

# **CHAPTER 1**

# **INTRODUCTION**

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# **Chapter 1:- INTRODUCTION**

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## **1.1 OVERVIEW**

A home automation system uses information technologies and a control system to reduce human labour.

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans, and other electrical appliances at home using a remote control? Off-course, yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Arduino-based home automation using Bluetooth & IR Remote. This system is super-cost effective and can give the user, the ability to control any electronic device. This project helps the user to control all the electronic devices using his/her smartphone or remote. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing a Home Automation system using Bluetooth/IR Remote/Voice, etc. With the help of this system, you can control your home appliances from your mobile phone. You can turn on/off your home appliances within the range of Bluetooth. In broad strokes, the main points of this project are automation and control, electronic boards and mobile applications, and particularly home automation, Arduino boards, and Android applications.

This is the result of the connection of two modern technologies, including hardware and software. Despite the actuality of these

components, they all appeared long ago and have been evolving throughout history.

The rapid growth of technologies influences us to use smartphones to remotely control home appliances. An automated device has the ability to work with versatility, diligence, and with the lowest error rate. The idea of a home automation system is a significant issue for Researchers and home appliances companies. Automation system not only helps to decrease human labour but also saves time and energy. Early home automation systems were used in labour-saving machines but nowadays its main objective is to provide facilities for elderly and handicapped people to perform their daily routine tasks and control the home appliances remotely. A Bluetooth-based wireless home automation system can be implemented at a low cost and it is easy to install in an existing home. Research work proved that Bluetooth systems are faster than wireless and GSM systems. Bluetooth technology can transmit data serially up to 3 Mbps within a physical range of 10m to 100m depending on the type of Bluetooth device. The design of the proposed method is based on an Arduino board, Bluetooth module, sensors, and smartphone application. Bluetooth module HC-05 is interfaced with the Arduino board and home appliances are connected with the Arduino board via relay. A smartphone application is used for serial communication between the smartphone and Bluetooth module which is further connected to the Arduino board.

### **1.1.1 What is Automation?**

The dictionary defines *automation* as “the technique of making an apparatus, a process, or a system operate automatically.”

We define automation as "the creation and application of technology to monitor and control the production and delivery of products and services."

Using our definition, the automation profession includes “everyone involved in the creation and application of technology to monitor and control the production and delivery of products and services”; and the automation professional is “any individual involved in the creation and application of technology to monitor and control the production and delivery of products and services.”

### **1.1.2 Automation encompasses many vital elements, systems, and job functions.**

Automation provides benefits to virtually all of the industry. Here are some examples:

- **Manufacturing**, including food and pharmaceutical, chemical and petroleum, pulp and paper
- **Transportation**, including automotive, aerospace, and rail
- **Utilities**, including water and wastewater, oil and gas, electric power, and telecommunications
- **Defence**
- **Facility operations**, including security, environmental control, energy management, safety, and other building automation
- And **many others**

Automation crosses all functions within the industry from installation, integration, and maintenance to design, procurement, and management. Automation even reaches into the marketing and sales functions of these industries.

Automation involves a very broad range of technologies including robotics and expert systems, telemetry and communications, electro-optics, Cybersecurity, process measurement and control, sensors, wireless applications, systems integration, test measurement, and many, many more.

### **1.1.3 Other Types of Home Automation**

Apart from the home appliance control using a computer and microcontroller which will be further discussed in this paper later, there are many other different ways by which we can control the home appliances and each and every system will have its pros and cons.

#### **1.1.3. a Home Appliances Control Using a Remote Control**

The lights and fans can be automatically turned on/off with the help of a remote where there will be a sensor instead of going near to a switchboard and putting on/off the switch. Companies like Legrand and Gold Medal already started these kinds of the control system and they are at present available in the market.

#### **1.1.3. b Home Appliances Control Using DTMF**

In this method, the control of home appliances can be done even when we are elsewhere just by using the DTMF tone generated when the user pushes mobile phone keypad buttons or when connected to a remote mobile.

#### **1.1.3. c Home Appliance Control Using FreeHand Gesture**

This is a type of home appliance control system where the person must be a present insight into the appliance that is needed to be controlled and a predefined gesture must be used to turn on the device and another gesture must be used by us to turn off the device. The performance of the proposed system is done with hardware embedded in that particular device.

#### **1.1.3. d Home Appliance Control Using Internet and Radio Connection**

In this system, the control of home appliances can be done from a remote area with an option from a local server, using the Internet and radio connection. This system is accomplished by personal computers, interface cards, radio transmitters and receivers,

microprocessors, ac phase control circuits, along with window-type software and microprocessor control software.

### **1.1.3. e Home Appliance Control Using Speech Recognition in Wireless Network Environment**

The main aim of this system is to establish a wireless connection between a client computer and a server in a real application. Via the wireless communication system, this system utilizes the remote voice recognition system server to translate the voice input received from a serviced client computer into a symbolic data file to be processed by the client's computer. The Wi-Fi network and the computer server utilize the GUI manager for implementing the speech recognition system.

### **1.1.3. f Home Appliance Control Using Power Line Communication Technology**

One of the technologies used by domestics to connect the home controller with the appliances is using the Power-Line Communication (PLC) protocol for data transmission. Power-line is a special media, which transport not only the AC power to devices, but also the multimedia or control data to and from the device; the benefits of using this media are the availability and quantity of electrical outlets in a house and no new wiring necessary for building the network

### **1.1.3. g Home Appliance Control Using Bluetooth**

The main part of the system is the multimedia gateway with the HTTP server inside. In the system, there are also personal communication assistants (PCA), a special kind of remote control with the Bluetooth protocol applied to them. The PCA is used to communicate between the user and the multimedia gateway. The aim of the system is the centralization of services in the multimedia gateway.

## **1.2 The History of automation**

This project is based on automation technology and more specifically on home automation systems.

Automation is the transfer of tasks normally performed by humans to a set of technological elements.

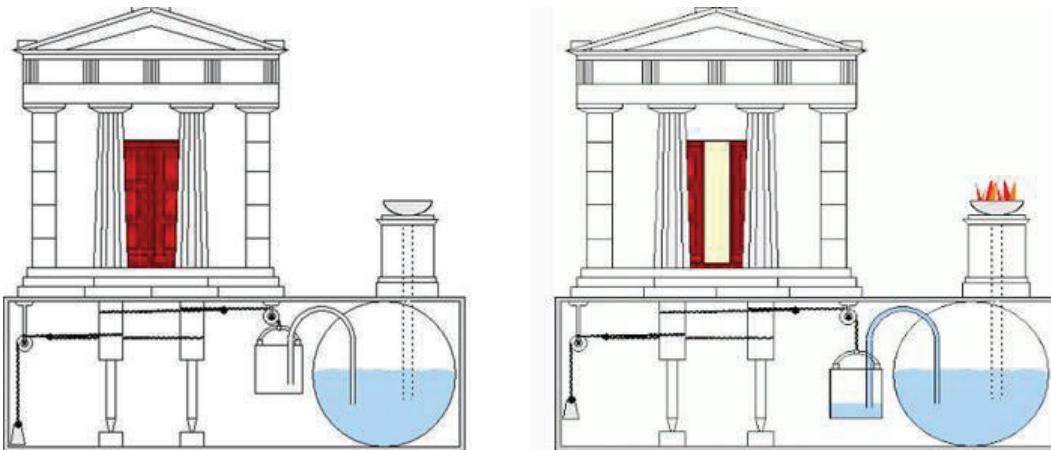
An automated system consists of two parts:

- Operation: Part formed by elements that act directly on the machine and make it perform desired operations. These elements are called actuators and some examples are engines, cylinders, or photodiodes.
- Control: The brain of the system, normally constituted by a programmable automaton, can communicate with all constituents of the operation part.

The inclusion of control in the automation system allows deciding on the development of a process, manipulating certain variables to get these or other variables to act in the desired way.

Although it seems a recent technology and currently is in full development, automation dates back to ancient times.

Nowadays nobody thinks of divine forces seeing an automatic door, it is something of the day-to-day that we have very internalized. It was not the same with the people of Alexandria when Herón, the great genius of mechanical engineering of classical Greece, invented an automatic door opening system for a temple in Alexandria.

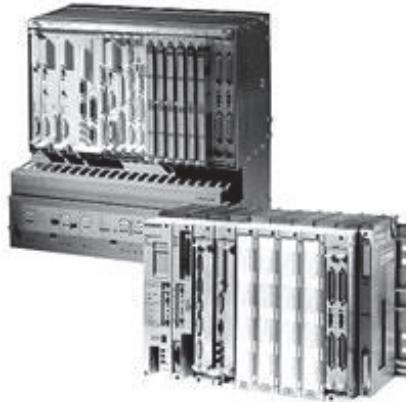


Automatic door designed by Herón of Alexandria.

Despite being antecedents of automation much earlier, like the Osiris statue of ancient Egypt, crankshaft and mechanic watches of the engineer Al-Jazari (1260), or automats designed by Leonardo Da Vinci (1452-1519), the industrial revolution is considered the greatest technological, socioeconomic and cultural change in history.

It is not completely clear what year the industrial revolution began, but it is speculated that it was in 1775, when James Watt invented the steam engine. Even so, around the '50s, semiconductors began to be used, a fact that turned out to be a breakthrough because, before this, only mechanical and electromagnetic elements were used.

In 1968 Ford and General Motors raised the specifications that had to have a programmable electronic controller to be useful in the industry, a fact that arises from the need for programming to optimize processes. In addition, the company Bedford Associates developed a prototype of an industrial controller obtaining what is considered the first PLC (*Programmable Logic Controller*) in history, which was named Modular Digital Controller or MODICON, used by a car manufacturer in the United States.



MODICON. First PLC of the history

Later, in the early 70s, the Intel company developed the first microprocessor, a 4-bit CPU named i4004, for the Japanese company Busicom to incorporate into calculators and by the middle of that decade, it was already incorporated into automatons. It contributed to giving more flexibility because of the ease of programming, as the wired memories disappeared.



i4004. The first microprocessor in the history.

Over years the improvements were continuous, the automaton was gaining memory, the ability to govern control loops, communications and programming languages became more powerful, obtaining faster processing speed, more complex control techniques... Nowadays, having a great number of existing automatons, increasingly powerful

and useful in different fields, even disengaging from the industry to open new roads, such as home automation applications.

### **1.3 Background of remote-control switching device**

Most homes make use of many electrical and electronic appliances such as the television set, standing fan, ceiling fan, air conditioner, lighting bulbs, video players, radio, etc. All these appliances require switching to turn on and turn off these appliances traditionally. This manual switching of any home appliance is an inconvenient method for the physically disabled or elderly or even for the young and busy individuals when frequent switching operation is required. Thus, an easier method of switching is developed to replace this manual switching method, using an advanced switching method for electronic home appliances.

The early wired remotes made it possible for users to control appliances at a distance, but the wired remote also limited the user's mobility by either tethering or tripping the user. If the user runs the remote control's cord under the rugs and furniture, effectively anchoring the device to one location in the room, the remote thereby limits the freedom of movement for it was designed to provide. But if the cord is left out in the open, the users might stumble over it. The wireless remote control solved all these challenges of the wired remote control and effectively takes control of the household. The use of remote to restore order to the household, changes lifestyle; brings multi-function and multi-platform lives easy.

Various technologies have evolved in the past: controlled by radio waves; used to execute commands transmitted by electromagnetic waves; and also, the use of battery-operated low-frequency radio transmitter remote control for consumer electronics. The idea for an electronic remote control, which worked wirelessly by shining a beam

of light onto a photoelectric cell, came up in the United States in 1955. Advancements in remote control kept going till recent days when many technologies such as infrared, radio frequency, Bluetooth, and Global System for Mobile (GSM) communications control are used for remote control.

The major technology used in home remote controls is infrared (IR) light. The signal between a remote-control handset and the device that it controls consists of pulses of infrared light, which is invisible to the human eye, but can be seen through a digital camera, video camera, or phone camera. The transmitter in the remote-control handset sends out a stream of pulses of infrared light when the user presses a button on the handset. A transmitter is often a light-emitting diode (LED) that is built into the pointing end of the remote-control handset. The infrared light pulses form a pattern unique to that button. The receiver in the device recognizes the pattern and causes the device to respond accordingly. Radio Frequency (RF) remote control is used to control distant objects using a variety of radio signals transmitted by the remote-control device. As a complementary method to infrared remote controls, the radio remote control was used with an electric garage door or gate openers, automatic barrier systems, burglar alarms (for security and also for restriction of the use of household appliances), and industrial automation systems. The importance and benefit of remote control for household applications using radiofrequency technology vary:

- It is not affected by line of sight.
  - It penetrates most solids materials and passes through walls.
  - It transmits signals to a longer range, more than that of infrared technology.
  - It is not sensitive to light, weather, or any environmental conditions.
- This paper is confined to the use of Radio Frequency (RF) technology in switching to control household appliances which involve:
- The design and construction of a transmitter circuit that switches to send signals to the receiver circuit using RF technology.

- The design and construction of a receiver circuit that receives the signal from the transmitter circuit via RF technology and then acts to switch on or off a household appliance.

## **1.4 Project Background**

After carefully analyzing different ideas for the project proposal, I came across one of the most interesting and indeed the most emerging ideas that would cause a huge impact on the people to interact with the objects. It took me a while to go through various literature reviews and methodologies to bring up something that could be much more efficient and of course sustainable.

So, to accomplish my motivation I came up with the project proposal based on Bluetooth & IR Module, in which I have used '**Home Automation**', in other words, this is a practice-based project in which I am coming up with the physical object. This Bluetooth & IR technology will result in controlling home utilities with the voice command, remote control, and touch sensor, produced by the user on its Android phone which will contain that software application and through IR Remote.

Here another point of interest to be noted is that is my firm interest in working for the people with the special needs (disabilities). My project implementation could cause a big change in the way of using facilities, which normally would have been difficult or maybe impossible at a certain level. The ease of using the facility is now just waiting for the voice order or IR Remote to perform the action.

## **1.5 Context**

By performing hours of research work, we came up with the most valid and implementable solution for using remote, touch switches, android app, and voice technology to control the home utilities. In terms of the implementation point of view, it is being justified by connecting the various objects to the Bluetooth / IR sensor and after that, the functionality of the object could be controlled by the software or remote which in return is responsible to take the input and generating the response.

Past performance and the analysis of their result is the key feature to bringing something innovative to the society. Even current research work will lead to the better additions of ideas in the future which will be based on the past experiments. But our idea for home automation can get good remarks based on the past experiments of controlling utilities through gestures. But indeed, our concept of using the remote, android software, touch sensor, and voice adds a huge value to it, which is a propagation of research more desirably.

The process of designing that kind of software can be justified by the academic evidence and supportive literature. Bluetooth is the technology that is predicted to be the most evolving in the near future. The research and the implementation of Bluetooth are growing up at a faster pace and more justification with the facts are getting clear.

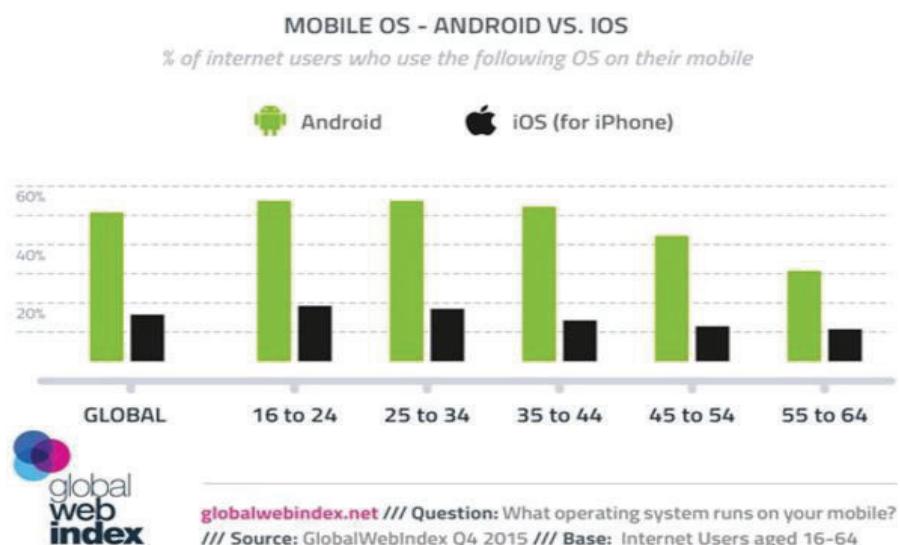
### **1.5.1 The rationale of the Project**

Any project or idea that is proposed is always intended to make the life more comfortable and relaxed. The basic ideology behind my project is to make the people more comfortable while they are at home and use basic facilities i.e. light and fan. Instead of going around and finding the power source to use utilities, this project will make them calm stay at the same place, and use the smartphone or IR

Remote to give the command or voice order, which will be ultimately processed, and the action will be performed.

The same concept goes for the people with little mobility or maybe with no mobility, all they need is to have an android phone or IR Remote with the application installed, give a recognized command, and the rest of the process will be taken care of by the Bluetooth technology or IR Receiver. Even if this concept is implemented on a larger scale, the hospitals can be truly modified for the patients where they would be able to control the things around in the room just with the voice commands or using a Remote, and that command will be going to cause the action of their requirement.

One of the major reasons for choosing the android phone instead of the iPhone for our project is the difference in the number of people who are mostly using these smartphones. According to the report, several people in the world are using Android than iPhone. The evidence can be clearly illustrated by several reports and journals. Not only that even the number of Android users is predicted to increase in the future. So, while considering all these facts and numbers we have decided to design this application for the android phone at the moment.



## Android Vs IOs

So, therefore this concept will be going to have a great evolution and will solve many problems for the special people when they alone at any time. Humanity is trying to achieve a target where everyone lives the life in the way they want and certainly, IoT is going further than expectations in the way it's emerging, and soon implementation of this technology will lead us to the most comfort zone of life.

## **1.6 Challenges in the home automation**

If we look around the literature review of various Bluetooth technologies, it will be clearly concluded that there is no doubt the way Bluetooth has changed the way of people behave towards the things they normally encounter in their daily life. As long as we are going further, things around us getting easier and more convenient to interact with and use them. But as the World is going into a much better time since history, several difficulties and challenges are coming up on the way.

One of the major challenges that have been faced by home automation is its cost. Although home automation gives the best ultimate user experience, sometimes affordability factors come up in the middle. The cost of home automation arises from the several levels starting from the manufacturing cost, second major is the cost that is involved in the development process of the system. Later installation costs and further support and service could come up with the requirement of a big budget to maintain the affordability.

Lack of required standards is also one of the challenges that come in the way. As Bluetooth is one of the emerging technologies, while implementing it on a commercial basis user unfamiliarity with the interface is also a great difficulty. Lack of awareness and lack of motivation needs to be updated to tackle these problems.

## **1.7 Aims and Objectives**

The success of any project depends on the ultimate reason for which it has been proposed. There must have several aims that could result in the motivation process of designing the project. Aims are certain number of requirements which support the project. And firm objectives always give backing to the aims and open the future doors for the better innovation of the proposed idea.

Android-based application for controlling the home utilities has certainly an incredible effect on the society, where it can also cause the elimination of discrimination towards the daily life objects when all people will get the same ease of managing utilities.

The major aim of this project is to provide a platform that has never existed before. The application software will work along with the google voice recognition services, where it will get the voice command or will take the command from the IR Remote and it will be converted into text format so that it could be understandable in a logical way and that command will be transferred to the Arduino NANO device via Bluetooth, and at that point, the command will be executed to complete the task, ultimately the action will be performed in the way device is pre-programmed.

If we put the things in a more short and logical form, the following are some of the major aims and objectives of our project.

- This project is designed to use the touch switch, IR Remote, Android app, and voice recognition technology to control home utilities i.e., light and fan
- Its implementation especially focuses on the needs of disabled people.
- Google voice recognition facility will be utilized to input voice.
- Android phone will be used for the application software which will be connected to the google voice command input.

