the next place due to business requests and necessities. A few people can waste various days from their homes abandoning all their family unit apparatuses without any sort of perception and control. A portion of the gadgets which are left connected or associated with the power attachments though alternate ones are made-up to be connected to and out of all the power attachments at different interims which are relying upon the season of that day. This needs a substance to physically centre to the greater part of the gadgets exclusively every once in a while. All such checking and oversee can be finished without unavoidably being about or inside the house. A portion of the gadgets if not being monitored appropriately secured a mess of vitality which in future prompts an additional consumption on the electric bills. Subsequently we propose to the planning of a house computerization framework in light of the web which will empower us to enigmatically run our machines from anyplace and at whenever.

### **1.3 OBJECTIVES**

Our project suggests a Home Automation system that makes use of incorporating multiple touch mobile - devices, wireless communication, cloud networks as well as power-line communication in order to provide the users with a remote control for a variety of lights and other appliances within their house. This system also employs a consolidation of a cell phone based application, as well as handheld wireless remotes, and computer based programs to provide us with means of user interfaces to all the consumers. The foremost purpose of our Project is to devise and put into practice a managing and monitoring system for a smart house. In addition to that, the smart home system has been sustained by a remote control system which acts as a sub controlling system. The major purpose of our project is to help old aged and handicapped people. It gives us a basic plan of how to manage different home appliances and to provide security using Android phones and tab. The plan comprises of a website for home automation, ATMEGA8 microcontroller and Raspberry Pi. Users can interrelate and interact with the website and can also send control signals to our Raspberry pi kit which will in turn manage other embedded sensors and devices.

## **MOTIVATION**

Most of the people are always on the go from one place to another because of business demands. Some of the people can squander for a couple of days far away from their houses leaving all of their household appliances in the absence of any kind of control and monitoring. Some of the devices might be left plugged into the power sockets whereas some others are thought to be plugged in and out of the power sockets at various intervals depending on the particular time of the day. All of this needs an individual to physically attend to all of the devices separately from time to time. All such control and monitoring can be done without inevitably being inside or around the home. Some of the devices if not controlled appropriately put away a lot of energy which in turn leads to an extra expense on electricity. From all of these issues we also realized that we have a need for automatic monitoring and also as a control system for home automation.

## **THEORETICAL BACKGROUND**

- **HOME AUTOMATION**

A house computerization course of action includes a figure of sub-frameworks which is for controlling distinctive qualities of a house, similar to a security sub-framework, or a HVAC sub-framework, an excitement sub-framework and a lighting control sub-framework. The network includes a host computer which is linked with the help of a host interface to a number of nodes. The network is present in a free structure topology and utilizes an asynchronous communication. The host processors poll each and every node on the system to establish system organization and to carry out an analytic test on the system.

The messages which are sent out among the nodes and are contained of a source address, and of a destination address which exclusively identifies the position of every part of the hardware on the system, a data length segment and a message type field. Every hardware device consists of a mirror image software entity present in the host processor to which all the messages are focussed. The user interfaces present for the different sub-systems allocate a general interfacing scheme whereby making use of the system is significantly simplified.

## **1.4 Methodology**

### **1.4.1 Proposed System Feature**

As we enter the 21st century, the interaction between humans and computer is breaking old barriers and entering a new realm. In the highly technology driven world of today's mobile phones have become a part of our Lifestyles. Mobile phones are not just communication tool. Our project tries to derive solution providing better control on home appliance with help of cell phone. The Existing System consists of physical appliances in our home that are been controlled through switches. These devices can be switched ON & OFF manually whenever needed. This system is less secured and prone to electrical hazards. Also the wastage of electricity tends to be a major factor of concern. The proposed project is conceived networking our mobile phone to all appliances via a smart logic circuit. The proposed system consists of Smart Logic Circuit connected to the appliances. Status of all home appliances could be controlled by user from remote location with help of user's mobile phone.

### **1.4.2 Proposed Home Automation System**

The end user can use their mobile phone to log into the system. An initial check is performed for whether the hardware device is ON or not. Only if the Hardware is authorized and ON then the user is authenticated. Once the authentication is completed successfully, user is then able to send the control signals to the Hardware machine. At the hardware machine the SL driver program will constantly track for the transformation in the status & will therefore send the signals to the Circuit. When a user selects a change in the status for any of the device [ i. e. .. ON or Off], the data from the hand held is sent to the Web Server in a thread format, where the Web – site is the host. On the server the status is stored in the database in their personal device field. At the Hardware finish, the circuit drive program a web page is used to salvage the status of the devices in a sensible pattern [for every 10sec]. These changes come in the form of cookies [which are temporary internet files] from the web server & are stored on the computer in the name of the web site. Hence every 10 sec as the page is refreshed and the new cookie values are modernized.

### **1.4.3 Proposed Home Automation System Functions**

The anticipated home mechanization framework has the ability to control the accompanying workings in clients home and watch the accompanying cautions:

- Temperature and humidity
- Gas leakage detection
- Control appliances

It can also control following appliances:

- Lights on/off/dim
- Fan on/off
- On/off different appliance
- Leakage of gas



## **CHAPTER 2 – LITERATURE SURVEY**

## **2.1 The Framework of Home Remote Automation System Based on Smartphone**

**Akbar Satria, Muhammad Luthfi Priadi, Lili Ayu Wulandhari and Widodo Budiharto**

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The main proposal behind this paper was to create a mobile app on a Smartphone gadget so the user can be in charge of electronic strategy; see the amount of flow that has been used in the quantity of dollars, so the problem is the complexity in saving electricity which can be determined. progress and design was done by collecting data using questionnaire to the respondents. Design method using annotations to distribute questionnaires and to learn literature, and then afterwards doing the designing in hardware (that is the microcontroller) made United Model Language (UML), database designing, code implementations and creation of user interfaces on an IOS and on the Android. The result of this study is the implementation of a remote home automation purpose in mobile which can help the users in charge to controlling the home and determining the costs of electricity that has been used in every electronic tool so that the optimization is achieved.

### **2.1.2 Framework of the System**

By and large this review is isolated into two primary obligations to be specific controlling gadgets and giving present data. The controlling and given that the data errand is led by joining the Arduino small scale controller which associates with the switch in the house and can be gotten to by advanced mobile phones utilizing the web. The given data errand will help the client to see the measure of electrical claim utilized as a part of a stay with an advanced cell in day by day, week after week, and month to month premise in the measure of Indonesian Rupiah. While the technique that bolster the information supply to be sent and got are: Modem for exchanging the information, electronic apparatuses to see the outcomes and whether they are in the User summon and a portable to send and get information. In the framework over, the primary gadget of association will be actuated with the hold of the arriving power supply with AC voltage of 5 Volts which is changed into DC. The Smartphone sends guidelines as information completely through a web server by utilization of the web which is landing by the microcontroller. To cling to web, the gadgets are furnished with a microcontroller Arduino ethernet shield which is to be adjusted with an ethernet link associated with a modem for interfacing with the web. The information which is landing through the microcontroller is sent to the portable web application framework and discharges the data, for example, increment in current utilization, "kill" or "turn on" the electronic apparatuses and diminish the lights.

### **2.1.3 Operating Procedure**

The operational apportions are conveyed so as to run the program. As a matter of first importance, the client is fundamental to sign into fill the points of interest like username and watchword, which is acquired from the administrator. In the event that these points of interest are entered erroneously then it will show the mistake message. Then again in the event that it is fruitful, the client will go into the "Fundamental Menu", in which there are four alternatives particularly "Electronic List", "Gathering", "Electric Current Record" and "Logout". On the off chance that the client chooses the first "Electronic List" then it will demonstrate a rundown of every single electronic gadget introduced. From this choice the client can likewise kill and on the lights and set the desolate condition with keys that are as of now accessible. At that point if the client chooses the following choice "Gathering" the client will see the alternative gatherings existing in light of client gathering and can perform control on existing electronic gadgets. At that point if the client chooses the alternative "Record Electric Current", the client can see the quantity of streams that have been set as Rupiah. What's more, if the client chooses the choice "Logout" then the client mechanically backpedals to the login shape application.

### **2.1.4 Conclusion and Future Works**

In view of the learning and assessment of the outcome examination in the past segment, this application can be keep running in two working frameworks, (Android and iOS). This application is utilized for the client to kill and turn on electronic apparatuses from their mobiles with the assistance of the web, so that can help the clients to take a gander at the power utilization of electronic devices in the room that had been set in the measure of Indonesian Dolar Rupiah (IDR). This application is likewise valuable for the client to diminish the lights, with the expect to spare the cash.

#### **Future Works:**

Useful proposal based on survey in this study to develop this application in the future such as:

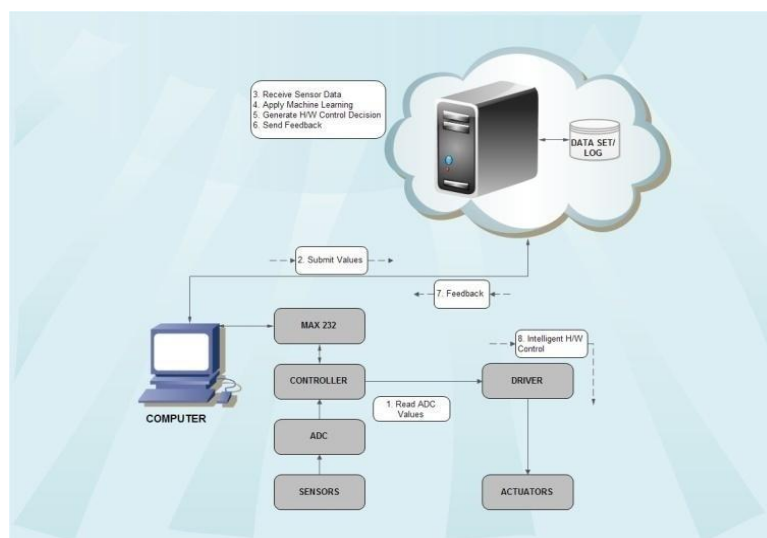
- Giving extra features such as camera for security purpose.
- Providing additional features like door lock automation system
- Developing the new User Interface in order to make it more interesting and more attractive to users
- Providing a brief tutorial mounting hardware, also setting up and usage of software
- This system can be better implemented in new residential areas or in new apartments.

## **2.2 “Implementation of Internet of Things for Home Automation**

**Mamata Khatu, Neethu Kaimal, Pratik Jadhav, Syedali Adnan Rizvi”**

### **2.2.1 Introduction**

In this paper, with a vision of achieving maximum automation we have reported an efficient implementation for Internet of Things used to monitor regular household conditions by means of low costs omnipresent sensing systems. It would successfully create a transmit of machines that would provide motivation to each other and require the minimum human interference The report about the incorporated network architecture and the interconnecting mechanisms for consistent measurement of parameters by smart sensors and broadcast of data through internet is being presented. The longitudinal education system will be able to provide self-control mechanism for better operations of the tools during monitoring. The outline of the monitoring system is based on combination of persistent distributed sensing units, information system for data aggregation and reasoning. The steadiness of sensing information broadcast through the proposed incorporated network architecture is roughly 97%. The model will be tested to generate real-time graphical information. Internet of things coverage is very wide and includes diversity of objects like smart phones, tablets, digital cameras and sensors. Once all these gadgets are connected to each other, they permit more and more smart processes and services that support our basic needs, economies, environment, health etc. Such huge number of devices connected to internet provide many kind of services and create huge amount of data and information.



**Figure 2(1) :Detailed Architecture**

## 2.2.2 ALGORITHMS USED

### A. Secured Hashing Algorithm

In cryptography, SHA-1 is a cryptographic hash function planned by the National Security Agency and made available by the NIST as a U.S. Federal data Processing Standard. SHA stands for "secure hash algorithm". The three SHA algorithms are designed in a different way and are well-known as SHA0, SHA1, and SHA2. SHA-1 is very similar to SHA-0, but corrects the fault in the original SHA hash specification that led to important weaknesses. The SHA-0 algorithm was not implemented by many applications. On the other hand SHA-2 significantly differs from the SHA-1. SHA-1 is the very often used of the existing SHA hash functions, and is working in several widely-used security applications and protocols. SHA-1 produces a 160-bit message digest based on principles similar to those used by Ronald L. Rivest of MIT in the design of the MD4 and MD5 message digest algorithms, but has a more conventional design. The original explanation of the algorithm was published in 1993 as the Secure Hash Standard, FIPS PUB 180, by US government standards agency NIST (National Institute of Standards and Technology). This version is now often stated as SHA-0 hash function. It was withdrawn by NSA shortly after publication and was outdated by the reviewed version, published in 1995 in FIPS PUB 180-1 and commonly referred to as SHA-1. SHA-1 differs from SHA-0 only by a bitwise rotation in the message agenda of its compression function; this was done, according to NSA, to correct an error in the original algorithm which concentrated its cryptographic security. However, NSA did not provide any further description or classify the error that was corrected. Weaknesses have as a result been reported in both SHA and SHA-1. SHA-1 appears to provide greater struggle to attacks, supporting the NSA's assertion that the change increased the security.

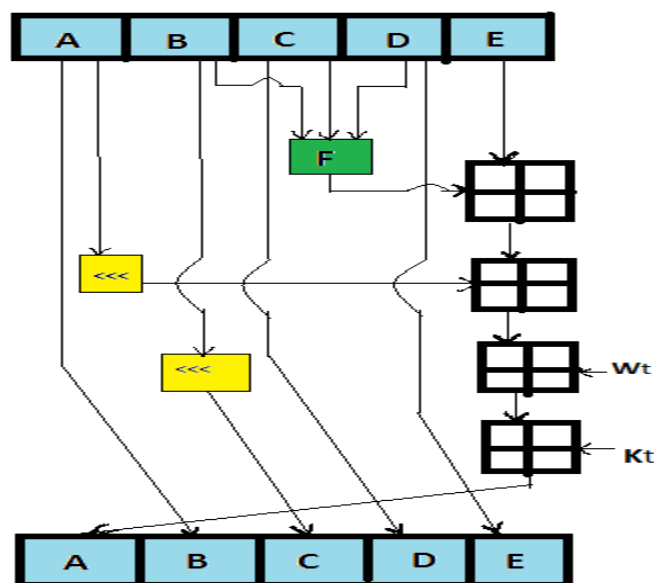


Figure 2(2) SHA1 Flow

### **2.2.3 CONCLUSION AND FUTURE WORK**

The Internet has changed significantly the way we live, moving interactions between people at a virtual level in several contexts on both sides of from the professional life to social relationships. The Internet of things has the prospective to add a new dimension to this process by enabling interactions with smart objects, thus leading to the vision of “anytime, anywhere, any media, anything” interactions. To this purpose, we observe that the Internet of Things should be measured as part of the overall Internet of the future, which is likely to be vibrantly different from the Internet we use today.