- Application software will be responsible for converting the voice command into text format.
- Ultimately application software will transfer that command in the text format to the Arduino NANO using the Bluetooth module.
- This microcontroller (Arduino NANO) is intelligent enough to convert the text command executable according to the programming that is involved as per requirement.
- And after execution, the action will be performed
- Commands which we have included are lights on/off, fan on/off, tv on/off, and all on/off
- Major home utilities for our project are light, fan, and TV. Each of them follows a certain command that is programmed.

The aim is to use this Bluetooth technology for people of all ages, gender, and even with some disabilities to enjoy life more pleasantly.

Now we are getting up to turn our home appliances on or off. If we are making the home controlling system, easier and more reliable for the user like disabled people then they will be benefited from our system. It will become the best system for disabled people and for the elderly people to use their mobile phones and control their home utilities. The goal of this system is to help disabled and elderly people.

Better aims and objectives come into consideration when the project is supported by a good literature review, methodology, and other things that can cause a satisfactory improvement. And in accordance with the previous experiments and research work, a better product could be possibly expected. Objectives of this project can rather be put in a more fashionable format in the future based on our current research work and designing an ultimate product.

## **1.8 Literature Review**

It is one of the major requirements of any project which brings out the logical context of the work that is been done. In other words, it is the reflection of work and the methodology that has been adopted previously and what are the different flaws and drawbacks which require improvement on a conceptual basis. It also focuses on all the related available technologies that are been used for the home automation system. Depth Analysis, and a logical conclusion with a judgemental solution all are integral parts of the literature review. ‘Automation’ is a word that involves the use of machines rather than the human physical effort to manually perform the task. In other words, this technique is being proposed for the benefit of mankind and its trend is growing at an exponential rate day by day, as this system has brought a great change in the individual routine life and also several benefits in businesses. Scientists and researchers are still working hard to make this more beneficial, efficient, and secure for everyone, most important ecological and economical at every level.

Certain projects in home automation are using Wi-fi technology for their operation. While considering the Wi-fi system, the infrastructure is usually divided into three major components.

- Web-based server
- Interface module
- Wi-fi connection

This system is quite flexible in terms of the user interface, as all it requires is to log in to the web server using the interface module i-e Arduino Nano provided with the Bluetooth connection. And all the result is the functionality of sensors and the actuators which acts suddenly in response to the information processed by the web-based server. The user can remotely login without any geographical restrictions.

This login system was developed on the Android-based system, in the form of an application. And the home appliance that has been used for this project is the window shutter. Interfacing is done by the user (remotely), web server, and raspberry pie, and these are interfering with the home appliance while in that case is the shutter of the windows. Interface cards act as the central point to ensure the connection between the command that is followed by a remote user to the raspberry pie, and from there to the actuator sensor. The Android-based application gives a direct response to the raspberry pie in accordance with the per-user input.

Another major work that is been done on home automation is the use of the cloud as the medium for controlling and monitoring appliances. This cloud-based system gives the remote user to easily alter and monitor the appliances. The idea behind is to take all the data that has been allocated to be monitored and controlled, and the collected data is referred to the cloud-based data server. And after the collection of data, it is stored in Hadoop distributed file system (HDFS). To process this data MapReduce uses the special framework of the data that is received from HDFS and later takes it back to the HDFS for storage. And finally, it provides remote access to the user to carry out the monitoring and controlling of the data received. For the implementation of this idea, Raspberry Pi has been used where it was subjected to work whenever it receives the E-mail subject and also the algorithm. The reason behind using Raspberry Pi is its several advantages over the others. Firstly, it is quite a powerful device that gives the best platform while working with home automation. Another major positive impact of the raspberry pie is its economical basis, where it consumes less amount of energy and provides an efficient user-friendly experience.

GSM (global system mobile communication) technology-based project has been done on the home automation appliances. And for that purpose, the Arduino board has been used to control these appliances. This project is based on mobile applications which have

the ability to generate message alerts according to user commands. After these commands are sent to the GSM modem which is connected to the Arduino and these commands generate effects on the appliance in accordance with the user commands. There are several flaws in this project which causes poor performance in the system efficiency. GSM technology is quite expensive to use, where it causes charges per SMS, so here affordably comes into consideration. Secondly, SMS reliability is also one of the issues on which the whole system is mostly dependent. Customization of an interface according to the devices is also not applicable.

If we analyze the structure of this system, it has been developed in a quite straightforward fashion. As usual, a Bluetooth board has been placed on the Arduino board and used for controlling home automation. Python was used to give a platform for the user interface as it is general high-level programming. Bluetooth module has been provided with the ports of I/O which controls its operation. Several relays have been used for the appliances interfacing, which was an integral part of the system to work simultaneously. To provide a secure system, a Bluetooth module has been introduced with password authentication. So, if anyone desires to access the system controlling and monitoring must go through the password checks. Secondly, the range of the Bluetooth which has been allocated is from 10 to 100 meters.

# **CHAPTER 2**

# **METHODOLOGY**

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**Recent technologies with better feature**

**2.1 Research Methodology**

**2.2 Development Methodology**

**2.3 Data Collection Methodology**

**2.4 Software Methodology**

**2.5 Hardware Methodology**

# **Chapter 2 :- METHODOLOGY**

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## **Recent technologies with better feature**

Wireless technology is one of the great revolutions in the history of Bluetooth. It has replaced many old ways of user interference.

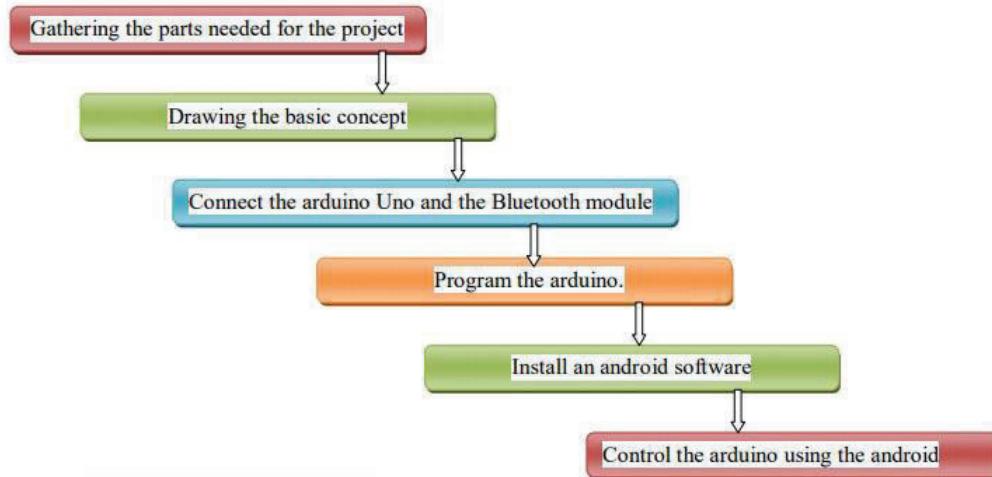
Remote controlling is now much more in use than ever before and day by day this trend is making wired technology outdated. Installation cost is always a challenge in home automation. But since the wireless technology has come into play, it has greatly reduced the cost of installation, as this technology doesn't involve any hardware network cabling.

Remote connection through Bluetooth to control and manage the devices has resulted in the great achievement for the user convenience. It makes the mind worth thinking about how the user is managing home automation by sitting down anywhere on the Planet provided with the Bluetooth connection and a mobile phone. Wireless technology is still at the beginning of its revolution. As time passing awareness and consciousness are getting more popular all over the World. New requirements and the changes make it more scalable and expandable.

Another major achievement in the feature of home automation is its security, which is still in the progression of getting better. Security is one of the key factors which is the compulsory requirement in the integrated system of interconnection with the Bluetooth system of home automation. Security also keeps the integrity of the whole system and as compared to the past works on Bluetooth technology we are in a much better time of promising the ultimate best security in Bluetooth and providing the platform that all can rely on without hesitation.

## **2.1 Research Methodology**

There are a certain number of ways which can be used to complete the project, that means tools and techniques which are both hardware and software-based. Now here comes the important point of identifying those tools, and this is where we identify them considering the previous literature review. This not only helps to identify the correct methods, but also gives a suitable contrast and comparison approach towards various methods that are adopted before, and the outcome produced by them.



The above flowchart shows the number of steps that are involved in our project. It is a simple methodology format that we are intended to follow, which involves not only software development but also, its practical implementation with the hardware of the project.

## **2.2 Development Methodology**

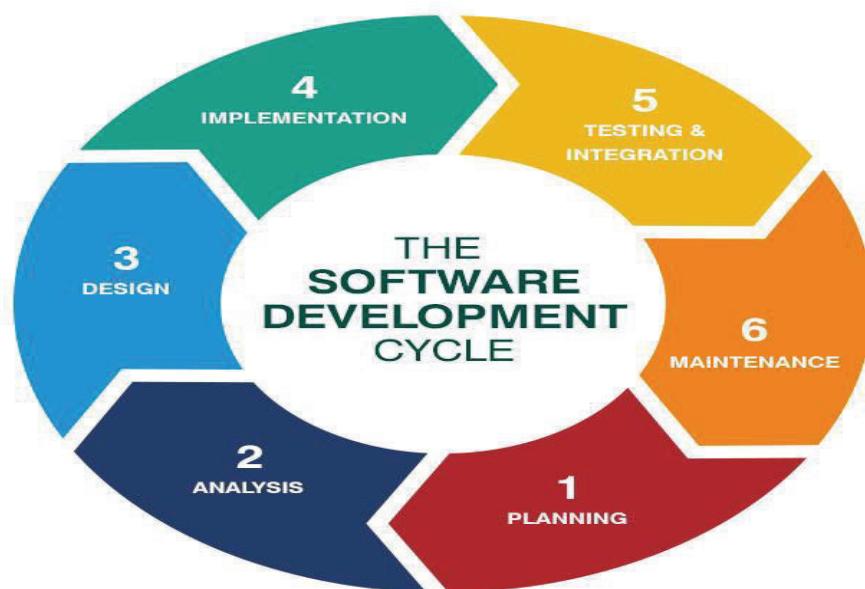
For any project to be completed there are several methods that can be used based on the objectives of the project. So, for software and hardware, there are certain types of methodologies that can be

taken into consideration. As we consider software development, the following are some of the methods that are widely in use:

- Waterfall Model
- V-Shaped Model
- Evolutionary Prototyping Model
- Spiral Method (SDM)
- Iterative and Incremental Method
- Agile development

While considering these mentioned above, we have chosen the waterfall method of the system development lifecycle, in contrast to other methodologies, a major reason behind this is as follows:

- Its awesome structural approach
- All the phases are accordingly well defined and ordered
- Keeps the time schedule for each phase from its starting point to the endpoint
- Every step at SDLC has unique deliverables.
- Another important aspect is its sequential model, where the progress is seen in the slow and downwards flow (like the water falling from a spring.) all through to the end of the software development.



*Software Development Life Cycle*

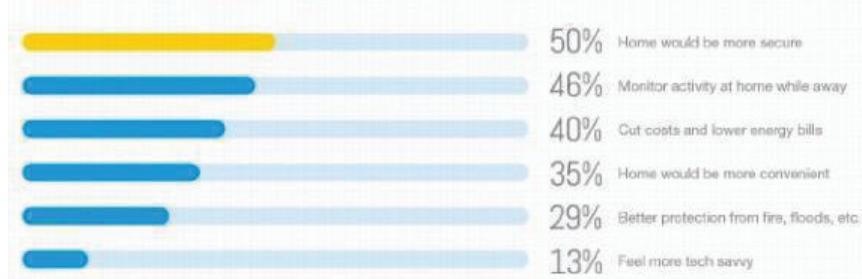
The above figure shows the waterfall method in the system development lifecycle, starting from the initial requirement analysis, designing, development, testing, and maintenance. Each of these steps is followed one after another, and a new phase cannot be initiated until the last phase is completed.

## **2.3 Data Collection Methodology**

It is an important technique in terms of getting all the statistics that were applied before while performing the same project or maybe a related project. As this is a product-based project, very deep qualitative and quantitative analysis is not required, although a thorough understanding of the different procedures is required to carry out the product-based project. As we have discussed various controlling mechanisms via Android-based home automation which show the number of procedures that are used for managing home utilities.



According to a study by go-assist.co.uk, they have taken a survey of the adult-aged between 25-65 years old asking them about the smart home, and whether they like it or not. More than 700 people among a thousand said they would love to have a smart home.



People would like to have their home as automation considering Security, monitoring, cost and energy, convenience, protection and felt of a techie.

The above chart shows the percentage of the people There are also data for security of a home automation done by Greentechmedia.com.

We also have collected data from the literature review. The literature reviews has not only given us the reason to pursue this idea in a better way, but it has also helped us to identify the reason for utilizing this Android-based technology. Previous trials and experiments are the major sources of giving an idea for adopting the better solutions for the future trial, and it has totally helped us to a certain level. A good understanding of the literature review has helped us to gain our objectives quite efficiently, and certainly, it has helped to consider a better procedure for our project

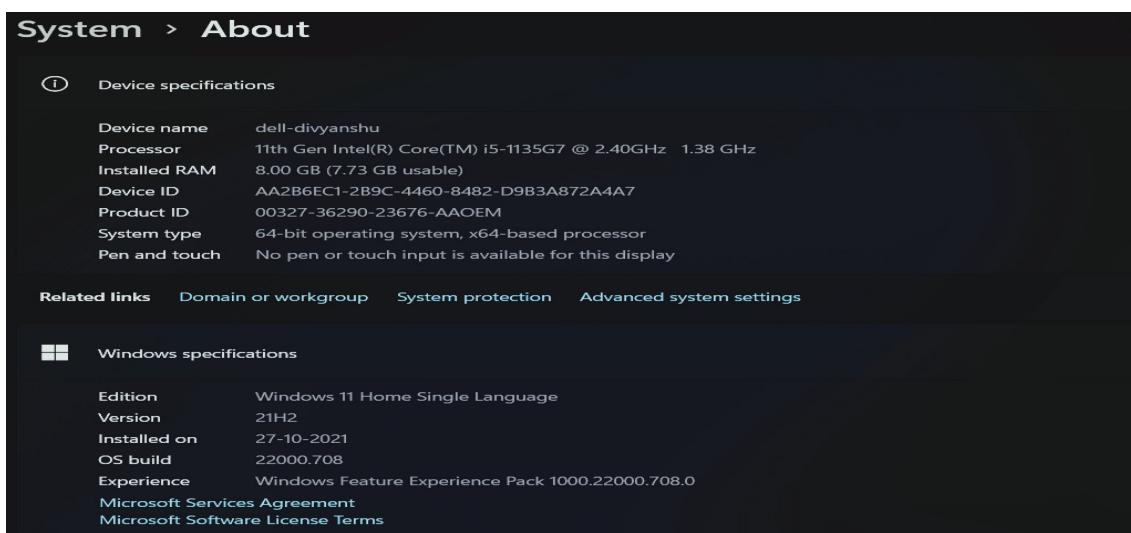
## **2.4 Software Methodology**

To accomplish the project, we had to go through various software methodologies, so that we could the one which is best to fulfil the requirements efficiently. In the market, many software tools are available, and even they could be different in their own way according to the purpose of use. So, in our case, after careful analysis, we have chosen MIT App INVENTOR, because of its specific advantages. There is some other software that we could possibly use, but we have decided to use MIT App INVENTOR as this is easy to make an android application. There are android studio and eclipse that

use java language to make an application, but our target was to achieve the project in a much simpler and more efficient manner, so the other android studies are quite complicated and even some are less efficient. Because of that, we have decided to go for the APP INVENTOR instead which is simpler and easy to use.

## **2.5 Hardware Methodology**

If we look at the hardware methodologies, it's been clear from our project that we have used a microcontroller, as this is the basic thing for carrying out all the necessary compilation of the program and causing the effect on the utilities according to the input by the users. Several microcontrollers are available in the market, like raspberry pie, Arduino Uno, etc. But according to our comfort and the efficiency that we were looking for, Arduino NANO is the best one to be chosen for our project. Raspberry pie is quite complex, as it uses the Linux-based operating system and it uses the python language. To work on this language was totally new to us, so we decided to rather go for the Arduino microcontroller because of its simplicity and efficiency. We are using computer hardware specifications was:



Configuration of The Computer

# **CHAPTER 3**

## **LIST OF MATERIAL & THEIR DISCRIPTION**

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**3.1 List of Material**

**3.2 Description of the Material Used**

**3.3 Software Description**

# **Chapter 3 :- LIST OF MATERIAL & THEIR DESCRIPTION**

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## **3.1 List of Material**

### **{Hardware Required}**

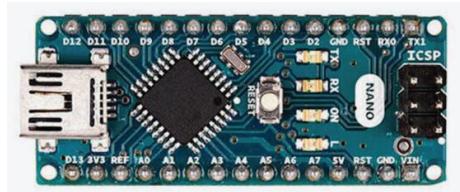
1. Arduino NANO
2. Bluetooth Module HC-05
3. TTP 223 Touch Sensor
4. IR Module (KY -022 Infrared Receiver Module)
5. IR Remote
6. 4 Channel 5v relay
7. Zero PCB Board
8. Breadboard (Solderless)
9. Power Adapter (5v 2Amp)
10. DC Female Jack
11. Male Breakable Pin Header Connector Strip
12. Voltmeter
13. M.C.B. (with MCB Housing)
14. Incandescent Light Bulb
15. Bulb holder
16. LED Strip Lamp
17. 220v A.C. Fan
18. 220v 6Amp Socket (Modular)
19. Modular Switch Board with Blanking
20. Wires

## **{Software Required}**

1. Arduino IDE
  2. MIT App Inventor
  3. MATLAB R2022B
  4. Proteus 8 Professional
  5. Canva
  6. MS Word
  7. MS PowerPoint
  8. MS Excel
  9. Adobe Acrobat DC Pro
-

## **3.2 Description of Material Used**

### **1. Arduino Nano.**



Arduino boards are introduced for non-tech people who struggle to make heavy electronic circuits with a constant worry to put all wires and components in place. These units are a remarkable addition to the electronic industry as they are easy to learn and integrate into various electronic projects. Everything is combined inside a single package and you can simply plug the device into the computer and start playing with it. All you need to learn is coding – to program the board and you're good to design, develop and modify electronic projects on the go.

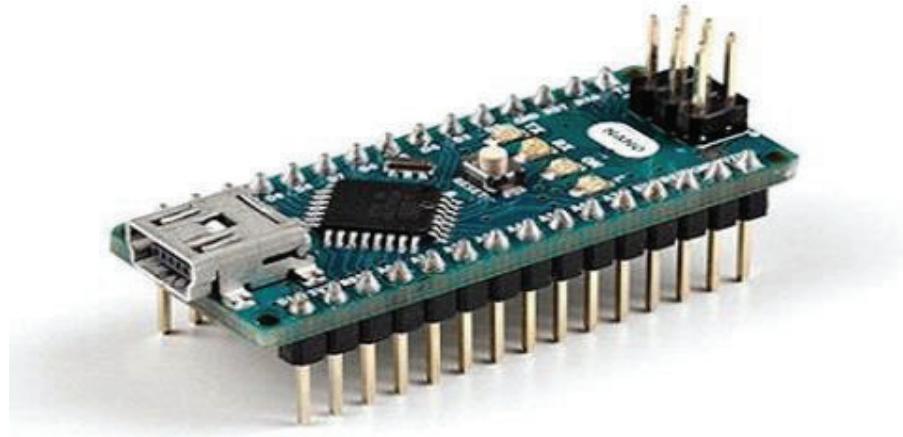
### **What is an Arduino Nano Board?**

Arduino Nano is one type of microcontroller board, and it is designed by Arduino. It can be built with a microcontroller like Atmega328. This microcontroller is also used in Arduino UNO. It is a small size board and also flexible with a wide variety of applications. Other Arduino boards mainly include Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lilypad, Arduino Leonardo, and Arduino Due. And other development boards are AVR Development Board, PIC Development Board, Raspberry Pi, Intel Edison, MSP430 Launchpad, and ESP32 board.

This board has many functions and features like an Arduino Duemilanove board. However, this Nano board is different in packaging. It doesn't have any DC jack so the power supply can be given using a small USB port otherwise sprightly connected to the pins like VCC & GND. This board can be supplied with 6 to 20volts using a mini-USB port on the board.

## **Arduino Nano Features**

The features of an Arduino nano mainly include the following.



Arduino-nano-board

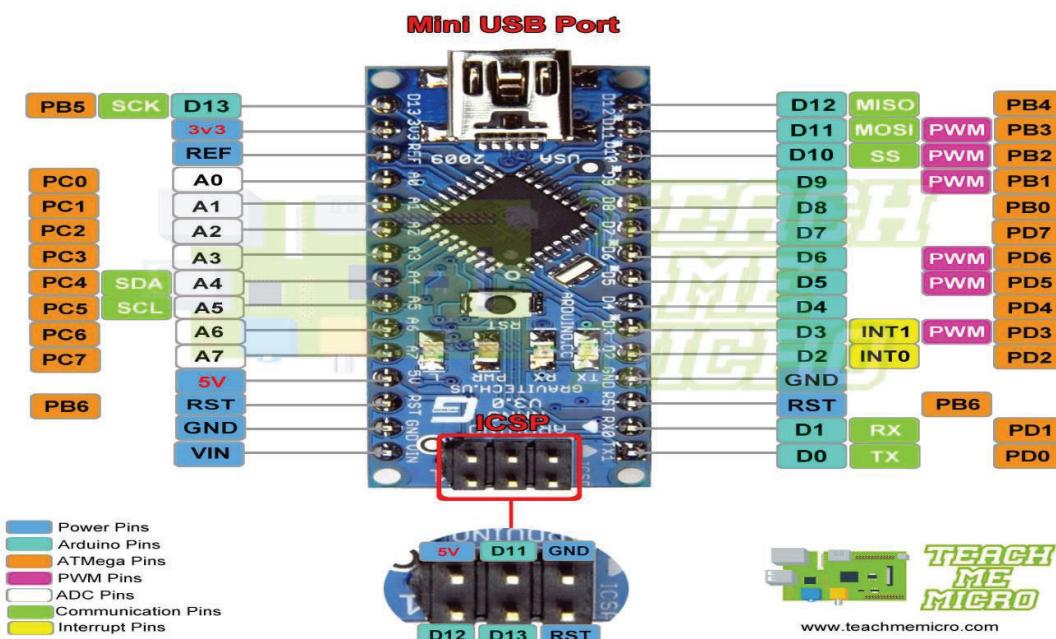
- Atmega328P Microcontroller is from the 8-bit AVR family
- Operating voltage is 5V
- Input voltage (Vin) is 7V to 12V
- Input/Output Pins are 22
- Analog i/p pins are 6 from A0 to A5
- Digital pins are 14
- Power consumption is 19 mA
- I/O pins DC Current is 40 mA
- Flash memory is 32 KB
- SRAM is 2 KB

- EEPROM is 1 KB
- CLK speed is 16 MHz
- Weight-7g
- Size of the printed circuit board is 18 X 45mm
- Supports three communications like SPI, IIC, & USART

## Arduino Nano Pinout

Arduino nano pin configuration is shown below and each pin functionality is discussed below.

### ARDUINO NANO PINOUT



**Power Pin (Vin, 3.3V, 5V, GND):** These pins are power pins

- Vin is the input voltage of the board, and it is used when an external power source is used from 7V to 12V.
- 5V is the regulated power supply voltage of the nano board and it is used to give the supply to the board as well as components.

- 3.3V is the minimum voltage that is generated from the voltage regulator on the board.
- GND is the ground pin of the board

**RST Pin (Reset):** This pin is used to reset the microcontroller

**Analog Pins (A0-A7):** These pins are used to calculate the analog voltage of the board within the range of 0V to 5V

**I/O Pins (Digital Pins from D0 – D13):** These pins are used as an i/p otherwise o/p pins. 0V & 5V

**Serial Pins (Tx, Rx):** These pins are used to transmit & receive TTL serial data.

**External Interrupts (2, 3):** These pins are used to activate an interrupt.

**PWM (3, 5, 6, 9, 11):** These pins are used to provide 8-bit PWM output.

**SPI (10, 11, 12, & 13):** These pins are used for supporting SPI communication.

**Inbuilt LED (13):** This pin is used to activate the LED.

**IIC (A4, A5):** These pins are used for supporting TWI communication.

**AREF:** This pin is used to give reference voltage to the input voltage

## Arduino Nano Communication

The communication of an Arduino Nano board can be done using different sources like using an additional Arduino board, or a computer, otherwise using microcontrollers. The microcontroller used in the Nano board (Atmega328) offers serial communication (UART TTL). This can be accessible at digital pins like TX, and RX. The Arduino software comprises a serial monitor to allow easy textual information to transmit and receive from the board.

The TX & RX LEDs on the Nano board will blink whenever information is being sent out through the FTDI & USB link in the

direction of the computer. The library-like Software Serial allows serial communication on any of the digital pins on the board. The microcontroller also supports SPI & I2C (TWI) communication.

## **Arduino Nano Programming**

All Arduino boards can be programmed using **Arduino IDE** (Integrated Development Environment) Software – An official software introduced by Arduino. All you need is a code to burn into the board to make it work as per the instructions fed into the board.

The board also features a built-in Bootloader that sets you free from getting an external burner to burn the Arduino program. The unit supports a USB interface with a mini-USB port. The USB cable is used to connect the board with the computer

The programming of an Arduino nano can be done using the Arduino software. Click the Tools option and select the nano board.

Microcontroller Atmega328 over the Nano board comes with preprogrammed with a boot loader. This boot loader lets to upload new code without using an exterior hardware programmer. The communication of this can be done with the STK500 protocol. Here the boot loader can also be avoided & the microcontroller program can be done using the header of in-circuit serial programming or ICSP with an Arduino ISP.

## **Arduino Nano Applications**

The best thing about Arduino boards is that they can work as a stand-alone project or part of other electronic projects. You can interface Arduino Nano with other Arduino boards and Raspberry Pi boards. No technical expertise is required to use Arduino boards and anyone

with little to no technical knowledge can make amazing projects with these units.

The following are the main applications of the Arduino Nano board.

- Medical Instruments
- GSM Based Projects
- Embedded Systems
- Arduino Metal Detector
- Industrial Automation
- Android Applications
- Virtual Reality Applications
- Real-Time Face Detection
- Automation and Robotics

## **2. Bluetooth module HC-05**



Bluetooth module HC-05 is used for wireless communication between Arduino Uno and smartphones. HC-05 is a slave device and it can operate at a power of 3.6 to 6 volts. It has 6 pins: State, RXD, TXD, GND, VCC, and EN. For serial communication connect the TXD pin of Bluetooth module HC-06 with RX (pin 0) of Arduino Uno and RXD pin with TX (pin 1) of Arduino Uno. The connection diagram of the adriano and Bluetooth (BT) module is illustrated.

After a global communication overview, it is decided to use Bluetooth for the communication between Arduino and mobile applications, more specifically the HC-05 module.

This module is finally chosen to meet all application requirements. It is a wireless technology, the sender and the receiver are not physically connected, but through electromagnetic waves. It has a range of 10 meters, enough to be able to control the variables using a mobile phone since this type of control makes sense when the user is inside the house. Finally, the only additional requirement to make the communication between both devices is that the mobile phone has Bluetooth connectivity, which nowadays is a standard characteristic of mobiles.

## Overview

HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for a transparent wireless serial connection setup.

The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with a complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single-chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

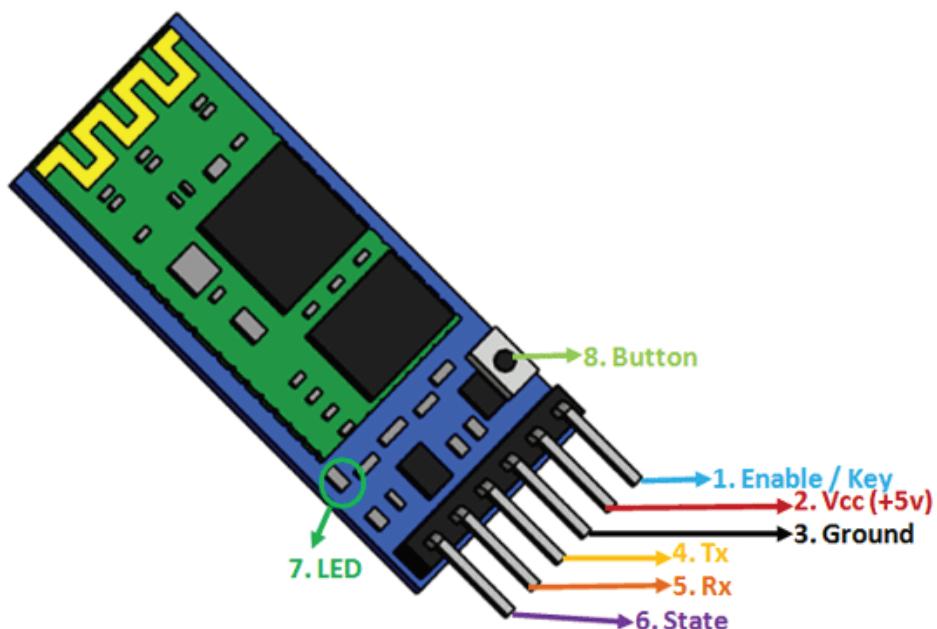
### Bluetooth Module HC-05

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device but can accept connections. The master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish a connection between MCU and GPS, PC to your embedded project, etc.

## HC-05 Specifications

- Bluetooth protocol: Bluetooth Specification v2.0+EDR
- Frequency: 2.4GHz ISM band
- Modulation: GFSK(Gaussian Frequency Shift Keying)
- Emission power:  $\leq 4\text{dBm}$ , Class 2
- Sensitivity:  $\leq -84\text{dBm}$  at 0.1% BER
- Speed: Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
- Security: Authentication and encryption
- Profiles: Bluetooth serial port
- Power supply: +3.3VDC 50mA
- Working temperature: -20 ~ +75Centigrade
- Dimension: 26.9mm x 13mm x 2.2 mm
- It is IEEE 802.15.1 standardized protocol, through which one can build a wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over the air.

## Pin Description



It has 6 pins,

**1. Key/EN:** It is used to bring Bluetooth modules into AT commands mode. By default, this pin operates in data mode. Key/EN pin should be high to operate Bluetooth in command mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode. HC-05 module has two modes,

- **Data mode:** Exchange of data between devices. Baud rate is 9600bps in data mode.
- **Command mode:** It uses AT commands which are used to change the setting of HC-05. Baud's rate is 38400bps in command mode.

**2. VCC:** Connect 5 V or 3.3 V to this Pin.

**3. GND:** Ground Pin of the module.

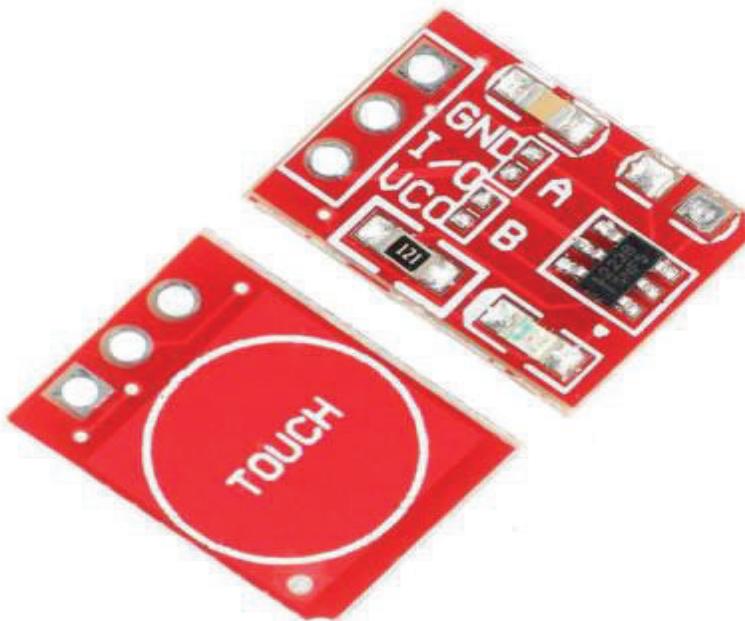
**4.TXD:** Connect with Microcontroller RXD pin of Microcontroller. Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)

**5.RXD:** Connect with Microcontroller TXD pin of Microcontroller. Received data will be transmitted wirelessly by a Bluetooth module.

## Applications

1. Wireless communication between two microcontrollers
2. Communicate with laptops, desktops, and mobile phones
3. Data Logging application
4. Consumer applications
5. Wireless Robots
6. Home Automation

### 3. TTP223 Touch Sensor



TTP223 or the touch sensor which we commonly use works as a capacitive touch switch which is ideal for driving devices under a microcontroller working voltage range

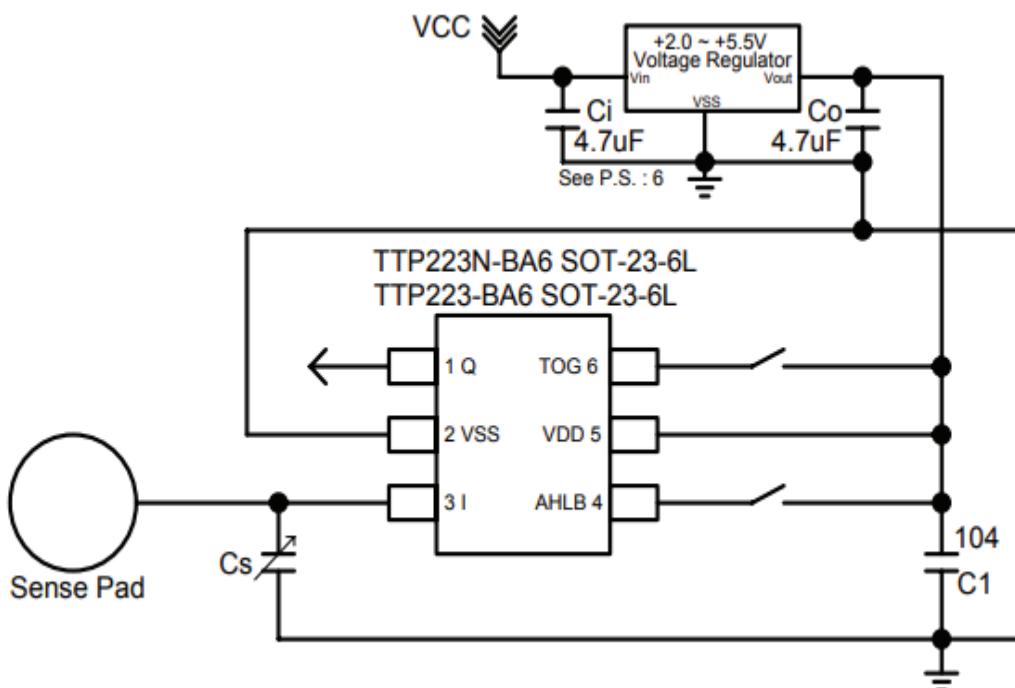
- TTP223 touch sensor is the very common sensor that is used to control the system with human interface with the system. **TTP capacitive touch sensor** is a widely used sensor in automation and project.
- So, here we are talking about, “what is a **TTP223 touch sensor?**” The touch sensor can be used in home automation and many other household things. Like you can attach the sensor to the wall on any other places
- Touch Sensors are used for controlling the system or device physically with the touch response of the body to the sensor. It comes in various sizes and multiple sensor points in single module variants.
- This sensor seems to be small in comparison to others, but the touch sensitivity of this sensor is good for beginner purposes.

- The only drawback of the most common Capacitive touch sensor i.e., the TTP223 touch sensor is that it does not have any sensitivity control potentiometer or trimmer capacitor available on the module.

## Main Features

- Operating voltage: 2~5.5V DC;
- Inching Mode: Low level in the initial state, high level with a touch, low level without touching (similar to a soft-touch button);
- Low-power consumption;
- Double-sided touch panel, a great substitute for soft-touch button;
- $4 \times M2$  screw mounting hole;
- Easy-mounting.

## TTP223 Touch Sensor schematic



- The application circuit of the TTP223 touch sensor or TTP223 IC from its datasheet which you can see. But I'll explain each pinout, and it's working in the working section of the article.
- Other than this, to control the sensitivity of the sensor or human touch, we have to desolder the SMD Capacitor that has pre-soldered onto the board and then replace it with a trimmer or the fixed value we want.
- Also, due to its most common range of voltage operation in the TTP223 Touch sensor, it can be used with almost any of the microcontroller or microprocessor.
- The PCB of the module is quite compact so the sensing pad of the sensor is rather small, but you can extend that by attaching a separate wire of the large plate for more area of sense.

## TTP223 Touch Sensor Working

- The working of the TTP223 touch sensor IC is very simple and can be understood easily through a thorough reading of the datasheet which is provided above.
- This IC comes in a SOT-23 6L package which is for both packages, either **TTP23 & or TTP223N**. The 4 pins which are used other than Power pins are used for various changes.
- Q pin in the above circuit is the output pin which gives either high or low output which gives a signal to the microcontroller the state of this pin can be changed according to the table mentioned below.

<b>TOG</b>	<b>AHLB</b>	<b>Pad Q option features</b>
<b>0</b>	<b>0</b>	<b>Direct mode, CMOS active high output</b>
<b>0</b>	<b>1</b>	<b>Direct mode, CMOS active low output</b>
<b>1</b>	<b>0</b>	<b>Toggle mode, Power on state=0</b>
<b>1</b>	<b>1</b>	<b>Toggle mode, Power on state=1</b>

- The sensitivity of the sensor can be changed via changing the Cs capacitor in the circuit diagram. Which is connected to the input pin of the IC & GND and in parallel with the touchpad.
- Upon touching the pad, the capacitance of the circuit increases, and hence the IC registers the touch.

### **Advantages:**

- The main and most important advantage of this sensor is that it can be used without actually physically any button or switch.
- Secondly due to its small size it can be fixed in almost any place without any issues with space and size. Furthermore, you can also fix it some other place and extend a wire through the touch pin as shown in the above schematic to the body of the area where sensitivity needs to be arranged.
- The working voltage level of the TTP223 touch sensor IC is 2.0V to 5.5Vw which is easily acceptable for almost all types of microcontroller and development boards. The sensitivity may change according to the voltage level concerning the microcontroller used.
- It is very low cost for a project which need capacitive touch sensitivity to control appliances or task and is mostly used in home appliances like smartwatches, Monitor buttons, etc.
- This sensor comes in multiple sensing pads at once which are useful for making touch response pads in a single place thus residing wiring and space.
- 

### **Disadvantages:**

- The main disadvantage of this sensor is that you have to isolate it from other electric or magnetic fields or places that can provide human-like touch to the sensor due to which the sensor

may react to that as touch and your project or task may malfunction.

- Secondly, you have to make sure which using wire to extend the touch pin that you properly place wire away from other power lines as this may affect the sensitivity and may affect your work.
- To change the sensitivity, you have to desolder the SMD capacitor on the PCB which is not quite easy for beginners or someone who doesn't have equipment.

#### **4. IR MODULE (KY-022 INFRARED RECEIVER MODULE).**



The KY-022 Infrared Receiver module reacts to 38kHz IR light. It can be used to receive commands from IR remote controllers from TVs, stereos, and other devices.

It can also be used together with the [KY-005 IR Transmitter module](#). Compatible with popular microcontrollers like Arduino, Raspberry Pi, ESP32, and others.