### **2.2.4 FUTURE ENHANCEMENT**

In the near future the Internet and wireless technologies will connect different sources of information such as sensors, mobile phones and cars in a tighter manner. The number of devices which connect to the Internet is – apparently exponentially – increasing. These billions of components create , consume and process information in different environments such as logistic applications, factories, airports and in the work and everyday lives of people. The society needs new and scalable, companionable and secure solutions for both the management of the ever more broad, complexly-networked Internet of Things, and also for the support of various business models.

### **2.3 “Raspberry Pi as a Wireless Sensor node: Performances and constraints”**

The main structure block of Wireless Sensor Network (WSN) in sensor node consisted of four basic units: the sensor unit, processing unit, communication and power units. In this paper it has been proposed that the Raspberry Pi, cheap, elastic, fully customizable and programmable small computer board and the ability of its usage as WSN node and Sensor Web node. The Raspberry Pi brings the compensation of a PC to the domain of sensor network, what makes it the perfect stage for interfacing with wide variety of external peripherals. Relative analysis of its key elements and performances with some of current existing wireless sensor nodes have shown that in spite of few disadvantages, the Raspberry Pi remains an inexpensive computer with its very successful usage in sensor network domain and dissimilar range of research applications.

A wireless sensor network (WSN) is composed of spatially spread nodes equipped with sensing devices to monitor and to evaluate characteristics of the physical environment at different levels. WSNs are planned and deployed for different purposes by various organizations. WSN based monitoring applications range from simple data assembly, to complex Internet-based information systems. In other words, the observations obtained from sensor networks may be supportive in many software applications like environmental, industrial and meteorological monitoring, building and home automation, medicine, urban sensor networks, intelligent transportation, security, military defence, etc.

### **Exploring IOT Application Using Raspberry Pi**

Internet of Things can be defined as interconnection between people, animals or object with the ability to exchange data over network without concerning human-to-human or human-to computer interaction. IOT offer various kinds of connectivity from tools, systems, and services that work within machine to-machine communications (M2M) and cover with applications, domains and protocols. [1]. Nowadays, there have been many implementations of IoT devices, for instance, heart monitoring implants, automobiles built-in sensors, farm animals equipped with biochip transponders, field action device used by fire-fighters in search and rescue operations etc. [2]. In current advertise the implementation of smart thermostat systems and washer/dryer for remote monitoring by using Wi-Fi [3]. According to McKinsey Global Institute, IoT has wider market and prospective to create economic impact of \$2.7 trillion to \$ 5.2 trillion annually by 2025 [4]. IoT is not futuristic or rousing technology trend; instead it already exists in our devices, cloud infrastructure, data, and sensor as well as business intellect tools. Microsoft

Corporation also delivers exclusive and incorporated approach for all enterprises to take advantage of IoT by collecting, storing and dispensation of data. This method was extended from broad product portfolio such as PC, tablets and industry devices on edge of endeavour network to backend system and services develop device and also a diverse partner ecosystem.

## **Raspberry Pi**

The Raspberry Pi is a low cost, small and transferable size of computer board. It can be used to plug-in to computer monitor or television, keyboard, mouse, pen-drive etc. Raspberry Pi has built in software such as Scratch which enables users to program and design animation, game or interesting video. In addition, programmers can also develop script or program using Python language; it is main core language in Raspbian operating system [8]. Raspberry Pi B+ is evolution of Model B. Python language has been used in this work to write the script for client/server communication. Moreover, there are improvements such as totalling more GPIO header PIN, more USB ports, lower power utilization etc. It is optional to use model B+ for school knowledge because it offers more litness than model A especially for embedded projects and requires a low power as well as given that more USB ports compared to Model B [9]. Samba is a open source software that provide flawless file and print facility to SMB/CIFS clients [10]. This software is considered to be a good and user pleasant development because it allows interoperability between Linux/Unix server and Window-based clients. Samba server has two key programs which is smbd and nmbd [11]. The four major services provided by Samba include: file and print services, confirmation and authorization, name resolution and service declaration. In this project, samba is used for as a server in raspberry pi for remote file access with numerous computers.

## **3. METHODOLOGY**

In this project, Raspberry Pi is used as a server by connecting it to several computer systems as clients in the same network. The work was explored in three different scenarios:

- i. Client-server communication using Wi-Fi,
- ii. Client-server communication using ZigBee and
- iii. Client-server communication within local host for distant file sharing provision. Router is used to make a wireless network statement between the devices. To create remote file partaking environment, wireless adapter and router is used and 2 units of XBee S1 series ZigBee communication is used to travel around for a substitute wireless communication platform. In order to bring out the research, a number of hardware and software platforms were required as described below.



### **3.1. Hardware List**

- Raspberry Pi B+: Small and moveable board that can perform its functions as a computer.
- SD card: Raspbian OS in SD card
- Asus WL-167G V3: Wireless adapter for Raspberry Pi Wi-fi connection.
- Wireless router: Provide wireless environment for the file Access between client and server.
- Computer: Client model that gains remote access to raspberry Pi.
- XBee: It is used connect to Raspberry Pi to function as data transmitter and another XBee connects to Window to function as a receiver.

### **3.2. Software List**

- Raspbian OS: It is the official copy for Raspberry Pi, software development for this OS has python language.
- Window 7: is used by client model to gain remote access to file server. It can store, copy and delete file in server.
- Samba: is an open source server chiefly for transferring a file.

### **INTERNET OF THINGS ARCHITECTURE**

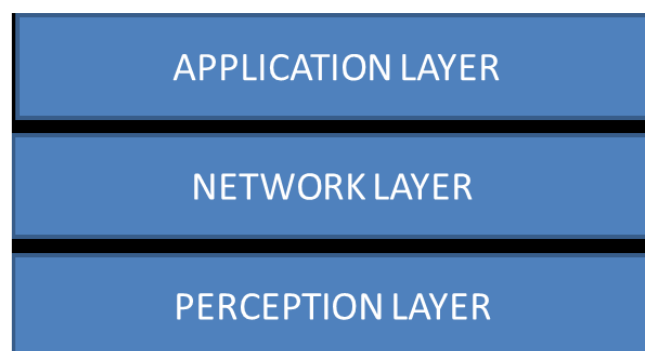


Figure 2(3)

- **Perception layer**

It is the primary layer of IOT it is generally used to identify objects and collect information. It is attached to the hardware device like a GPS, RFID tags, and sensor network and associated to any intelligent system, it is also called physical layer as the information from the corporeal devices has been changed into a digital signal that is fitting the network transmission. The closing device is plugged into the perception layer and all are “network element” which is alike the physical layer in the open system interrelated model. The primary work of this layer is to assemble information from the sensing technology.