Infrared (IR) beam technology has long been widely used in technological devices. The TV controls we use constantly send information to the television via infrared light signals. The infrared

sensor receiver module is simply a receiver module as the name implies. It is used to detect infra-red rays at a specific frequency.

Various companies produce IR modules. If you want to make an IR receiver circuit with a few electronic materials easily.

## KY-022 SPECIFICATIONS

This module consists of an 1838 IR receiver, a  $1k\Omega$  resistor, an LED, and 3 male header pins.

Operating Voltage	2.7V to 5.5V
Operating Current	0.4mA to 1.5mA
Reception Distance	18m
Reception Angle	$\pm 45^\circ$
Carrier Frequency	38KHz
Low-Level Voltage	0.4V
High-Level Voltage	4.5V
Ambient Light Filter	up to 500LUX

## KY 022 IR Sensor Module Pinout:



- +VCC = 3.0V or 5.0V supply voltage
- GND is Ground (-)
- Signal will connect to Arduino, raspberry, etc...
- Reception distance: 17m
- Carrier Frequency: 38kHz

The circuit diagram of the IR sensor module is very simple. You just need to materialize the 1838B IR receiver. When using this receiver in your circuits, you can use LEDs and Resistors, as is the case with Keyes.

### **VS(OS) 1838B IR receiver specifications:**

- Compact design;
- Built-in dedicated IC;
- Wide-angle and long-distance reception;
- Can more than offset the impact of ambient light;
- Low voltage operation;

### **Application of IR MODULE\_(KY-022 INFRARED RECEIVER MODULE)**

#### **1. IR remote Home Control using the KY-022 IR receiver**

In this project, you can control the lighting of multiple rooms by remote control. We need additional equipment like Relay Module, buzzer, and remote control.

#### **2. Universal Arduino Remote**

This project won the award for best remote-control project at Instructible. Ky 022 and encoder are used in this project, you can control hundreds of buttons with a single controller.

### **3. Sensor Based 4WD Vehicle**

As in the above project, you can control a 4-wheeled vehicle with the KY 022 module and the remote control.

### **4. Controlling LED's With an IR Remote**

This may be the first project that beginners should do. In this project, you control several LEDs by remote.

### **5. Servo motor control with KY 022 infrared receiver module**

You can easily control the motors such as the servo motor via Arduino. This project explains how to control a servo motor using KY 022.

## **5. IR REMOTE**



An infrared (IR) remote control uses light signals sent from a transmitter located at one end of the remote to a receiver in another electronic device.

These devices include televisions, stereos, DVD players, game consoles, and more. The basic operation of an IR remote control is a bulb or set of bulbs at the end of the remote that sends instructions to remote electronic devices using an invisible (infrared) light.

There are different types of IR remotes, from the least expensive with only one IR transmitter to higher-end units that feature several IR transmitters. Electronic devices compatible with IR remotes feature sensors on the front that can detect infrared light and decode the instructions.

## How IR Remote Controls Work

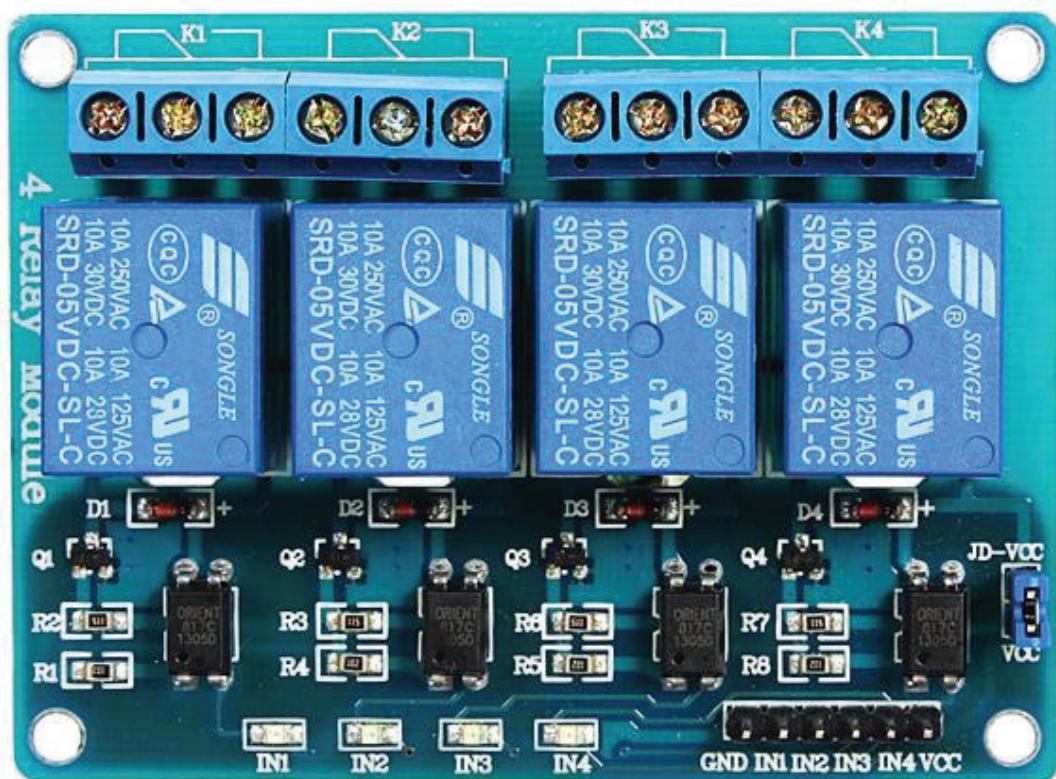
The transmitter at the end of the remote transmits an electromagnetic signal with a wavelength that's somewhat longer than visible light. The IR remote control pulses this "invisible" light in binary code.

Each "command" has a specific code. These command codes might include:

- Power on
- Volume up or down
- Channel up or down
- Opening and navigating on-screen menus

The electronic devices receiving the signal have sensors to detect the IR light. These sensors transmit the code to the microprocessor inside the electronic device. The microprocessor then interprets the code and translates it into the appropriate instructions to perform.

## 6. Relay (4 Channel 5v)



4 Channel Relay Board is a simple and convenient way to interface 4 relays for switching applications in your project. Very compact design can fit in a small area, manly this board is made for low voltage application.

### **Features:**

- 4-Channel Relay interface board and each one needs 15-20mA Driver Current
- Both controlled by 12V and 5V input Voltage
- Equipped with high-current relay, AC250V 10A; DC30V 10A
- Standard interface that can be controlled directly by microcontroller (Arduino, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic active low)

- Opto-isolated inputs
- Indication LEDs for Relay output status.

## Pin-out Instruction:

**Vcc** :- Power(5V DC)

**GND**:- GND

**IN1**:- Signal pin, connected with Arduino and control Relay 1

**IN2**:- Signal pin, connected with Arduino and control Relay 2

**IN3**:- Signal pin, connected with Arduino and control Relay 3

**IN4**:- Signal pin, connected with Arduino and control Relay 4

**COM**:- Common pin, which usually directly connects with the “Gnd” unless you want to change the TTL mode  
(default the HIGH level activate)

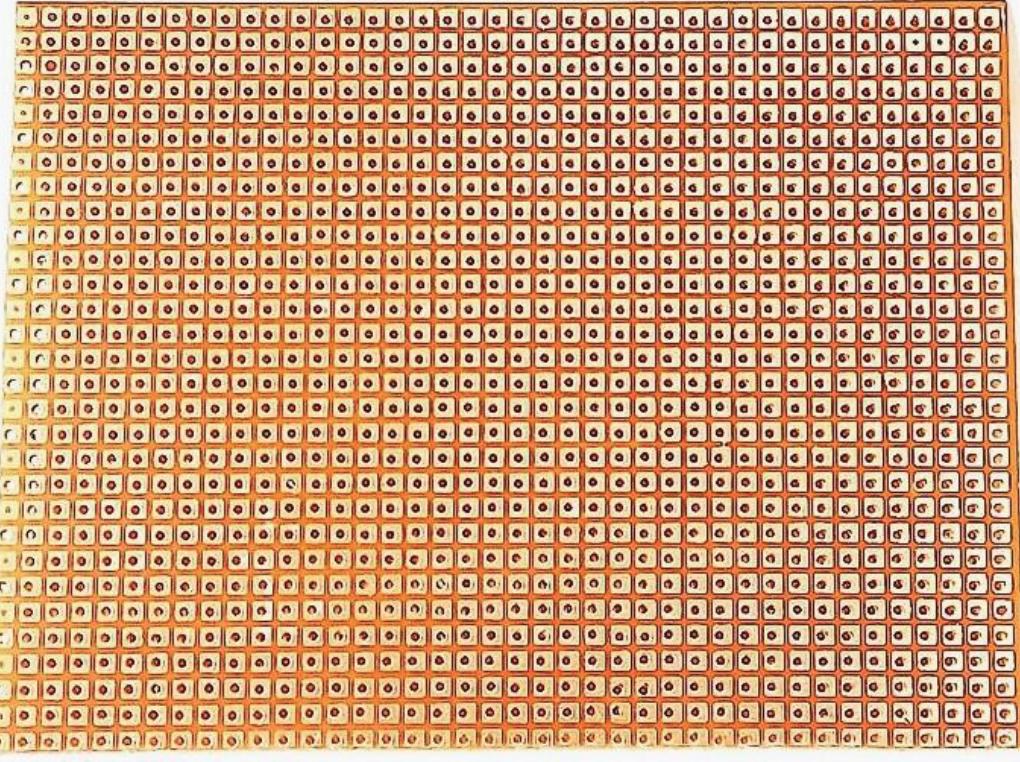
**NO**:- Normally Open Connection

**NC**:- Normally Closed Connection

**C (middle pin)**:- Common Connection, which connected with the power for the load.

**Note**:- The last pin “COM” “NC” “and C” is not indicated on the Board, because there is not enough place for these. But we indicate this by a simple graphic for each Relay terminal.

## 7. Zero PCB Board

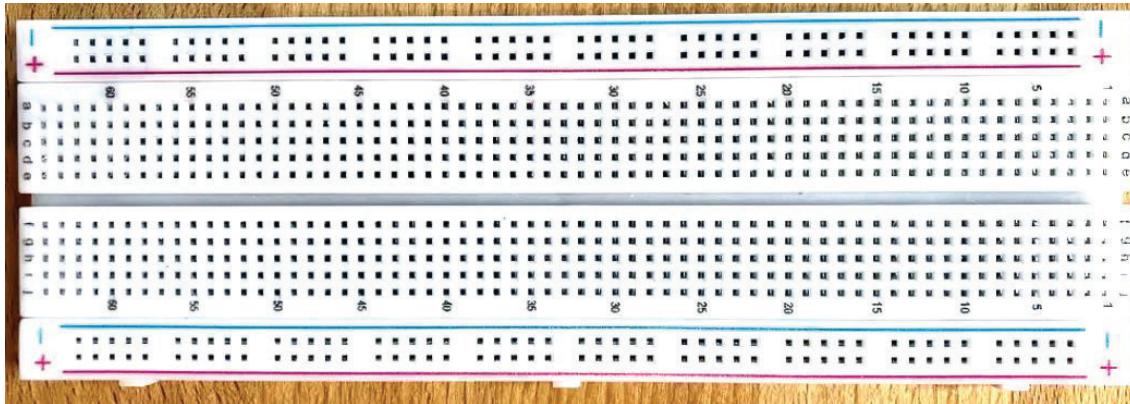


Zero PCB is basically a general-purpose printed circuit board (PCB), also known as perfboard or DOT PCB. It is a thin rigid copper sheet with holes pre-drilled at standard intervals across a grid with 2.54mm (0.1-inch) spacing between holes. Each hole is encircled by a round or square copper pad so that component lead can be inserted into the hole and soldered around the pad without short-circuiting the nearby pads and other leads. For connecting the lead of a component with another lead, solder these together or join these using a suitable conducting wire.

Veroboard or stripboard is also a general-purpose PCB characterized by a 2.54mm regular (rectangular) grid of holes, with parallel strips of copper cladding running in one direction across one side of the board. This general-purpose PCB is known by the name of the original product, Veroboard, a trademark of British company Vero Technologies Ltd and Canadian company Pixel Print Ltd.

Both zero PCB and Veroboard are popular among hobbyists, beginners, and students for rapid prototyping and project works.

## **8. Breadboard (Solderless)**



The breadboard is a white rectangular board with small embedded holes to insert electronic components. It is commonly used in electronics projects. We can also say that breadboard is a prototype that acts as a construction base of electronics.

A breadboard is derived from two words bread and board. The word breadboard was initially used to slice the bread pieces. But, it was further named as a breadboard for its use in electronics around the 1970s. Hence, the term breadboard refers to these boards only and provides a quick electrical connection.

A breadboard is also categorized as a Solderless board. It means that the component does not require any soldering to fit into the board. Thus, we can say that breadboard can be reused. We can easily fit the components by plugging their end terminal into the board. Hence, a breadboard is often called a plugboard.

## **9. Power Adapter (5v 2Amp)**



A power supply for electronic devices. Also called an “AC adapter” or “charger,” power adapters plug into a wall outlet and convert AC to a single DC voltage. Computers use multiple DC voltages, and the power adapter is the external part of the power supply for a laptop. The additional DC voltages are created by internal circuits. Desktop computer power supplies are in one internal unit, which converts AC to all DC voltages.

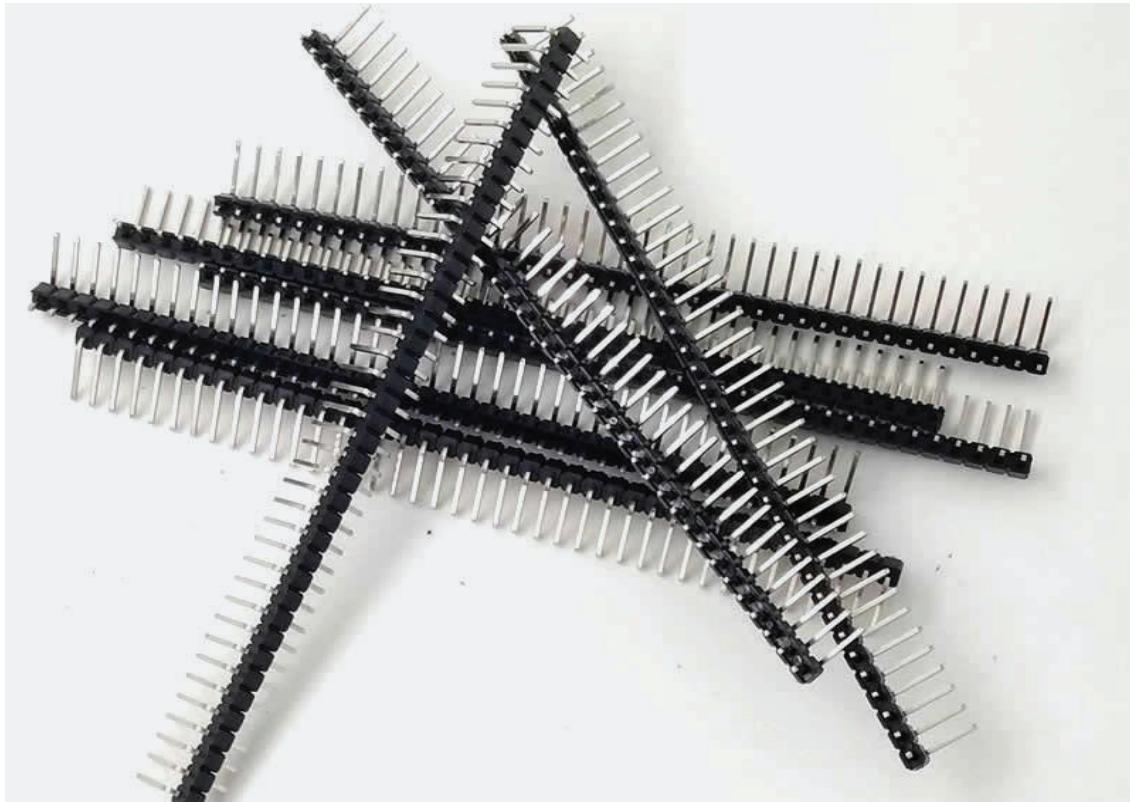
## **10. DC Female Jack**



DC female power jack are commonly used in the electronic industry to connect adapters to your circuit board. The most commonly used DC female jack is a 2.1mm x 5.5 mm DC jack. Where 5.5mm is the outer diameter and 2.1mm is the internal pin size.

The DC plug (male) should match this dimension for proper matching. Most of the non-proprietary co-axial power plugs match the 2.1 x 5.5 dimensions. In most of the DC plugs, the outer body is the negative supply and the internal is positive.

## **11. Male Breakable Pin Header Connector Strip**



Male header pins (Straight) are used on PCB or perf board to tap out connections. They can be commonly found on development boards, test boards, evaluation boards, and sensor modules. Connections to this pin can be made using Female connecting wires without the need for soldering this all sers user to reuse the board or module for different connections as we can do rapid prototyping by easily swapping the wires around and not worrying about the soldering the wire onto that pin. Also, you can better organize the wires in the project as you have a specified place for all the wires to be connected and then you can trace the connections behind the board as well. It is also used on PCB to make external connections and expand the surface mount component's legs to be connected to external components via jumper wires. The male header pin strip consists of 40 pins. It can be easily broken based on the required number and used.

## 12. Voltmeter



A **voltmeter** is an instrument used for measuring the electric potential difference between two points in an electric circuit. It is connected in parallel. It usually has a high resistance so that it takes negligible current from the circuit.

Analog voltmeters move a pointer across a scale in proportion to the voltage measured and can be built from a galvanometer and series resistor. Meters using amplifiers can measure tiny voltages of microvolts or less. Digital voltmeters give a numerical display of voltage by use of an analog-to-digital converter.

Voltmeters are made in a wide range of styles, some separately powered (e.g. by battery), and others powered by the measured voltage source itself. Instruments permanently mounted in a panel are used to monitor generators or other fixed apparatus. Portable instruments, usually equipped to also measure current and resistance in the form of a multimeter, are standard test instruments used in electrical and electronics work. Any measurement that can be converted to a voltage can be displayed on a meter that is suitably

calibrated; for example, pressure, temperature, flow, or level in a chemical process plant.

General-purpose analog voltmeters may have an accuracy of a few percent of full scale and are used with voltages from a fraction of a volt to several thousand volts. Digital meters can be made with high accuracy, typically better than 1%. Specially calibrated test instruments have higher accuracies, with laboratory instruments capable of measuring accuracies of a few parts per million. Part of the problem of making an accurate voltmeter is that of calibration to check its accuracy. In laboratories, the Weston cell is used as a standard voltage for precision work. Precision voltage references are available based on electronic circuits.

## 13. M.C.B.



A Miniature Circuit Breaker (MCB) is an automatically operated electrical switch used to protect low voltage electrical circuits from damage caused by excess current from an overload or short circuit. MCBs have typically rated up to a current up to 125 A, do not have adjustable trip characteristics, and can be thermal or thermal-magnetic in operation. Nowadays miniature circuit breakers (MCBs) are much more commonly used in low voltage electrical networks instead of fuses.

## **Working Principle of Miniature Circuit Breaker**

There are two arrangements of operation of a miniature circuit breaker. One due to the thermal effect of over current and the other due to the electromagnetic effect of over current. The thermal operation of the miniature circuit breaker is achieved with a bimetallic strip whenever continuous overcurrent flows through MCB, the bimetallic strip is heated and deflects by bending.

This deflection of the bimetallic strip releases a mechanical latch. As this mechanical latch is attached to the operating mechanism, it causes to open the miniature circuit breaker contacts.

But during short circuit conditions, the sudden rising of current causes electromechanical displacement of plunger associated with tripping coil or solenoid of MCB. The plunger strikes the trip lever causing the immediate release of the latch mechanism consequently opening the circuit breaker contacts. This was a simple explanation of the miniature circuit breaker working principle.

## **14. Incandescent Light Bulb**



An incandescent light bulb, incandescent lamp, or incandescent light globe is an electric light with a wire filament heated until it glows.

The filament is enclosed in a glass bulb with a vacuum or inert gas to protect the filament from oxidation. Current is supplied to the filament by terminals or wires embedded in the glass. A bulb socket provides mechanical support and electrical connections.

Incandescent bulbs are manufactured in a wide range of sizes, light output, and voltage ratings, from 1.5 volts to about 300 volts. They require no external regulating equipment, have low manufacturing costs, and work equally well on either alternating current or direct current. As a result, the incandescent bulb became widely used in household and commercial lighting, for portable lighting such as table lamps, car headlamps, flashlights, and decorative and advertising lighting.

Incandescent bulbs are much less efficient than other types of electric lighting, converting less than 5% of the energy they use into visible light.<sup>[1]</sup> The remaining energy is lost as heat. The luminous efficacy of a typical incandescent bulb for 120 V operation is 16 lumens per watt, compared with 60 lm/W for a compact fluorescent bulb or 150 lm/W for some white LED lamps.

Some applications use the heat generated by the filament. Heat lamps are made for uses such as incubators, lava lamps, and the Easy-Bake Oven toy. Quartz tube halogen infrared heaters are used for industrial processes such as paint curing or for space heating.

## **15. Bulb Holder**

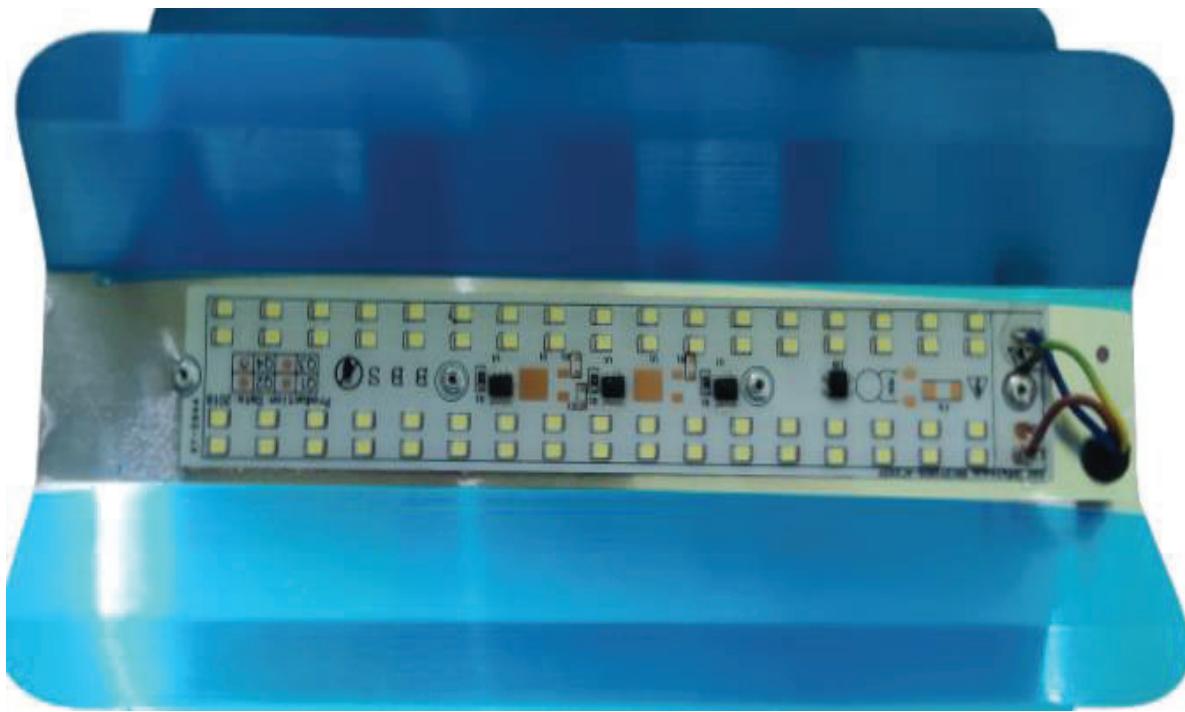


A bulb socket, light socket, lamp socket, or lamp holder is a device that mechanically supports and provides electrical connections for an electric lamp. Re-lamping is possible with the help of sockets. meaning of bulb holder. A device for securing a lamp to its support; specifically, a sockets or holders fitted with electric terminals, into which the top of the glass globe of a lamp is fitted, or from which it hangs.

How does a bulb holder work?

There is a tab-shaped contact inside the light sockets. The bulb's tip is touched by the contact. The threaded base of the bulb is held in place by the threaded base of the sockets. The circuit is completed when the white common wire touches the base of the sockets.

## 16. Led Strip Lamp



An LED lamp or LED light bulb is an electric light that produces light using light-emitting diodes (LEDs). LED lamps are significantly more energy-efficient than equivalent incandescent lamps and can be significantly more efficient than most fluorescent lamps. The most efficient commercially available LED lamps have efficiencies of 200 lumens per watt (Lm/W). Commercial LED lamps have a lifespan many times longer than incandescent lamps.

LED lamps require an electronic LED driver circuit to operate from mains power lines and losses from this circumeanans that the efficiency of the lamp is lower than the efficiency of the LED chips it uses. The driver circuit may require special features to be compatible with lamp dimmers intended for use on incandescent lamps.

## 17. A.C. Fan (220v)



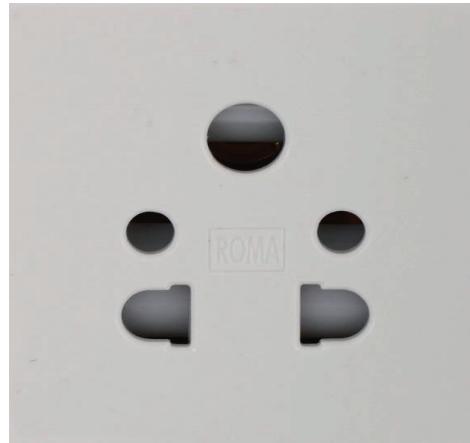
A fan is a powered machine used to create a flow of air. A fan consists of a rotating arrangement of vanes or blades, generally made of wood, plastic, or metal, which act on the air. The rotating assembly of blades and hub is known as an impeller, rotor, or runner. Usually, it is contained within some form of housing, or case.<sup>[1]</sup> This may direct the airflow, or increase safety by preventing objects from contacting the fan blades. Most fans are powered by electric motors, but other sources of power may be used, including hydraulic motors, hand cranks, and internal combustion engines.

The motor that converts the alternating current into mechanical power by using an electromagnetic induction phenomenon is called an AC motor. This motor is driven by an alternating current. The stator and the rotor are the two most important parts of the AC motors. The stator is the stationary part of the motor, and the rotor is the rotating part of the motor. The AC motor may be single-phase or three-phase.

The three-phase AC motors are mostly applied in the industry for bulk power conversion from electrical to mechanical. For small power

conversion, the single-phase AC motors are mostly used. The single-phase AC motor is nearly small in size, and it provides a variety of services in the home, office, business concerns, factories, etc. Almost all domestic appliances such as refrigerators, fans, washing machines, hair dryers, mixers, etc., use single-phase AC motors.

## **18. Socket (220v, 6 Amp)**



Electrical sockets, or outlets, allow us to plug-in appliances to attach them to the electrical grid and provide power for them to run.

## **19. Switch Board**



An apparatus (as in a telephone exchange) consists of a panel on which are mounted electric switches so arranged that several circuits may be connected, combined, and controlled.

## 20. Wires



A wire is a flexible strand of metal.

The wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number.

Wires are used to bear mechanical loads, often in the form of wire rope. In electricity and telecommunications signals, a "wire" can refer to an electrical cable, which can contain a "solid core" of a single wire or separate strands in stranded or braided forms.

### **3.3 Software Description**

#### **1. Arduino IDE**

The Arduino IDE is open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.'

#### **2. MIT App Inventor**

MIT App Inventor is a web application integrated development environment originally provided by Google and now maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to create application software(apps) for two operating systems (OS): Android, and iOS

#### **3. MATLAB**

MATLAB (an abbreviation of "MATrix LABoratory") is a proprietary multi-paradigm programming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.

Although MATLAB is intended primarily for numeric computing, an optional toolbox uses the MuPAD symbolic engine allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

## **4. Proteus 8 Professional**

A powerful application that was specially created to help designers more easily build and verify the circuit boards they need. Proteus is a powerful computer-aided design (CAD) software that was specially designed to help designers build and check circuit boards easily. By using this Proteus 8 Professional Crack Only, you can create highly complex electrical circuit designs that require not only solid knowledge but also a set of tools to get the job done. It allows you to design a PCB in which there are very detailed electrical components, such as microcontrollers, microprocessors, and other components that are often used in electrical circuits.

## **5. Canva**

Canva is a free graphic design platform that allows you to easily create invitations, business cards, flyers, lesson plans, zoom backgrounds, and more using professionally designed templates. You can even upload your photos and add them to Canva's templates using a drag and drop interface. It's like having a basic version of Photoshop that's free and doesn't require extensive photo editing knowledge to use. Here's everything you need to know about using Canva.

# **CHAPTER 4**

# **SYSTEM**

# **DEVELOPMENT &**

# **ANALYSIS**

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## **4.1 System Development**

# **Chapter 4:- SYSTEM DEVELOPMENT & ANALYSIS**

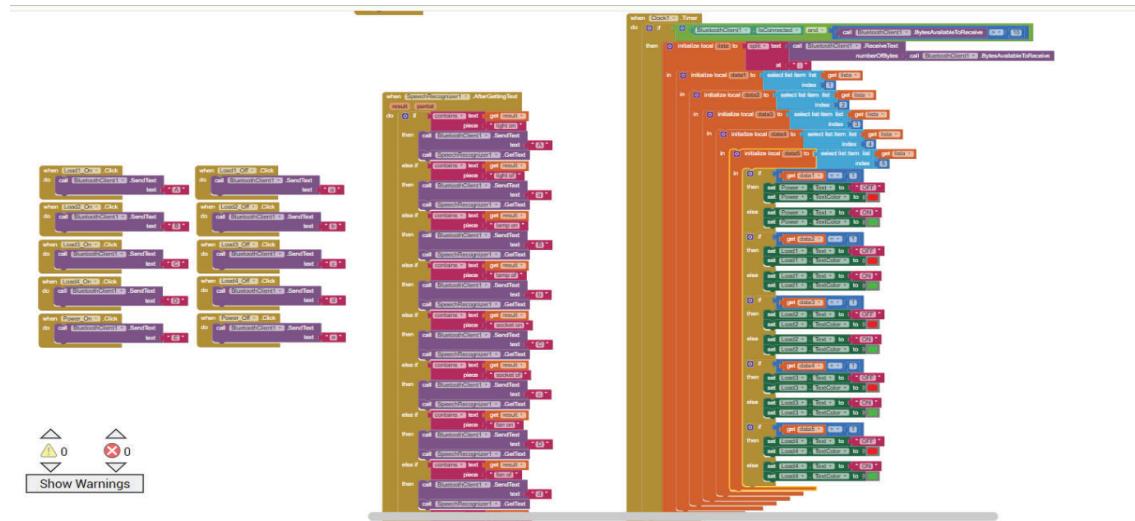
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## **4.1 System development**

In this project, we are combining two things, hardware, and software. So, according to this, we need to be aware of each step that is required to follow. As we are coding in the microcontroller, and for the software, we need to be aware of the developing process of the application and course the hardware which is linked to it. We are going to Use SDLC (**Systems development life cycle**) method to demonstrate the developing steps of the hardware and the software. Following are some of the phases that we have followed for our project, which include the development of the application (software) along with the hardware development.

### **4.1.1 Phase one: software development**

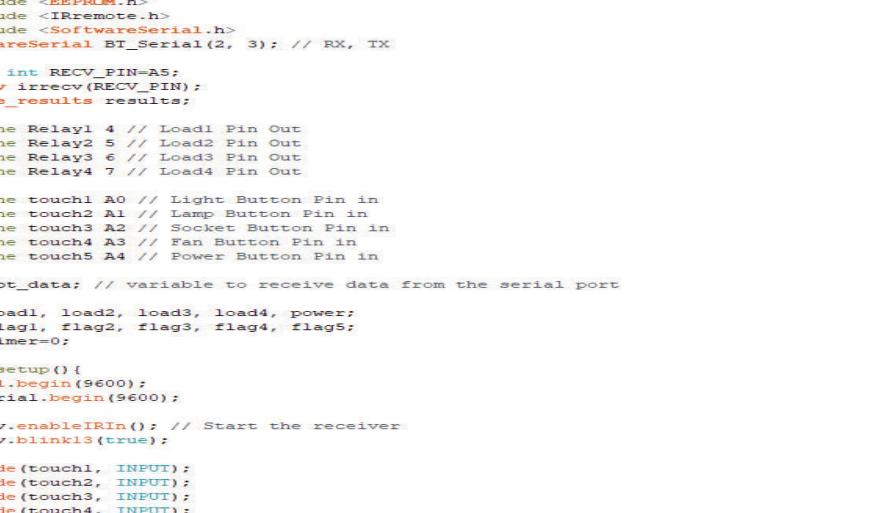
We are developing an application with a graphical user interface (GUI) for converting the voice into text and sending the command over the internet / Bluetooth. This GUI will appear for the user to perform a certain task by voice. Software development of our project is specialized to take the input and convert to computer-readable format (text), and once that is accomplished, the voice is to be transferred over the Internet/Bluetooth, so that it could reach the Arduino board and the action is performed.



The software, that we are using is app inventor which is written by MIT. This is a web-based IDE that will make a code run online. It is only applicable to creating Android software. We have chosen this because we can build an application in a unique and better way secondly it is more fun to make an application with graphical logic, methods, and functions. We have described all detailed descriptions of the coding in the

#### **4.1.2 Phase two: Testing the hardware with Arduino NANO and Debugging.**

When the process of application of converting the voice into text is done, then this command must travel to Arduino to act. So, for this, we have an intelligent Arduino NANO which has the functionality of executing the command that will be received. For this, we have done programming in the microcontroller so that it could understand the upcoming commands and execute them because the microcontroller is there to control the home utilities according to the command received from, the user's mobile application. The code we have used in Arduino exactly matches with the codes in the application, in terms of understanding each other, so that the same reference code is executed accordingly and action is performed on the home utilities



The screenshot shows the Arduino IDE interface with the following details:

- Title Bar:** home\_automation | Arduino 1.8.19 (Windows Store 1.8.37.0)
- Menu Bar:** File Edit Sketch Tools Help
- Toolbar:** Includes icons for Checkmark, Refresh, Open, Save, Upload, and Download.
- Code Area:** Displays the `home_automation.ino` sketch. The code includes definitions for pins, serial communication, and digital inputs for various buttons and relays. It also includes setup and loop functions for receiving IR signals and controlling the relay outputs.

```
home_automation

1 #include <EEPROM.h>
2 #include <IRremote.h>
3 #include <SoftwareSerial.h>
4 SoftwareSerial BT_Serial(2, 3); // RX, TX
5
6 const int RECV_PIN=A5;
7 IRrecv irrecv(RECV_PIN);
8 decode_results results;
9
10 #define Relay1 4 // Load1 Pin Out
11 #define Relay2 5 // Load2 Pin Out
12 #define Relay3 6 // Load3 Pin Out
13 #define Relay4 7 // Load4 Pin Out
14
15 #define touch1 A0 // Light Button Pin in
16 #define touch2 A1 // Lamp Button Pin in
17 #define touch3 A2 // Socket Button Pin in
18 #define touch4 A3 // Fan Button Pin in
19 #define touch5 A4 // Power Button Pin in
20
21 char bt_data; // variable to receive data from the serial port
22
23 int load1, load2, load3, load4, power;
24 int flag1, flag2, flag3, flag4, flag5;
25 int timer=0;
26
27 void setup(){
28   Serial.begin(9600);
29   BT_Serial.begin(9600);
30
31   irrecv.enableIRIn(); // Start the receiver
32   irrecv.blink13(true);
33
34   pinMode(touch1, INPUT);
35   pinMode(touch2, INPUT);
36   pinMode(touch3, INPUT);
37   pinMode(touch4, INPUT);
38   pinMode(touch5, INPUT);
39
40   pinMode(Relay1, OUTPUT); digitalWrite(Relay1, 1);
41   pinMode(Relay2, OUTPUT); digitalWrite(Relay2, 1);
42   pinMode(Relay3, OUTPUT); digitalWrite(Relay3, 1);
43   pinMode(Relay4, OUTPUT); digitalWrite(Relay4, 1);
44 }
```

#### **4.1.3 Phase three: Implementing the Hardware with home Utilities.**

This phase of development includes the use of connecting the ultimate product that is required to be managed. Home utilities that we are intended to use for our project are lights, fans TV, etc. will be connected to the relay board. This board is joined with the Arduino and in return, Arduino is connected to the application that will take the input from the user. So basically, the process work from the application through input, and after execution from the Arduino, action (output) will be performed by the home utilities. We have utilized all the required relay boards for our project along with all of their corresponding connection tools.

#### **4.1.4 Phase four: Software testing with coordination of hardware.**

This phase of the development lifecycle of our project is crucial as it tells the working status of the whole system. Its operation all depends on the hardware that has been used, secondly, it also depends

on the codes and software implementation that is done on the microcontroller as well as on the mobile application. Synchronization and the operation of the whole system justify the correctness of the system, and this can find out by doing testing and troubleshooting. In case, if something comes across like bugs that can be detected very easily. We are connecting our hardware with the home appliances and the just newly built hardware and the software and testing whether the whole system works well or not. We will make sure that the system does not have any bugs relating to the security issue and working process. We have elaborately illustrated testing in other parts of this assignment.

#### **4.1.5 Phase five: Data analysis.**

This phase of development involves the formal completion of the product ultimately. This is a point where the product is used on a commercial basis, which means it is handed down to the users to utilize the feature and tell us about their experience. Collecting data from the users is important as it gives an overview of most of the people and helps us to understand if it's required to improve something in any way. In other words, all the updates, upgrade, or change is done will be based on the user requirements. This data analysis from the user makes the system sustainable and more user-friendly by giving the end-user every time a better experience as per their demand and even this data can help to improve future projects that require a similar basis.