- **Network layer**

It is a second layer for the Internet of things architecture .Its core function is to perform and obtain data or information. It is a network management run for IOT. It gains data or information from the above layer that has been treated and transferred to the various networks with wired or wireless network. It has a lot of protocols, but the main protocols used are ipv4 and ipv6 as these protocols are used for addressing billions of network devices and it also transmits huge amount of data between different networks.

- **Application layer**

It is the third layer for the internet of things. It ties the network to the application. The data or information from the network layer is given to the application and it runs on the application intended and it depends on the rudiments of that attentiveness. For internet of things it urbanized a wide scope of applications such as logistics management, intelligent transportation and character authentication primarily for safety.

## **CHAPTER 3- SYSTEM DEVELOPMENT**

## 3.1 Hardware Description

### Segments:

- 1 Raspberry Pi — The Pi 3 Model B has the special reward of having a quad-center processor and 1 GB of RAM so it bolsters heavier working frameworks, as Ubuntu and Microsoft 10 or LINUX.
- 2 Power supply – wi-fi to be used for the connection. Electricity required.

### Components:

- 1 Raspberry Pi — The Pi 3 Model B has the added bonus of having a quad-core processor and 1 GB of RAM so it supports heavier operating systems, like Ubuntu and Microsoft 10 or LINUX.
- 2 Power supply — You will need a 5V micro-USB power supply. You can find them for really cheap online. You may even have one from a non-apple mobile device lying around the house.
- 3 USB keyboard
- 4 USB mouse — If you prefer to use a Bluetooth keyboard and mouse, you could just get a Bluetooth adapter.
- 5 microSD card — The microSD card must have no less than 8 GB of capacity. You can buy one that comes pre-stacked with Raspberry Pi's New Out of Box Software (NOOBS), however you can likewise download the product for nothing from the site, so there is no compelling reason to buy an uncommon NOOBS microSD card.
- 6 microSD USB card peruser — You'll require something that you can interface the microSD card to your PC or Mac keeping in mind the end goal to download programming onto it. Adafruit conveys one that is ideal for Raspberry Pi, however you can get one at pretty much any gadgets or office supply store.

- 7 A screen or TV that backings HDMI or composite video — You can utilize a more seasoned composite video show, yet HDMI works better and backings sound exchanges.
- 8 An HDMI link or composite video link, contingent upon what the screen you utilize underpins
- 9 An ethernet link (or Wi-Fi dongle) — An association with the Internet is not required for setup, but rather numerous Raspberry Pi ventures utilize them. A 5V smaller scale USB control supply. You can discover them for truly shoddy on the web. You may even have one from a non-apple cell phone lying around the house.

An association with the Internet is not required for setup, but rather numerous Raspberry Pi ventures utilize them.

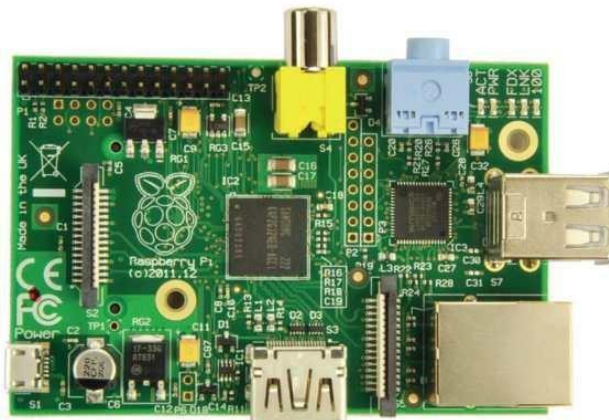


Figure 3(1)

- **RASPBERRY PI**

The Raspberry Pi 3 is the third era Raspberry Pi. It supplanted the Raspberry Pi 2 Model B in February 2016. Contrasted with the Raspberry Pi 2 it has:

- A 1.2GHz 64-bit quad-center ARMv8 CPU
- 802.11n Wireless LAN

- Bluetooth 4.1
- Bluetooth Low Energy (BLE)

Like the Pi 2, it additionally has:

- 1GB RAM
- 4 USB ports
- 40 GPIO pins
- Full HDMI port
- Ethernet port
- Combined 3.5mm sound jack and composite video
- Camera interface (CSI)
- Display interface (DSI)
- Micro SD card opening (now push-pull as opposed to push-push)
- VideoCore IV 3D design center

The Raspberry Pi 3 has an indistinguishable frame variable to the past Pi 2 (and Pi 1 Model B+) and has finish similarity with Raspberry Pi 1 and 2.

We recommend the Raspberry Pi 3 Model B for use in schools, or for any expansive use. Those wishing to embed their Pi in a wander may lean toward the Pi Zero or Model A+, which are more useful for embedded exercises, and endeavours which require low power.

It has 512MB RAM (twice as much as the A+), four USB ports, 40 GPIO pins, and an Ethernet port. In February 2015, it was superseded by the Pi 2 Model B, the second time of the Raspberry Pi. The Pi 2

offers various specs with the Pi 1 B+, yet it uses a 900MHz quad-focus ARM Cortex-A7 CPU and has 1GB RAM.

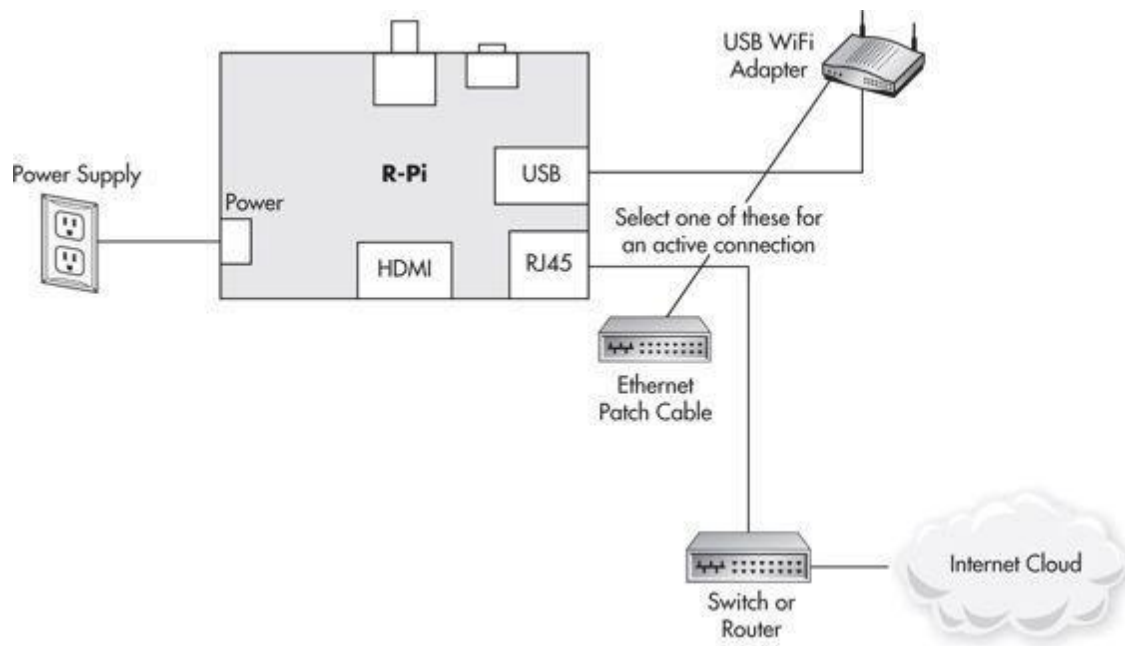


Figure 3(2)