# **CHAPTER 5 :-**

## **SYSTEM DESIGN & IMPLEMENTATION**

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**5.1 System Design**  
**Block Diagram**  
**Circuit Diagram**

**5.2 Implementation**

# **Chapter 5 :- SYSTEM DESIGN & IMPLEMENTATION**

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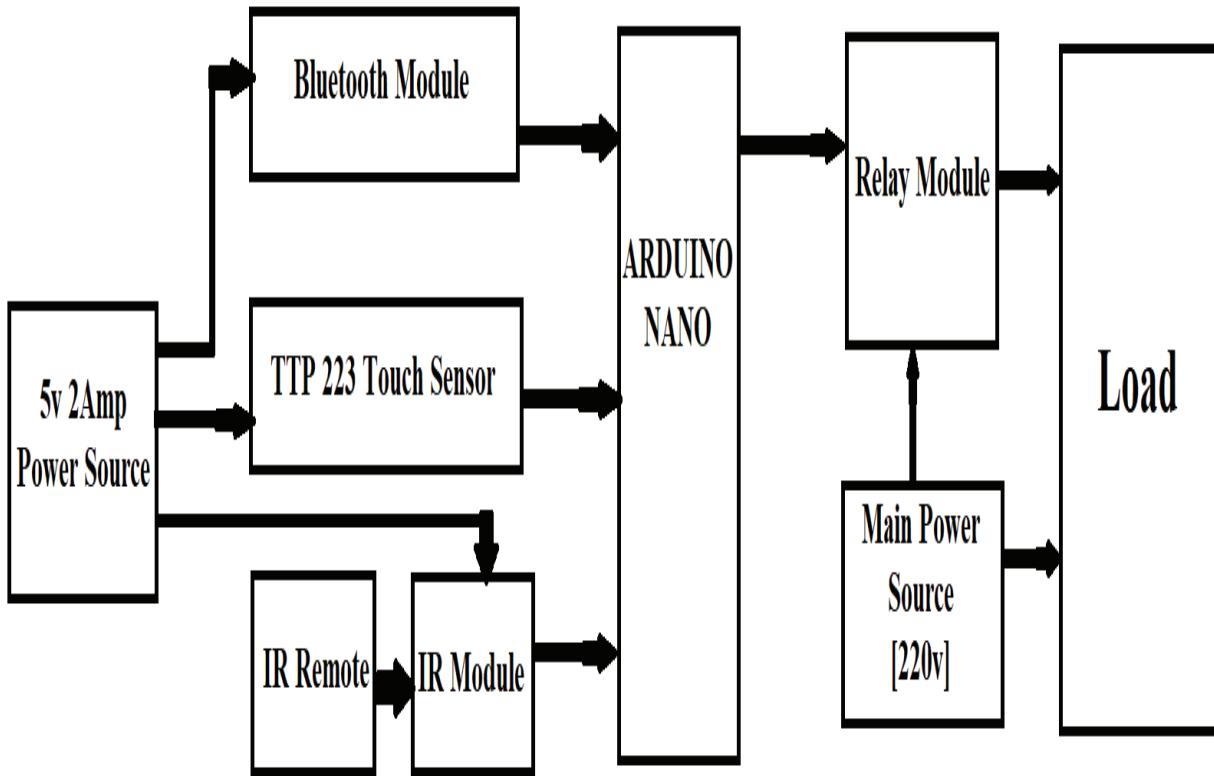
## **5.1 System Design**

In this project, we are combining two things together, hardware and software. As we are coding in the microcontroller and the software, we need to be aware of the developing process of the application and the hardware. As we have used SDLC (Systems development life cycle) method to demonstrate the developing steps of the hardware and the software. We have planned everything in this project in a sequence so that all the project goals are achieved as required. So, for system design, we have used certain criteria that could combine both software and hardware in an orderly manner. In this chapter, we will describe the tools and skills required to develop a system with a combination of software and hardware.

To illustrate our system design we have used various diagrams, like circuit diagrams, block diagrams, etc.

### **5.1.1 Block Diagram**

The microcontroller is the main part of the project. Here in the diagram, it explains that the command is taken from the smartphone, touch sensor, or through an IR receiver and then pass to the Arduino. After the Arduino is executed, the command is then passed to the relay board to turn the utilities on or off accordingly. Light, fan or lamp, or socket are turned on/off as the relay board is turned on or off. Arduino Uno uses C Language. The Arduino company named it “sketch”.

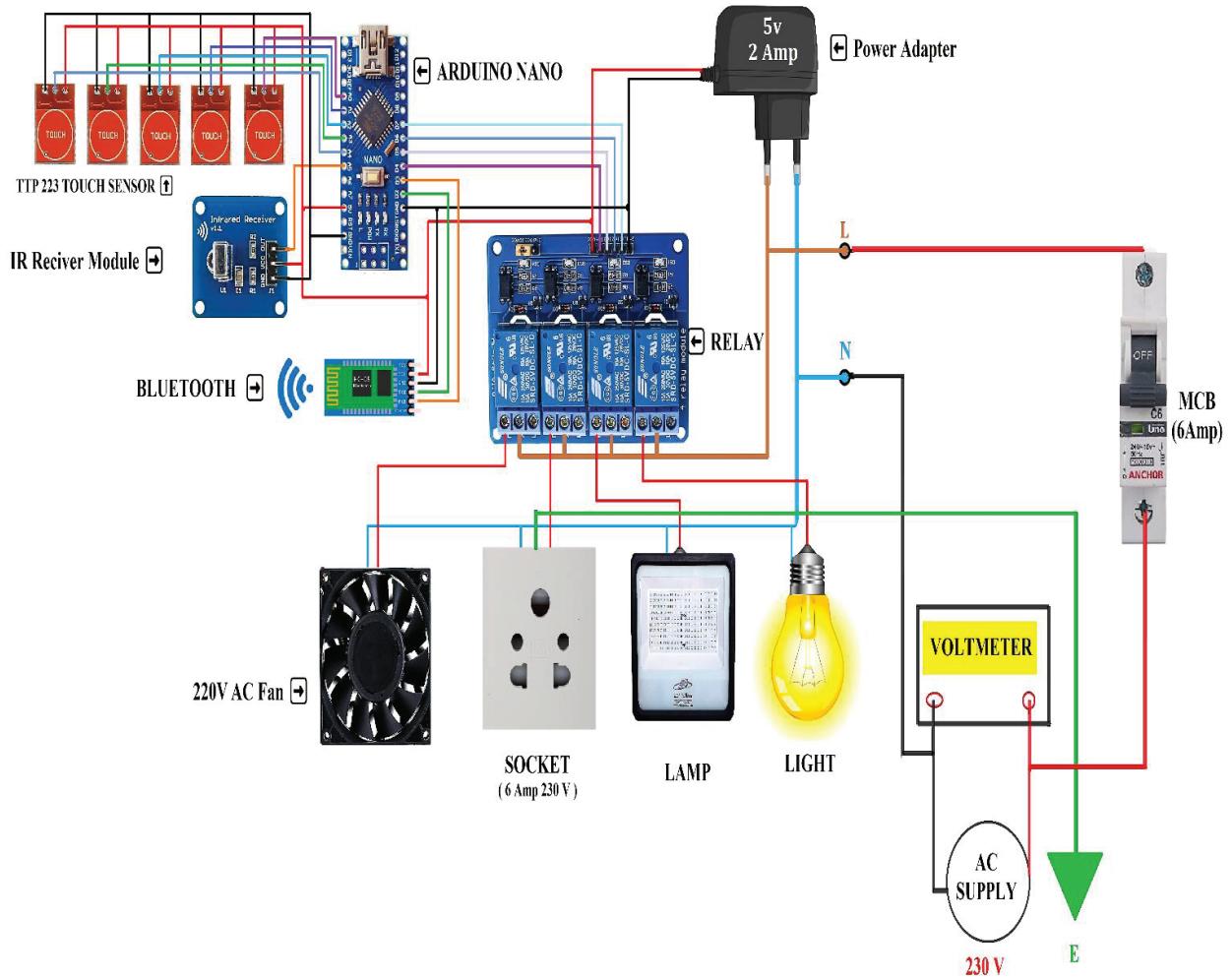


*BLOCK DIAGRAM*

### 5.1.2 Circuit Diagram

Circuit diagrams are the illustrative diagram to show the circuits that help engineers to understand which element is connected to where and how. It is a graphical representation of wires, cables, and boards together. As our project is based on the circuit, where all the elements of the project are interconnected. A circuit diagram is a simplified representation of the components of an electrical circuit using either the images of the distinct parts or standard symbols. It shows the relative positions of all the elements and their connections to one another. It is often used to provide a visual representation of the circuit to an electrician.

The following circuit design shows the circuit diagram, the Arduino device is connected to the board Board, which is further connected to the utilities i.e., light and fan. There is also a Bluetooth module connected which is responsible for receiving the signals from the mobile application.



*CIRCUIT DIAGRAM*

## 5.2 Implementation

This is the phase of the lifecycle where all the components are implemented and connected in the real-time scenario so that the ultimate targets and objectives are achieved accordingly. This is the part where most of the practical approach comes in handy. All the previous Designing, analysis, and coding come to the scenario at this phase. Here we describe the step-by-step different functionality we undertook to achieve the end goal in every module with their outputs. As this is the most crucial part of the project and we need to be more conscious than any other parts, we have considered this as the main part of the project. Understanding the importance of this phase we

have divided it into different steps (stages) whilst preparing the implementation process for our voice-controlled home automation project.

### **5.2.1 Stage One: Coding**

In this step, we have made the necessary code to burn Arduino NANO and App Development using MIT APP Inventor

#### **a) Coding Arduino NANO**

First of all, install the required libraries in Arduino IDE. For this, go to the Sketch menu and click on the Manage libraries option. Then search the library name and click on the install button.

After installing the required libraries, Write the code ( the code is written below )

```
#include <EEPROM.h>
#include <IRremote.h>
#include <SoftwareSerial.h>
SoftwareSerial BT_Serial(2, 3); // RX, TX
const int RECV_PIN=A5;
IRrecv irrecv(RECV_PIN);
decode_results results;
#define Relay1 4 // Load1 Pin Out
#define Relay2 5 // Load2 Pin Out
#define Relay3 6 // Load3 Pin Out
#define Relay4 7 // Load4 Pin Out
#define touch1 A0 // Light Button Pin in
#define touch2 A1 // Lamp Button Pin in
#define touch3 A2 // Socket Button Pin in
#define touch4 A3 // Fan Button Pin in
#define touch5 A4 // Power Button Pin in
char bt_data; // variable to receive data from the serial port
int load1, load2, load3, load4, power;
int flag1, flag2, flag3, flag4, flag5;
int timer=0;
void setup(){
Serial.begin(9600);
BT_Serial.begin(9600);
irrecv.enableIRIn(); // Start the receiver
irrecv.blink13(true);
```

```

pinMode(touch1, INPUT);
pinMode(touch2, INPUT);
pinMode(touch3, INPUT);
pinMode(touch4, INPUT);
pinMode(touch5, INPUT);
pinMode(Relay1, OUTPUT); digitalWrite(Relay1, 1);
pinMode(Relay2, OUTPUT); digitalWrite(Relay2, 1);
pinMode(Relay3, OUTPUT); digitalWrite(Relay3, 1);
pinMode(Relay4, OUTPUT); digitalWrite(Relay4, 1);
load1 = EEPROM.read(1);
load2 = EEPROM.read(2);
load3 = EEPROM.read(3);
load4 = EEPROM.read(4);
power = EEPROM.read(5);
delay(500);
}
void loop() {
if(digitalRead(touch1)==1){
if(flag1==0){flag1=1;
load1 = !load1;
EEPROM.write(1, load1);
delay(100);
}
}else{flag1=0;}
if(digitalRead(touch2)==1){
if(flag2==0){flag2=1;
load2 = !load2;
EEPROM.write(2, load2);
delay(100);
}
}else{flag2=0;}
if(digitalRead(touch3)==1){
if(flag3==0){flag3=1;
load3 = !load3;
EEPROM.write(3, load3);
delay(100);
}
}else{flag3=0;}
if(digitalRead(touch4)==1){
if(flag4==0){flag4=1;
load4 = !load4;
EEPROM.write(4, load4);
delay(100);
}
}
}

```

```
{else{flag4=0;}  
if(digitalRead(touch5)==1){  
if(flag5==0){flag5=1;  
power = !power;  
EEPROM.write(5, power);  
delay(100);  
}  
}{else{flag5=0;}  
if(irrecv.decode(&results)){  
Serial.println(results.value,HEX);  
if(results.value==0x1FEE01F){ // For Load1 On  
load1 = 0;  
EEPROM.write(1, load1);  
}  
else if(results.value==0x1FE906F){ // For Load1 Off  
load1 = 1;  
EEPROM.write(1, load1);  
}  
else if(results.value==0x1FE50AF){ // For Load2 On  
load2 = 0;  
EEPROM.write(2, load2);  
}  
else if(results.value==0x1FEF807){ // For Load2 Off  
load2 = 1;  
EEPROM.write(2, load2);  
}  
else if(results.value==0x1FE30CF){ // For Load3 On  
load3 = 0;  
EEPROM.write(3, load3);  
}  
else if(results.value==0x1FE708F){ // For Load3 Off  
load3 = 1;  
EEPROM.write(3, load3);  
}  
else if(results.value==0x1FE00FF){ // For Load4 On  
load4 = 0;  
EEPROM.write(4, load4);  
}  
else if(results.value==0x1FE9867){ // For Load4 Off  
load4 = 1;  
EEPROM.write(4, load4);  
}  
else if(results.value==0x1FE48B7){ // For Power On  
power = 0;
```

```

EEPROM.write(5, power);
}
else if(results.value==0x1FE7887){ // For Power Off
power = 1;
EEPROM.write(5, power);
}
irrecv.resume(); // Receive the next value
delay(100);
}
if(BT_Serial.available()>0){bt_data = BT_Serial.read();}
if(bt_data == 'A'){load1=0;EEPROM.write(1, load1);}
if(bt_data == 'a'){load1=1;EEPROM.write(1, load1);}
if(bt_data == 'B'){load2=0;EEPROM.write(2, load2);}
if(bt_data == 'b'){load2=1;EEPROM.write(2, load2);}
if(bt_data == 'C'){load3=0;EEPROM.write(3, load3);}
if(bt_data == 'c'){load3=1;EEPROM.write(3, load3);}
if(bt_data == 'D'){load4=0;EEPROM.write(4, load4);}
if(bt_data == 'd'){load4=1;EEPROM.write(4, load4);}
if(bt_data == 'E'){power=0;EEPROM.write(5, power);}
if(bt_data == 'e'){power=1;EEPROM.write(5, power);}
bt_data = '0';
if(power==1){
digitalWrite(Relay1, 1);
digitalWrite(Relay2, 1);
digitalWrite(Relay3, 1);
digitalWrite(Relay4, 1);
} else{
digitalWrite(Relay1, load1);
digitalWrite(Relay2, load2);
digitalWrite(Relay3, load3);
digitalWrite(Relay4, load4);
}
timer = timer+1;
if(timer>9){ timer=0;
BT_Serial.print(power); //send distance to MIT App
BT_Serial.print(";");
BT_Serial.print(load1); //send distance to MIT App
BT_Serial.print(";");
BT_Serial.print(load2); //send distance to MIT App
BT_Serial.print(";");
BT_Serial.print(load3); //send distance to MIT App
BT_Serial.print(";");
BT_Serial.print(load4); //send distance to MIT App
BT_Serial.println(";");

```

```

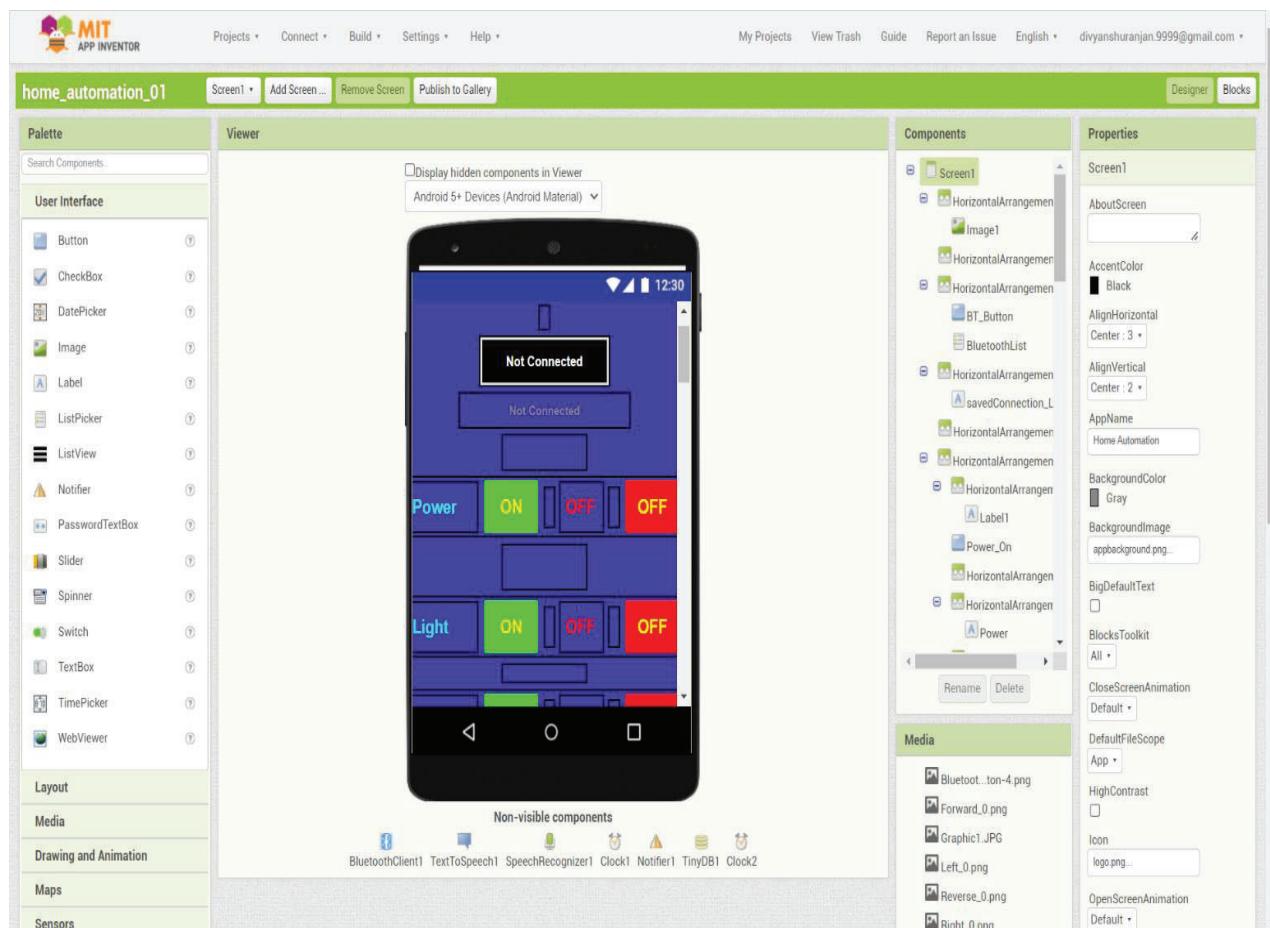
        }
        delay(50);
    }
}