## GPIO in Raspberry Pi

The GPIO sticks on a Raspberry Pi are an awesome approach to interface physical gadgets like catches and LEDs with the little Linux processor. In case you're a Python designer, there's a sweet library called RPi.GPIO that handles interfacing with the pins. In only three lines of code, you can get a LED flickering on one of the GPIO pins.

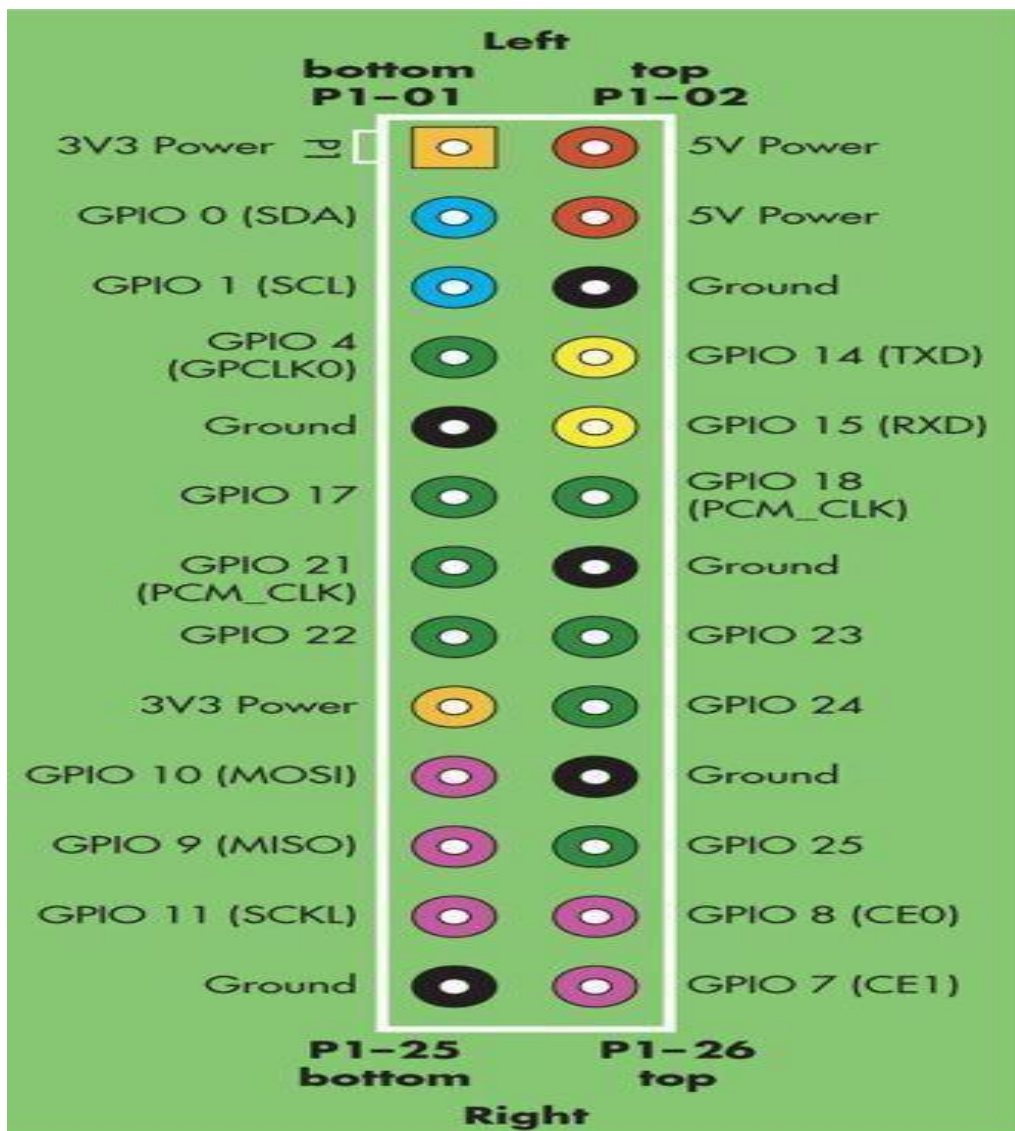


Figure 3(3)



- TRANSDUCERS:

A transducer is a device which measures a physical sum and changes over it into a banner which can be examined by a spectator or by an instrument. Since each one of the parameters are interlinked, a closed circle (input) control system is used in watching it. The sensors used as a piece of this system may be:

1. Light Sensor ( LDR (Light Dependent Resistor) )
2. Temperature Sensor (LM35)

- LIGHT SENSOR

Light Dependent Resistor (LDR) generally called photoconductor or photocell, is a device which has a resistance which contrasts according to the measure of light falling on its surface. Since LDR is to an incredible degree unstable in evident light range, it is proper for the proposed application.

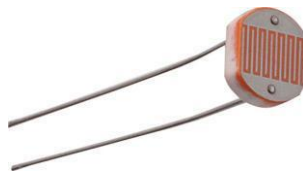


Fig. 3(4) Light Dependent Resistor

- Features of the light sensor:
- The Light Dependent Resistor (LDR) is made utilizing the semiconductor Cadmium Sulfide (CdS).
- The light falling on the dark colored crisscross lines on the sensor makes the resistance of the gadget fall. This is known as a negative co-productive. There are some LDRs that work in the inverse way i.e. their resistance increments with light (called positive coefficient).
- The resistance of the LDR diminishes as the power of the light falling on it increments. Occurrence photons drive electrons from the valence band into the conduction band.
- TEMPERATURE SENSOR

National Semiconductor's LM35 IC has been utilized for detecting the temperature. It is a coordinated circuit sensor that can be utilized to quantify temperature with an electrical yield relative to the temperature (in oC). The temperature can be measured more precisely with it than utilizing a thermistor. The sensor hardware is fixed and not subject to oxidation, and so forth.