```

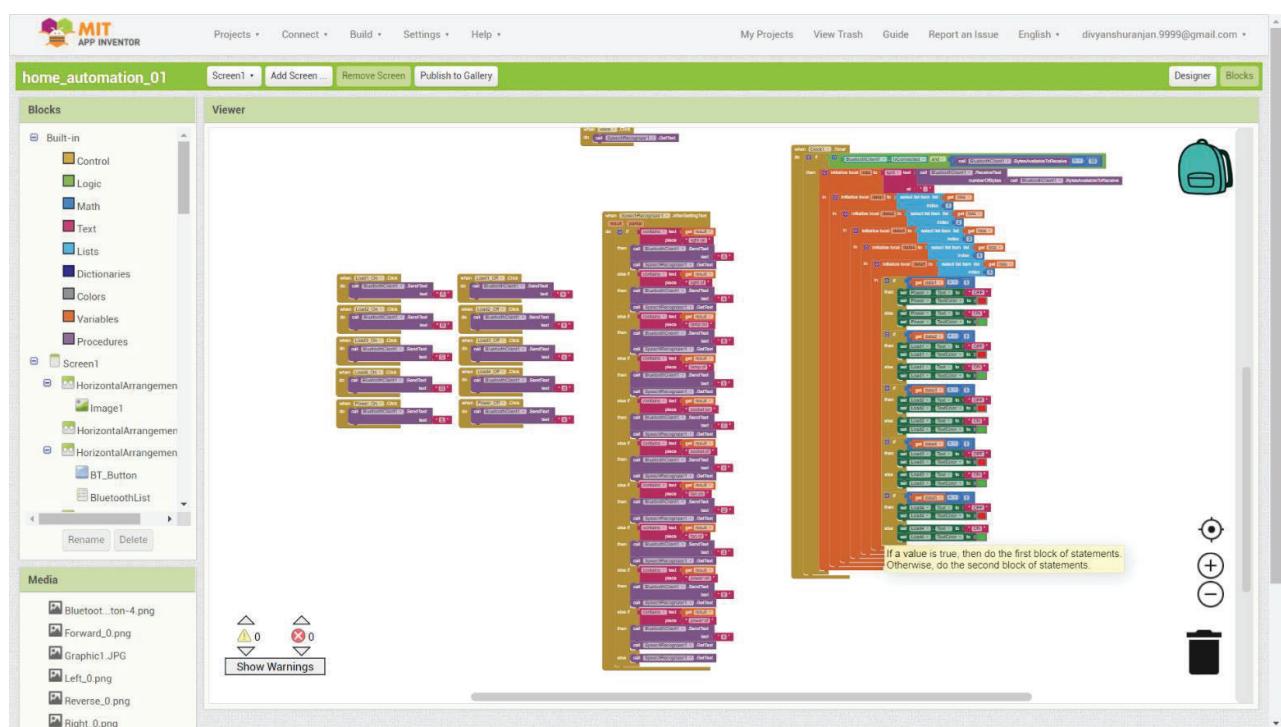
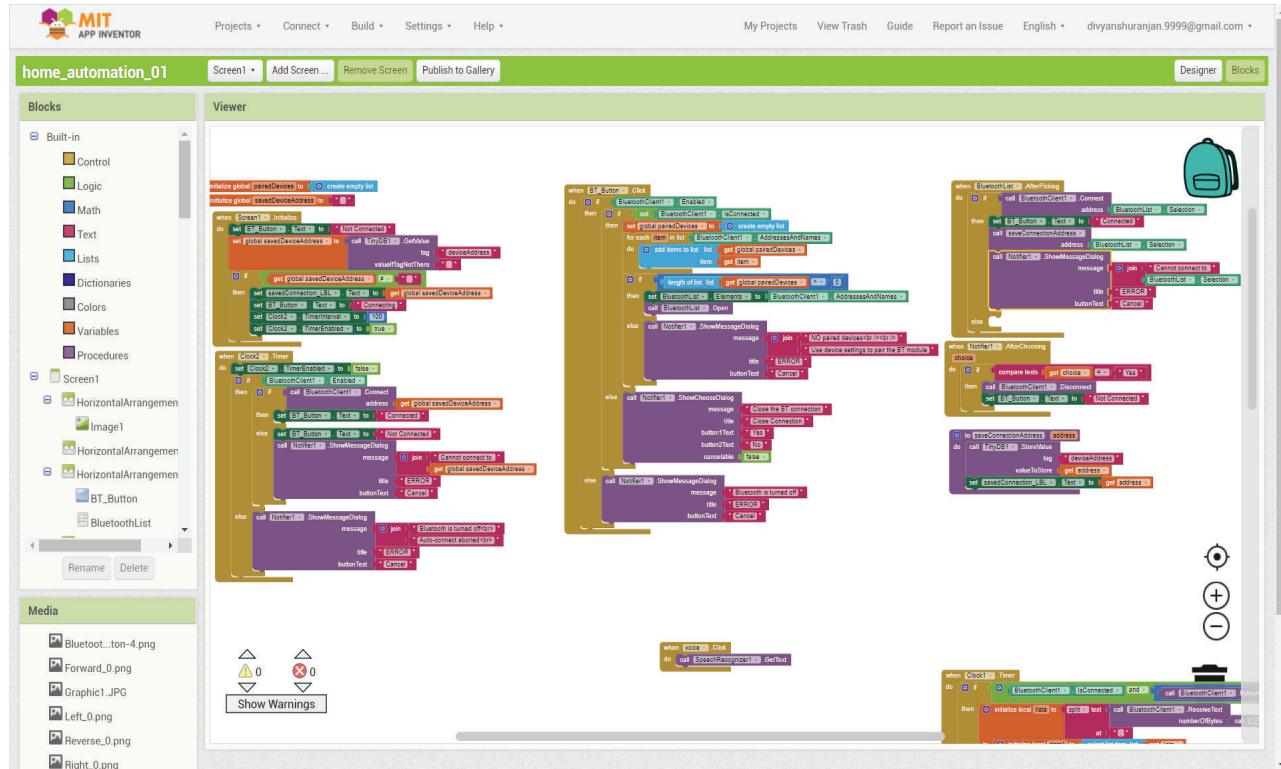
## b) Android app development

App development is done on the MIT App Inventor. First, you need to have a valid Google email account. Next, open the link <https://appinventor.mit.edu> to start the MIT App Inventor project. You will find two tabs—Designer and Blocks on the top right side of the screen.

1. Open the Designer section, create a layout for the app, and then add the following components as shown in the figure.

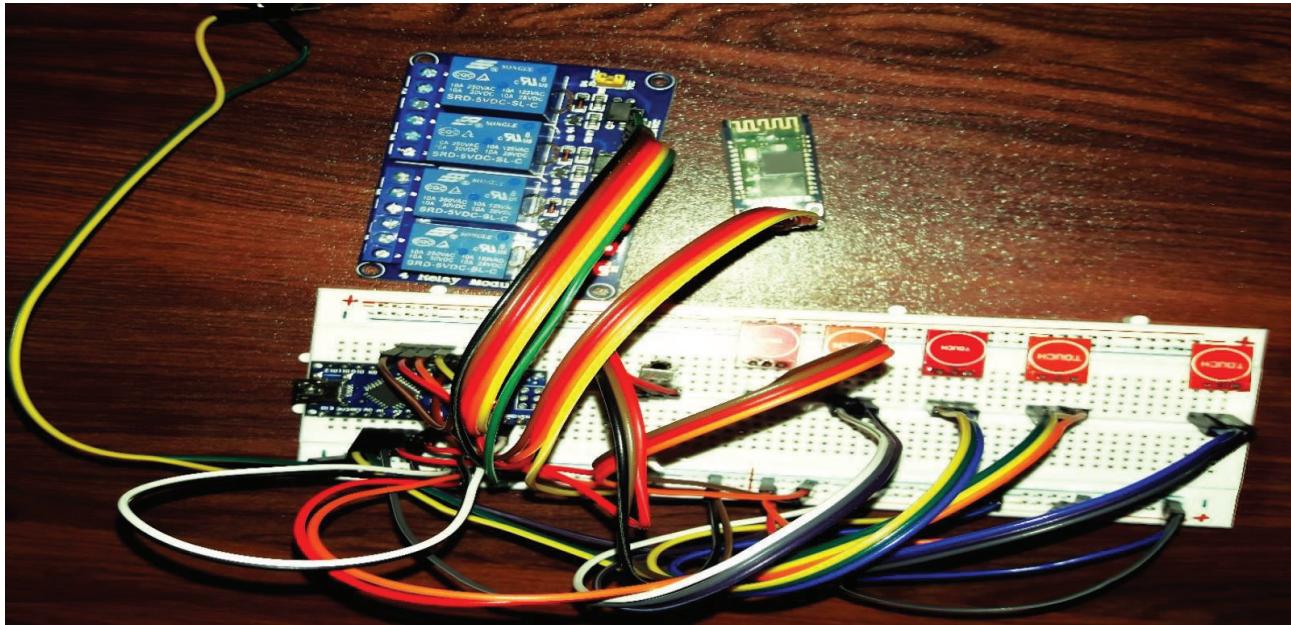


2. Next, open the Blocks section in MIT App Inventor. Pick and place the code blocks, as shown in the figure Save the project as homeautomation.apk and install this .apk file on your Android phone.



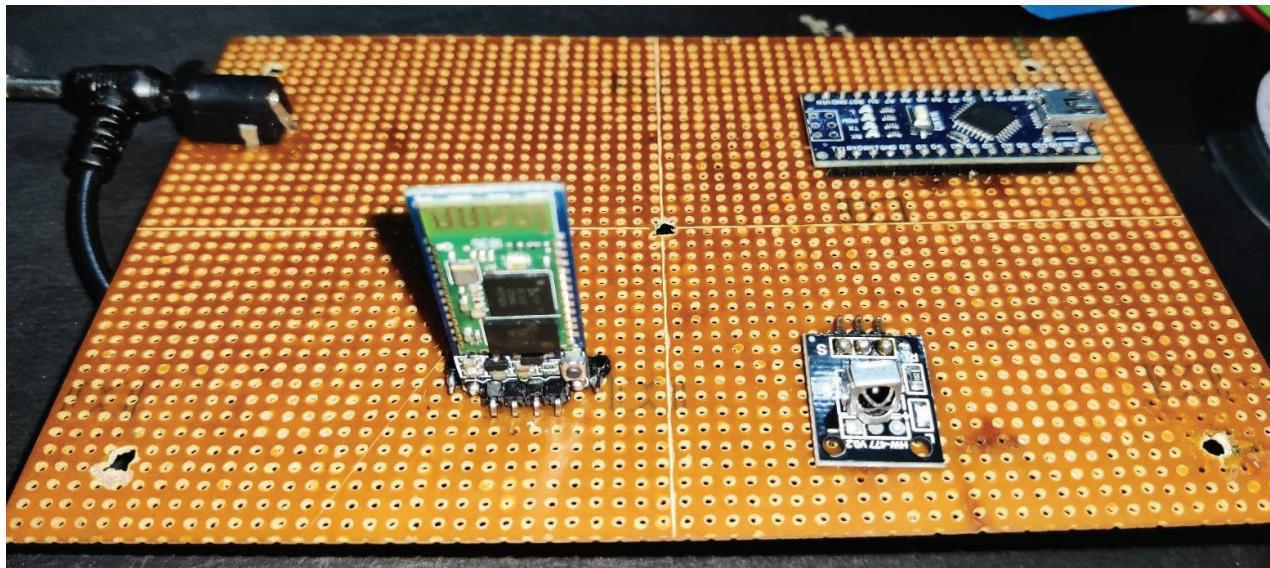
## **5.2.2 Stage Two: Implementation of the circuit on a breadboard.**

Implementation of the circuit on a breadboard is for clarification purposes and testing of components' reliability and functionality. The project design was carried out on a breadboard to ensure proper connection for testing as shown in Figure-

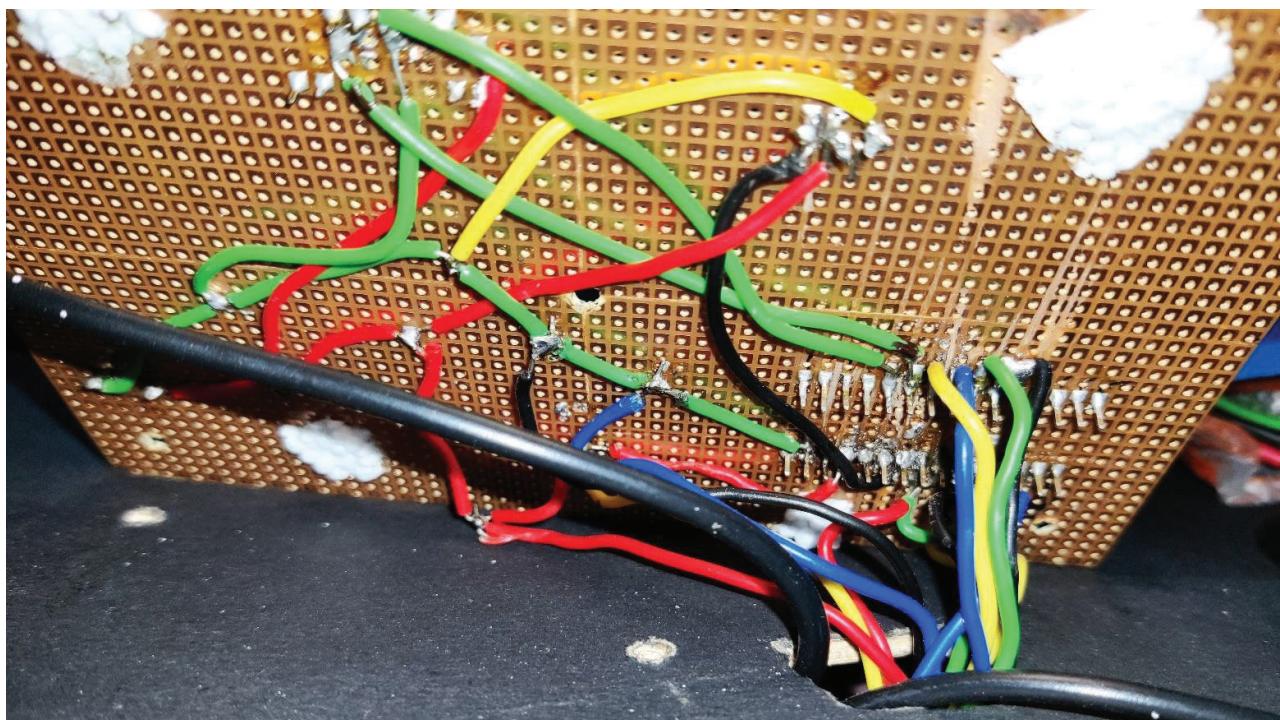


## **5.2.3 Stage Three: Implementing of Electronic Equipment on PCB**

After the success of stage two, as the confirmation is cleared we solder electronic equipment on PCB board according to the circuit diagram and connect them through connecting wires as shown in the figure-



*PCB Top View*



*PCB From Behind*

#### **5.2.4 Stage Four: Construction on a permanent board**

Subject to the positive result from the test on a temporary project board, implementation of the circuit on a permanent circuit board was carried out. This implementation involves the soldering of the

components to the board and carrying out appropriate connections of the components. The components were arranged on the circuit board following the specification of the circuit diagram. Four load and other safety and measuring device are installed, and connected for a prototype of the project, as shown in the figures below-

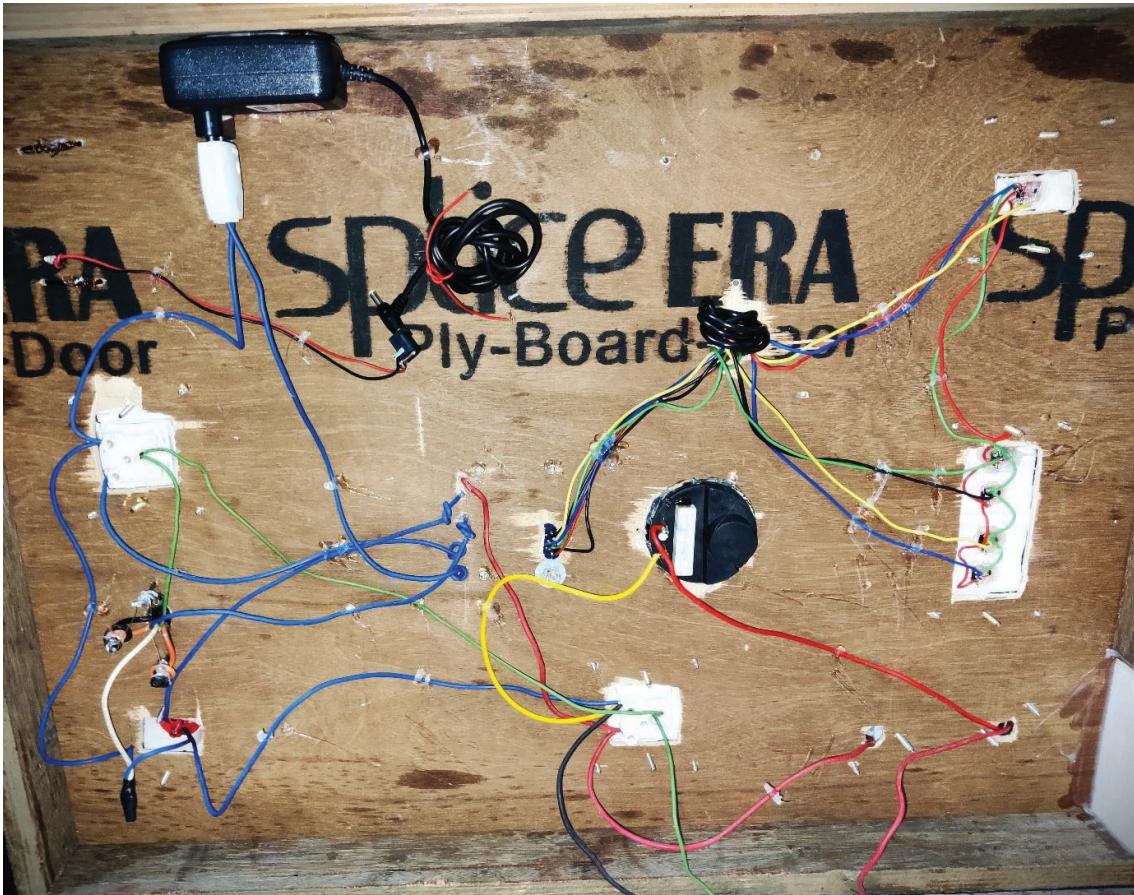


Image showing the wiring work behind the permanent board (Model).

&

Image showing the front of the Project (P.T.O)  
or  
The image of the project Model (P.T.O)



# HOME AUTOMATION

This Project is made by :-

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Of Electrical Engineering  
Final Year (2021-22)

# **CHAPTER 6**

# **ESTIMATION AND**

# **COSTING OF**

# **HOME**

# **AUTOMATION**

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**6.1 Required Material for Home Automation & Their Cost**

**6.2 Estimating the cost of Home Automation**

# Chapter 6:- ESTIMATION AND COSTING FOR HOME AUTOMATION

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## 6.1 Required Material for Home Automation & Their Cost :-

S. No.	Name of Material & their Description	Quantity	Unit	Rate ₹	Cost ₹
1.	Arduino NANO (atmeg 328)	1	Number	400	400
2.	Arduino Nano Patch Cable	1	Number	50	50
3.	Bluetooth HC-05	1	Number	350	350
4.	TTP 223 Touch Sensor	5	Number	35	175
5.	IR Receiver Module	1	Number	180	180
6.	IR Remote	1	Number	20	20
7.	Relay (4- Channel 5v)	1	Number	280	280
8.	Solderless Breadboard	1	Number	60	60
9.	Power Adapter (5v 2Amp)	1	Number	120	120
10.	Male to Male Jumper Wire	40	Number	100	100
11.	Male to Female Jumper Wire	40	Number	100	100
12.	Female DC Power Jack	1	Number	6	6
13.	Breakable Pin Header Connector Strip	40	Number	10	10
14.	Zero PCB (10cm x 10cm)	1	Number	20	20
15.	PCB Board Connecting wire (1 x 1mm copper)	5	Meter	10 per m	50
16.	LED Lamp	1	Number	50	50
17.	Incandescent Light Bulb	1	Number	15	15
18.	3 Pin Plug	1	Number	25	25
19.	MCB C6 (6Amp)	1	Number	100	100
20.	MCB Box (For single MCB)	1	Number	40	40
21.	Nut Bolt 5 cm	5	Number	5	25

S. No.	Name of Material & their Description	Quantity	Unit	Rate ₹	Cost ₹
22.	Nut Bolt 3 cm	4	Number	4	16
23.	Modular Switch Board Plate (4 Switch Nos.)	1	Number	36	36
24.	Modular Socket Board Plate (1 Socket Nos.)	2	Number	26	62
25.	Modular Switch Board Plate (1 Switch Nos.)	1	Number	26	26
26.	Modular Socket (6Amp 240v)	2	Number	27	54
27.	Modular Switch Blanking	5	Number	8	40
28.	Bulb Holder (Bracket Type)	1	Number	25	25
29.	2mm single core Copper Conductor PVC cable 650v V- Grade	8	Meter	30	240
30.	Voltmeter	1	Number	100	100
31.	Plywood (1m x 0.75m)	1	Number	200	200
32.	Black Chart paper	2	Number	10	20
33.	Fevicol	250 Gram	Number	50/ 250gram	50
34.	A.C. Fan 220v	1	Number	60	60
35.	Other Miscellaneous Things	1	Number	100	100

**Total Material Cost is ₹3205 (including GST)**

## 6.2 Estimating the cost of Home Automation

Total cost of the required material = ₹3,205

Labour Charge (15%) = ₹480.75

Total = ₹3,685.75

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Supervision Charge (15%) = ₹552.86

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Contingent Expenditure (5%) = ₹184.28

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**Grand Total = ₹4,423.14**

= ₹4,425 (Approx.)