**Fig. 3(5) LM35 temperature sensor**

Highlights:

- Calibrated specifically in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale figure
- 0.5°C exactness ensured (at +25°C)
- Rated for full -55° to +150°C territory
- Suitable for remote applications
- Low taken a toll because of wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60  $\mu$ A current deplete
- Low self-warming, 0.08°C in still air
- Nonlinearity just  $\pm 1/4^\circ\text{C}$  run of the mill

Utilitarian portrayal:

- The sensor has an affectability of 10mV/°C.
- The yield of LM35 is opened up utilizing a LM324 single power supply (+5V) operation amp.
- The operation amp is intended to have a pick up of 5.
- The hardware measures temperatures with a determination of up to 0.5 degree Celsius.
- The yield voltage is changed over to temperature by a straightforward transformation figure. The general condition used to change over yield voltage to temperature is:

$$\text{Temperature (}^\circ\text{C)} = (\text{Vout} * 100) / 5 \text{ }^\circ\text{C}$$

So if Vout is 5V, then, Temperature = 100 °C

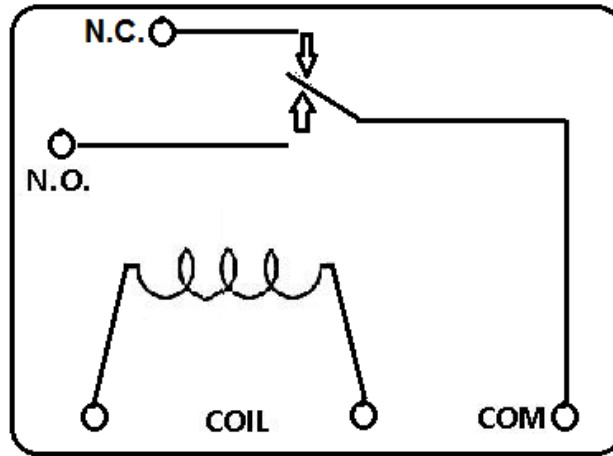
Single Pole Double Throw (SPDT) Relay

With a specific end goal to know how to interface a solitary post twofold throw(SPDT) hand-off, you should realize what each stick terminal speaks to and how the hand-off functions.

Terminal Pins

A Single Pole Double Throw Relay accompanies five terminal focuses.

The terminals are COIL, COIL, COM, and NO, and NC.



○ represents the terminals of the relay

Figure 3(6)

This correlates to the following in the relay:

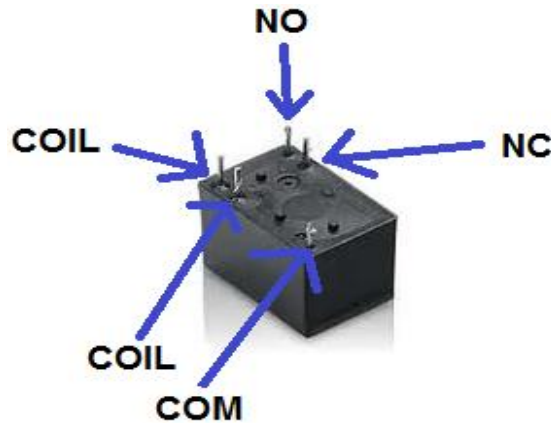


Figure 3(7)

### Terminal Descriptions

Circle This is the other side of the twist. These are the terminals where you apply voltage to remembering the true objective to offer vitality to the twists (which then will close the switch). Furthest point does not have any kind of effect. One side gets positive voltage and the inverse side gets negative voltage. Furthest point just matters if a diode is used.

NO-This is Normally Open switch. This is the terminal where you relate the device that you require the exchange to power when the hand-off is energized, which implies when the COIL gets satisfactory voltage. The device related with NO will be off when the exchange has no power and will turn on when the hand-off gains power.

NC-This is the Normally Closed Switch. This is the terminal where you interface the contraption that you require energized when the hand-off gets no power. The device related with NC will be on when the exchange has no power and will murder when the hand-off gains power.

COM-This is the essential

## OPTOCOUPLERS

As indicated by the Wikipedia an opto coupler is:

Opto coupler, in like manner called opto - isolator or optically coupled isolator, a transmission and social event contraption that limits as an impelled by light transmitted by a LED optoelectronic part splashing one, as a general rule as Phototriac phototransistor or switch.

The contemplation is to ensure electrical confinement between two circuits as an association that can be used as a switch is kept up. In addition, the industry, by and large so anxious to offer us as required, found an immaculate plan. Look at this circuit:

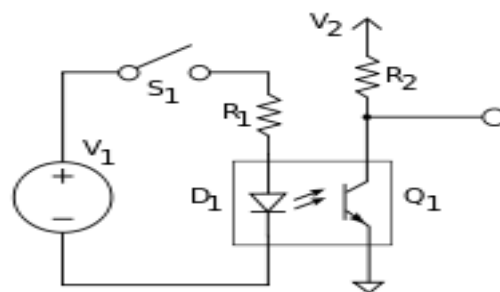


Figure 3(8)

:

At the point when the switch S1 is shut, the present courses through the main circuit bringing on the LED D1 to light up, which permits the conduction of the second circuit, on the grounds that the phototransistor Q1 is actuated.

Basically, we have a switch that is impelled by light, and acceptably secures both circuits, in light of the fact that there is no electrical relationship between them, yet optics, so it is very far-fetched possible that both circuits are electrically.

Eventually the insurance between the two can be a couple of thousand MΩ and that is the reason they are used even in high voltage.

You can tell a lot of optocouplers, dependent upon their sorts and others, yet here we will state some for relentless and low power present as befits Arduinos fulfilled and thusly simply say a sensible case: The 817c.

The opto coupler 817c is LED diode coupled to a phototransistor in a DIP package 4 stick ensuring detachment between the two circuits to the RMS 5.000Voltios (So you don't know anything, to play with an extensive number of volts case) fit for Switch in around 4.

What's more, as of now, they couldn't miss modules of 2 and one obviously:

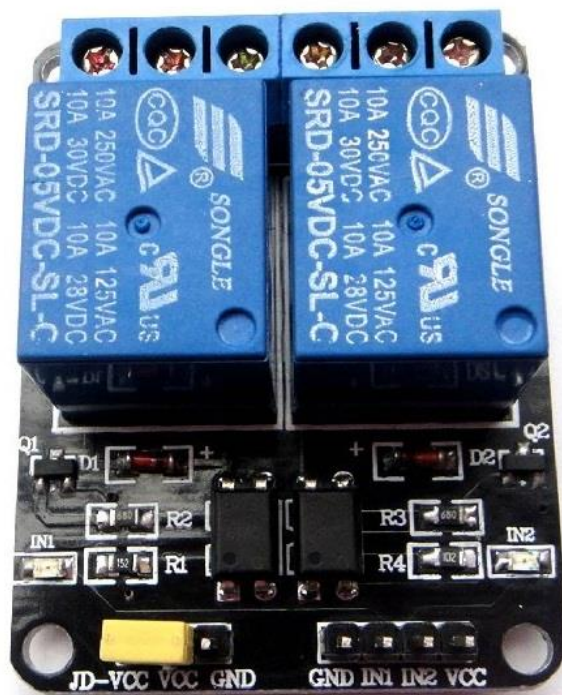


Figure 3(9)

The way to handle them is the same for all, They have a pin strip that is used to control each of the relays, plus a pair of positive and negative pins that feeds the internal, or control, of the optocouplers.



Figure 3(10)

# CIRCUIT DIAGRAM

## The Raspberry Pi is connected to relay interface

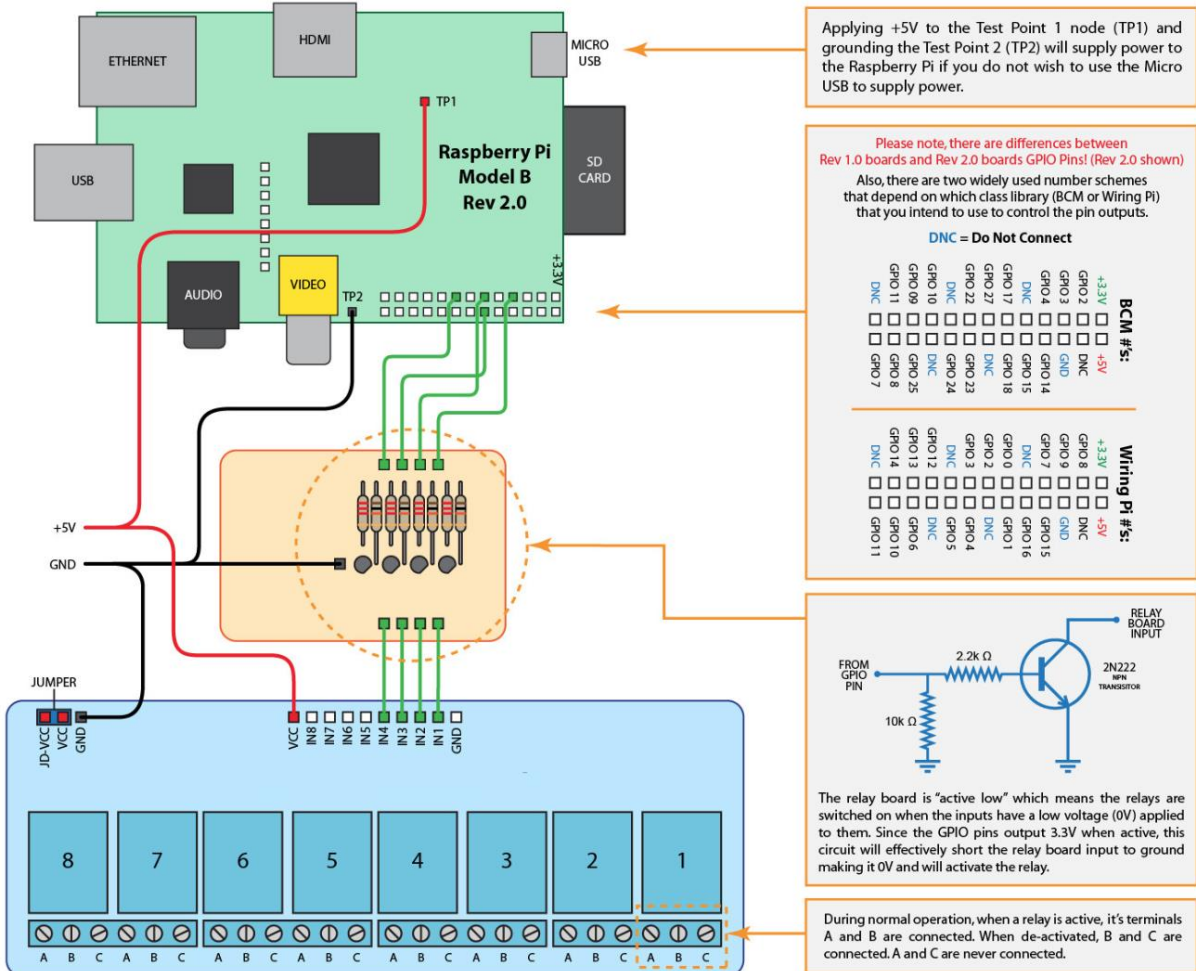


Figure 3(11)



## **LIST OF ALL THE COMPONENTS**

- **TRANSDUCERS (Data accomplishment framework):**

This part of the framework incorporates an assortment of sensors, principally for temperature, light and mugginess. These sensors can detect diverse parameters, for example, dampness, temperature, and the power of light and are then sent off to the Analog to Digital Converter.

- **THE ANALOG TO DIGITAL CONVERDER (ADC):**

The simple parameters which are ascertained by the sensors and are then changed to their comparing advanced values by the convertor.

- **THE MICROCONTROLLER:**

The microcontroller is in a general sense the heart of our expected embedded system. It perseveringly observes all the digitized parameters that are of the different sensors and besides affirms them with the help of heretofore portrayed edge values and tests if any killing action ought to be secured for the circumstance at right now of time. If a condition like this rises, it triggers the actuators to catch up on a controlled operation.

- **THE ACTUATORS:**

A social event of actuators can in like manner be used as a piece of our system, for instance, the exchanges, or the contactors, and the change over switches. They are profitable when we need to switch on the AC devices, for instance, coolers, motors, pumps, inception machines and sprayers. For the likelihood of show exchanges have also been used to control AC globules in order to reproduce the actuators and the AC devices. An inside and out working structure can moreover be recognized by clearly supplanting all the entertainment contraptions by genuine devices.

- **THE DISPLAY UNIT:**

A Liquid precious stone show has been utilized to indicate the present status of the parameters locally. The data that has been shown is continually refreshed in the continuous for looking at any modifications in these parameters. A pc is additionally utilized for the remote show, in which the information is conveyed serially utilizing the miniaturized scale controller with the end goal of remote observing.

### 3.2 The Python Programming

In our venture we will use IDLE IDE for the reason that it comes pressed with Raspbian appropriation, it is gratis, and it likewise makes composing and remedying the code more straightforward than when we utilize Python charge line or if there should be an occurrence of a content manager. It is essential to note down that when we are composing the python scripts that make utilization of the GPIO pins, we should hurry them as a super client or our scripts would not run appropriately.

- Power on our RPi and then booting all the way in to our operating system Graphic User Interface
- Open the terminals and then commence the IDLE IDE at the same time as a super user :`sudo idle`
- We then wait for IDLE to open up, and then click File > New in order to open up a new window (Ctrl + N)
- Then type the subsequent code in the window:

```
import RPi.GPIO as GPIO ## Import GPIO library
GPIO.setmode(GPIO.BOARD) ## Use board pin numbering
GPIO.setup(7, GPIO.OUT) ## Setup GPIO Pin 7 to OUT
GPIO.output(7, True) ## Turn on GPIO pin 7
```

- Click the File > Save as soon as you're finished (Ctrl + S).
- To run our program, we click Run > Run (Ctrl + F5). We would now see our led light up and then, we just need to tell the RPi to supply some voltage (+3.3v) into our circuit by using GPIO pin 7.

## **CHAPTER 4 – PERFORMANCE ANALYSIS**

#### 4.1) SYSTEM TESTING

The System testing for soft wares is the testing carried out on an absolute, incorporated system to assess the system's conformity with its precise requirements. System testing would fall within the span of the black box testing, and hence, it should need no knowledge about the inner designing of the logic or the code.

It is a very comparable functional test case lettering. In the test case lettering we should be able to write the test case scenarios & also the use cases.

##### 4.1.1 BLACK BOX TESTING:-

The Black-box testing is a technique to test software that finds out the functionality and working of an application devoid of the peering into the internal structures or into the workings.

Exact information of the application's internal structure, code and programming knowledge is generally not required. Also the tester is well aware of exactly what our software is thought to do but it is not responsive of how it would do it. For example, our tester is responsive that one particular input would return a definite, unchanging output however it is not certain about how the software would produce the output in the first place.

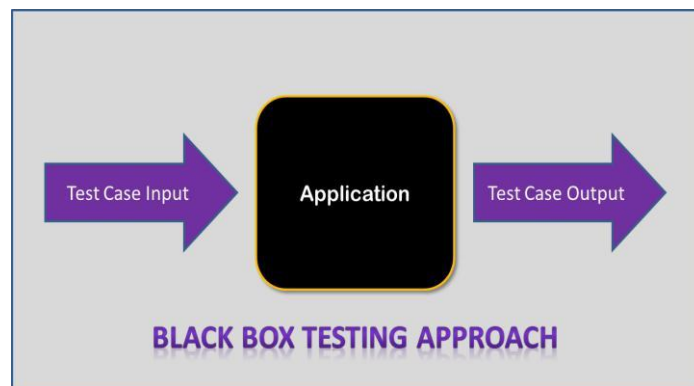
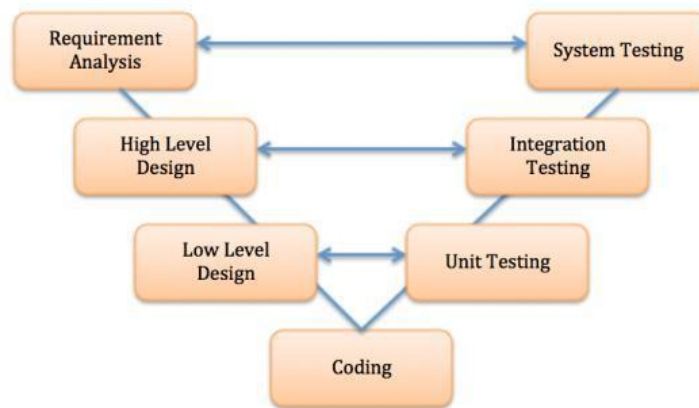


Figure 4(1)

#### 4.1.2 UNIT TESTING:-

During computer programming, we have unit testing which is a software test technique by which particular units of the source code, or a set of one and sometimes more computer programming elements jointly with linked control data, handling procedures, and functioning procedures, are experienced and tested to find out if they are robust for utilization. Intuitively, we can also sight a unit to be the smallest checkable element of an appliance. In case of procedural programming, our unit could have been an entire module, however it is more normally an individual procedure or function.

The objective of unit testing is to be able to separate every element of the program and to illustrate that the individual elements are correct.



**Figure 4(2)**

## **CHAPTER 5 – RESULTS AND CONCLUSION**

## **5.1 ADVANTAGES AND DISADVANTAGES**

### **5.1.1 ADVANTAGES**

#### **Accumulating Convenience in our Daily Life –**

When we change our house into a smart house, we'll have all our commodities programmed to our particular needs. Additionally being able to manage our home, no matter where we are, it can be tremendously beneficial.

#### **Customization –**

There are a lot of smart commodities in the marketplace at present and we definitely don't require purchasing all of these at once. As the purchaser it is totally up to us to create a decision which product we want mainly, determine if we like it, and then add it on to our set of smart home commodities as we go.

A high-quality product to begin with might be a thermostat or it might be a house security system if we're in the marketplace for either of them.

#### **Security –**

Smart house security systems permit us to analyse our house no matter where we are. We could have installed cameras, or installed motion detectors, and locks, etc, and we would be notified right away if anything is different or unordinary. A lot of these systems would even allow us to identify us of any unanticipated temperature modifications so that we're alerted in case there is a potential fire.

#### **Simplicity of Utilization –**

Roughly all smart house commodities can be put in not including a great deal of hassle, several of them do not even need us to carry someone into our house. Additionally if we are already a person who is a technology savvy, knowledge of how to utilize largely all these commodities is a puff of air.

#### **Saving Money and saving the Environment –**

Smart house features commodities like air conditioners .thermostats, and lighting. By having the capability to set this stuff on basis of a timer or to turn it on or off whenever we're away from our house will probably help us save our money on our electric bills. A lot of these commodities would allow us to trail our energy convention and expenditures.

## 5.1.2 DISADVANTAGES

### **Cost –**

Most of the families these days are capable to buy smart house commodities, but it doesn't signify it would not put down a huge dent in your budget. You can also buy the commodities one by one and then it would not seem like its too much, \$300 there, \$50 here, but almost by the instance when you contain the smart house organization we want, we would probably have exhausted a larger amount than we would have if we had obtained non-smart products.

### **Slight Learning Curve –**

We know we settled on the advantages like most of the smart home systems being actually very simple to use, however at the similar time there exists somewhat of a erudition curve for most of the people. For anyone who is already engrossed in technology, changing your smart house would be a puff of air, but for others who are not so tech nous, it might lead for a horde of time which would be spent reading manuals.

If we think we may have issues about learning how do we use smart house device, the reply may be straightforward. Ask for aid! Questioning someone to illustrate it to us how to scamper your smart house be able to remotely less puzzling than trying to create tails or heads of an lessons manual.

### **Reliability –**

A smart house will be enormously dependent on our internet connection. If our association or link drops we'll be gone or left with a set of smart commodities that won't work. Furthermore, wireless signals can probably be broken up by former electronics in our house and it would cause some of our smart commodities to work with a slow speedy or not at all.

There are lots of advantages and disadvantages which we have to consider while deciding whether we'd want to change our house into a smart house. Smart houses are not for everyone. They can assist bringing down our electricity payments, abridge our daily tasks, and assisted to give ourselves a feeling of security. But for a number of people smart house manufactured goods will merely transform into a financial burden. It is eventually up to you to choose which slot you fall into.



## **5.2 FUTURE SCOPE**

By using the system as a framework, this system can be extended to comprise a variety of former alternatives which possibly will comprise house security quality like detaining the picture of an individual moving about the home and hoarding it on to the cloud. This would reduce the storage capacity of data than by using a CCTV camera that would record the time and then store it. This system could also be extended for the energy scrutinizing, or at weather stations. This sort of a system with all the respective modifications can also be implemented at hospitals made for disabled people and also in the industries where there is no human invasion possible or is perilous, and also it can be applied for the environmental monitoring.

## **5.3 CONCLUSION**

The house automation by means of Internet of Things has now been experimentally verified to effort agreeably by linking uncomplicated appliances to the system and the machines were effectively controlled vaguely through the internet. The intended system not just checks all the data of sensors, like gas, temperature, motion sensors, light but it also activates a method in accordance to the necessities, such as switching the lights on when it turns dark. It furthermore supplies the sensor parameters to the created database in a well-timed manner. This will assist the consumer to analyze the order of a variety of strictures at home anytime and anywhere.

## **CHAPTER 6 – REFERENCES**

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Soun Chee Loon Quest University International Peraak [sf100389@qiup.edu.my](mailto:sf100389@qiup.edu.my)  
**-Discovering the IOT Application by Using Raspberry Pi**