# **CHAPTER 7**

## **MAINTENANCE, CRITICAL EVALUATION, PROS & CON'S, AND APPLICATION**

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- 7.1. Maintenance**
- 7.2. Critical Evaluation**
- 7.3. Pros & Cons of Home Automation**
- 7.4. Applications for Smart Home System**

# **Chapter 7:- MAINTENANCE, CRITICAL EVALUATION, Pros & Cons, and APPLICATION**

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## **7.1 Maintenance**

Our system is not the ultimate system that has ever been built. We mentioned that our “**Home Automation**” system have some limitation n in certain extent. We need to keep that limitation in mind and use the system.

If we think that we need help regarding coding, we will need an expert to help us. The system needs 24/7 to be powered on, so we can use some charged batteries along with the electricity supply. As this system is made for the elderly or less privileged person we can use this system in Hospital, Old home, or anyone who want to make their life easier.

The system use microcontroller that is highly sensitive to the touch of water or liquid. We need to keep the system away from children's as well. I believe that, if we use a carbon box to wrap it, then it will save the system from the fire.

The system can be improved by adding more features in the future like security features, implementing improvements like using in the autonomous car, etc.

## **7.2 Critical Evaluation**

In the Critical evaluation, we mention the evaluation of the product and the research work following are:

### **7.2.1 Critical Evaluation of Product**

The technology of home automation through a mobile application is already been implemented in different areas but putting this on the home utilities is something which I experienced a bit interesting to work. According to my thoughts and objectives, I have worked as the efforts required to complete the project and manage to achieve my target. Challenges and difficulties have been on the way of my project many times, I followed all the plans strictly and remain committed under all the hardships.

The most part of my project required analysis and a deep understanding of Bluetooth and IR technologies, so I have been from the various literature review and a research paper to have the knowledge of this technology. I read a good number of articles and other materials as well, but throughout all my research process I stay committed to showing a clear reflection of all the reviews on my project. And I believe this project will be the good literature review for the future research work on Home Automation technology.

### **7.2.2 Critical Evaluation of the Process**

Management of time was one of the big challenges for me, even though it happened to me several times I couldn't complete my target task within the specified time. But this made me work even harder on the next task so that I could compensate for my time and complete all the tasks on time. The good thing was I remain committed so that everything happens in the way as required which specifically includes the consideration of time, cost, and other requirements. I kept myself busy throughout the whole process of completion, where at some time I had to change the way of my work which specifically includes the theory and the practical work.

Another important key for my consideration throughout the process was the regular discussion and the guidelines from my teachers, I was lucky to have a clear map of all the work which I suppose to do accordingly, and this was only possible because of clear suggestions

and recommendation from my teachers. Decision-making is also being an essential part of my project, as sometimes I had to face the dilemma, and do personal understanding with the deep literature review to solve the conflict. But under all circumstances with the clear concept about the topic, I was able to make it and ultimately my hard work and focus have kept me committed to perusing my work as advised.

As this project is a product-based, so by that regard the only problem which I had faced in buying of the hardware is the time. The reason for that is, that the hardware that is required is not easily available in the local market. So, to that those I had to order online from Amazon (an e-shopping site) which includes Bluetooth Module, Arduino device, etc, this takes sometimes more time to continue my project than allocated. But even them with these problems, I stayed focused and work harder, so that I could be able to follow all the time schedule.

This home automation project has taught me all the concepts and ideas which are certainly required for the IT & Electrical Engineer to manage the projects. Taking all the burdens, time management, and management of tasks accordingly has helped me to develop this project. As the stress was also one of the big challenges, as I was busy with the other modules' work as well, but this has given me a target and push to complete all the things with little ups and downs in time. Ultimately, I could successfully complete everything in time by investing my skills and efforts.

Learning and getting practical-based skills were a major benefit which I have learned. Working with the hardware and software together with the writing was the challenging time, where every step must be followed accordingly. From start to end, every part of the SDLC taught me something new, and certainly the ultimate experience of working product based helped me to develop many important skills i.e. time management skills, adaptability skills, leadership skills, decision-making skills, communication skills, and most importantly

the writing of different computer language skills which I have used in making android application and also for the Arduino NANO.

## 7.3 Pros & Cons of Home Automation

### 7.3.1 Pro's (Advantage)

As we have already seen, home automation has a multitude of advantages, among which the following stand out:

#### A. Energy saving

Taking into account that home automation is responsible for managing those elements that are responsible for saving gas, electricity, and water, for example, it gives us the possibility of using energy depending on our needs. Thus, each appliance, for example, will only be on when it is essential, and not constantly.

In this way, home automation is able to control the management of 70% of energy consumption. Therefore, it offers the opportunity for the lights in a home to be turned off when they should be. Also, it allows the temperature, when no one is home, to be the ideal one, without having to spend a single cent more for a service that we are not using. At bedtime, the lowering of blinds and turning off lights would be automated. Also, the temperature would adapt to the circumstances. As we all know, the degrees that it does outside and that influence our home are not the same in the morning as at night. Likewise, our body does not respond the same when it is in motion as when it is completely calm. Taking into account that in addition to the above, other savings policies are carried out, people will notice fewer expenses when having to face their bills. In addition, the behavior of each of them, practically unintentionally, will become more ecological.

## **B. Security**

Among the advantages of home automation is also security. In this way, it could detect intruders, fires, a water leaks, or gas leaks. In this way, what could be catastrophic consequences would be avoided. Anything that happened inside the home could be observed by cameras.

## **C. Communication**

Of course, communication between people and their homes is very important. Internet and new technologies are a natural part of home automation. All this causes them to become both practical and intuitive tools. What's more, details such as body movements or tone of voice become part of the communication with our home. Thus, it will respond even to emails or text messages. Without a doubt, it is a whole world to discover in which even the smallest gesture counts.

## **D. Comfort**

Of course, how could it be otherwise, home automation greatly facilitates the tasks that have to be done in our house. In this way, many actions can be carried out through a screen, sending an order that we can later check from a distance or in person.

## **E. Wellness**

With home automation, it is possible to lower or raise the blinds depending on the level of light that exists in each room or even take into account the wind. Thus, it is possible to create a specific home environment when we deem it appropriate. For example, why have the blinds raised if it is totally dark outside? The same happens when we sleep, it is not comfortable to rest with the sun's rays hitting our face.

## **F. Telecare**

The home automation system works from a set of sensors. In this way, it is easy to monitor the habits of each family. How long does each member stay in bed while sleeping? Who does or does not take medication? Is it necessary to create hygiene routines? All these questions can be addressed by the central servers that are controlled 24 hours a day by health professionals. In this way, we will feel accompanied at all times and we will be aware that there are people who watch over our well-being even if we do not see them.

### **7.3.2 Con's (Disadvantage)**

It is possible that, having read about the advantages of home automation, the disadvantages no longer interest us so much and we really believe that everything is perfect. However, we must always analyze those negative points that we can find when betting on new technologies.

#### **A. Initial cost**

Of course, all the benefits we have described above come at a cost. Thus, it should be noted that the price of home automation installation is very high. Therefore, anyone can not assume this type of systems, since you have to make a very important investment in the beginning. Everything is a matter of analyzing whether it is worth it and, if so, start saving.

#### **B. Maintenance**

In addition to the initial investment, we cannot forget that a breakdown can always occur. Therefore, we are not talking about making a disbursement and being able to forget about the economic issue forever. Fixing any damage can be expensive as well as

complex. What's more, a single error could cause a large part of the system to crash and many functions that we thought were independent may be nullified. In this way, we will always have to have an amount of money so that, in case of any error, we can deal with it.

### **C. Data transmission speed**

Not everyone has the same number of connected systems. Now, the more there are, the slower the network can go , as it may become congested. The main consequence is that some of the functions that we have would slow down.

### **D. Ring connection**

In the event that the information can be connected in the form of a ring, there may be a certain delay in the system. This will also depend on the number of points we have connected to the network. For this reason, there are many people who do not trust this type of system.

## **7.4 Applications for Smart Home System**

The current smart home system targets domestic homes where ease of control is of major concern. This includes homes for people with disabilities, elderly, or for anyone with difficulties moving around. Nevertheless, these people must still at least have functionality of at least one finger as it is possible to navigate the Android device GUI with a single finger.

Home installed with this system will have a higher sense of controllability over their home appliances even when they are not at home. For instance, if a family went for a vacation, leaving their house vacant for some time, it could easily be targeted by robbers.

With this system, home users can monitor and control the appliances

in the house from anywhere with Internet connection. Switching on some

appliances from time to time may make the house seem occupied and minimize the chances of having unwanted visitors.

### a) Home Is Where the Smart Is

Even if you don't consider yourself well informed about the exploding innovations of the Internet of Things and machine-to-machine communication, and you understand you're not the most tech-savvy consumer, it's impossible that you've missed the abundance of home automation products filling the shelves and ads of every home improvement store. Suddenly an ordinary errand for light bulbs will leave you wondering if your lamp could send you a message alerting you that the light bulb needs to be replaced. Furthermore, if your lamp is talking to you, could your refrigerator and sprinkler system be too? Experts say: Yes, the possibilities are endless. If that's the case, where do you begin?

Any day-to-day, repeatable process is automatable with smart home applications. The greater the control and flexibility of these processes, the more energy and cost savings the resident experiences, which are factors anyone who pays utilities strives to moderate. The smart home revolution is likely to be more of an evolution, with the incorporation of one or two home systems at a time, gradually automating our households through smart mobile devices. However, with these elements of efficiency comes the question of ease of use. Will it bring you enjoyment or exasperation? With so many brands and models already available in an ever-growing market, how do you know which is best for you? We'll start with the basics. The most common *applications of home automation* are lighting control, HVAC, outdoor lawn irrigation, kitchen appliances, and security systems.

### **b) Lighting Control: Leaving the Dark Ages and Stepping Into the Light**

Smart lighting allows you to control wall switches, blinds, and lamps, but how intuitive is a lighting control system? It turns out, quite; its capabilities are extensive. You're able to schedule the times lights should turn on and off, decide which specific rooms should be illuminated at certain times, select the level of light which should be emitted, and choose how particular lights react through motion sensitivity, as seen with Belkin's WeMo Switch + Motion, which is both affordable and easy to use with its plug-and-play simplicity.

### **c) HVAC Regulation: No Longer Burned by Your Heating Bill**

As fuel costs rise and the availability and sustainability of our resources becomes a greater concern, heating/cooling our homes efficiently is less a budgetary bonus and more of a necessity. Over the past year, smart thermostats and automated home heating systems have become more readily available and easily incorporate into any home. Heating and cooling our homes consumes an average of 50% of energy costs yearly, making daily HVAC regulation progressively rewarding. Maintaining a substantial lead among the nearly non-existent competition, the Nest Learning Thermostat, learns your heating and cooling preferences over time, eliminating the need for programming and is accessible from your smartphone app. With automated HVAC you are able to reduce the heat when a room is unoccupied, and increase or decrease it at specific times based on your schedule and occupancy.

### **d) Lawn Irrigation Systems: The Grass is Always Greener**

A lush and healthy lawn is a source of pride for most homeowners, but the weather doesn't always cooperate and provide the adequate elements for a flourishing landscape. For decades we've relied on sprinkler systems to keep our yards at peak presentation, but at what

cost? The average American home spends approximately 30% of their daily water usage on lawn and garden maintenance. Nearly half of that amount is wasted due to inefficiency. If you apply that statistic to the national average, up to 4.5 billion gallons of water is wasted per day through ineffective watering methods. If we reflect upon the monetary impact of this, it results in Americans spending over a thousand dollars a year in water, with a portion of that being waste. The global effects are even greater when you consider the growing concern over climate change and the dramatic decrease in agricultural natural resources. However, sprinkler control systems, like Skydrop, are providing water regulation through real-time communication with local weather data. If a rainstorm develops and deposits two inches of rainwater on your lawn, the automated sprinkler detects the saturation and disables its scheduled watering. Conversely, the system will be alerted to dry conditions and supply the necessary amount of nourishment, without over-watering.

### e) Smart Appliances: What's for Dinner?

Will smart kitchen appliances actually make you a better cook? Maybe. Smart refrigerators, such as LG's Smart ThinQ, allow you to scan grocery store receipts and keep an inventory of your items, and alerts you if an item is about to expire. More impressively, it suggests recipes based on your refrigerator's contents and lets you know when you need to replace items. Smart ovens sync with your smartphone and automatically preheat to the correct temperature based on a recipe selected from your database. While these appliance options seem a bit superficial and convenience based, there is a conservation factor as well. By automating your kitchen appliance and making them accessible from your smart device, you're able to sever the electricity supplied to unused appliances and reduce your energy consumption and costs. Considering the number of appliances, the average

household owns; this could save a substantial amount of money over time.

### **f) Security Systems: Knock, Knock...**

Who's there? The Internet of Things. While efficiency and conservation are certainly IoT benefits, its potential to have improved control over home security is a primary focus. Smart locks, like Kwikset's Kevo, a Bluetooth-enabled electronic deadbolt, and various connected home security systems, offer a variety of features including door and window sensors, motion detectors, video cameras, and recording mechanisms. All of which are connected to a mobile device and accessible via the cloud, thus enabling you to access real-time information on the security status of your home. Naturally, there is a great deal of scrutiny regarding the level of trust in controlling your home's security system via a mobile device, but it begs earnest exploration when weighing the potential benefits and peace of mind it provides homeowners.

# **CHAPTER 8**

## **ENTREPRENEURSHIP**

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**8.1. Concept/Meaning of Entrepreneurship and Its Need.**

**8.2. Qualities And Functions of Entrepreneurs and Barriers in Entrepreneurship.**

**8.3. Schemes of Assistance by Entrepreneurial Support Agencies At National, State, District-Level, and Organizations**

# **Chapter 8 :- ENTREPRENEURSHIP**

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## **8.1. Concept/Meaning of Entrepreneurship and Its Need.**

### **8.1. (A) Concept**

The modern era is an industrial era. Comprehensive and complete industrialization is necessary for the overall development of a country. A developing country like India must promote industrial development by establishing small and big industries in rural and backward areas, remote plains, and hilly areas. In such backward and underdeveloped areas, because there is a lack of favorable industrial environment, it takes indomitable courage and entrepreneurship to take the risk of setting up an industry and business in such places by someone new.

The economic progress of any country depends on its industrial development and the Government of India is making special efforts in this direction. The basic policy of the government is also to promote the small and cottage industry businesses in such remote places and to decentralize the capital by removing the hurdles in their development so that more and more new and unemployed young individuals can get help in establishing their own jobs and maintain a smoothly running transition.

### **Industrial Management and Entrepreneurship Development**

The major factors influencing industrial development are:

- (i) Availability of Natural Resources
- (ii) Technical Facilities
- (iii) Infrastructural Facilities
- (iv) Capital

## (v) Inspired People

According to Dr. D. C. McClelland, who was a famous psychologist, “The economic development of any nation does not depend much upon the availability of natural resources and other such inputs but solely depends upon the inner desire and entrepreneurial inspiration of the people. Such inspired entrepreneurs utilize the resources and become the growth of the nation.”

### **8.1. (B) Entrepreneurship**

The word “Entrepreneur” is a French word meaning “An Undertaker” i.e. “An Initiator”. The term was given by the French economist Cantillon who conceptualized the entrepreneur as a bold, new-minded, creator, money provider, risk-taker, owner, or a manager.

Entrepreneurship can be defined simply as “Doing something new or doing something that has already been done with a new approach.”

According to Prof Rao and Mehta— “Entrepreneurship can be described as a creative and innovative response to the Environment.”

According to H. W. Johnson— “Entrepreneurship is composite of three basic elements— invention, Innovation, and Adoption.”

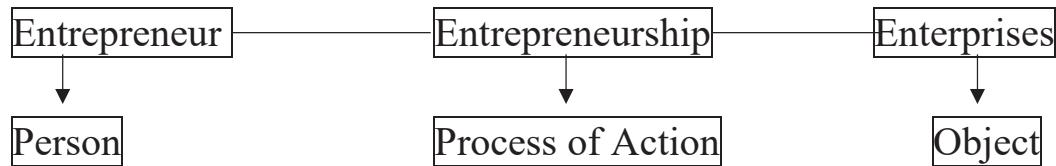
According to Richman & Kopen — “Entrepreneurship implies more creative, outer or open system orientation. involves innovation, risk-bearing, and relatively dynamic leadership.”

Entrepreneurship can be expressed as creative and innovative thinking. Such thinking can be implemented in any area of society like—trade, agriculture, education, social work, etc.) It can also be defined as follows:

“Entrepreneurship in a broader sense can be described as a process of action an entrepreneur (person) undertakes to establish his/her enterprise. It is a creative and innovative response to the

Environment.”

Entrepreneurship is not limited only to the production of goods but also includes the sale of goods, and services. This work requires self-initiative, leadership, indomitable courage, patience, and the ability to take risks.



### The concept of Entrepreneurship

“Entrepreneurship is the inclination (attitude) of mind to take a calculated risk with confidence to achieve a predetermined business or individual objective.”

Finding opportunities to make more profit in a market-centric economy and having the ability to take risks independently and personally are the key characteristics of the modern economy.

### **Dr. D. C. McClelland has marked two major signs of entrepreneurship:**

- (i) Doing things in a new and better way, and
- (ii) Decision uncertainty.

Entrepreneurship is a combination of many qualities, abilities, and skills. It involves foresight, readiness to take risks, organize and coordinate the components of production such as labor, capital, land, etc., to combine new scientific and technological ideas. It plays an important role in the process of economic development. In summary, we can say that, “Entrepreneurship thus means the function of creating something new, organizing, coordinating and undertaking

risks and handling economic uncertainty.”

### **8.1. (C). Need/Scope of Entrepreneurship**

Whatever strategy is adopted for the economic progress of any progressive country, it is mandatory to have industrial progress. Industrial progress cannot happen on its own and as a result, it will only happen through sustained efforts by human resources. These human resources have been named as entrepreneurs. People don't need to be born with entrepreneurship skills, but they can also develop such skills with the passage of time.

**Some of the major benefits from entrepreneurship development are:**

- (i) Self-employment.
- (ii) The number of industries increases.
- (iii) Industrial progress leads to an increase in successful production.
- (iv) Exports generate foreign exchange in the country.
- (v) Products that are being imported from outside the country can be produced in the country itself.
- (vi) Economic development of the country.
- (vii) Youth power and efficiency are well-utilized.
- (viii) Where the profit is made, it can be used for the welfare of the same area.
- (ix) Balanced regional progress.
- (x) Resources can be better utilized.
- (xi) New employment opportunities arise.

## **8.2. Qualities And Functions of Entrepreneurs and Barriers in Entrepreneurship.**

### **8.2. (A) Enterprise**

Alf enterprise is the basic unit of an economic organization. It produces or serves more things than the resources used. An enterprise is a business that relies exclusively on four key factors which are— Land, Labour, Capital and Entrepreneur.

### **8.2. (B) Entrepreneur**

“A positive individual who dares to start any new business and establishes his/her business on a new site is called an entrepreneur, i.e. one who ventures, is called an entrepreneur.”

Following are the major definitions given by various scholars in the context of an entrepreneur:

According to Joseph A. Schumpeter, “Entrepreneurs are business leaders and are not simple owners of capital but they are men with vision, drive, and talent, who spot out opportunities and promptly grasp them for exploitation”.

According to Joseph A. Schumpeter, “In an advanced economy, the entrepreneur is an individual, who introduces something new into the economy, a new method of production, a new product with which the consumers and not familiar, a new source of raw material or new market and the alike.”

According to French economist J.B., “Entrepreneur is a person who lift the economic resources from lowest level to the highest productivity and a greater yield.”

According to the French tradition, an “Entrepreneur is a person

who translates a positive thought into production activities.”

In summary, we can say that, “An entrepreneur is the one who organizes, manages, and prepares-an enterprise and is always ready to take risks in order to overcome all the obstacles and difficulties which comes in the way of the enterprise.”

“Entrepreneur is an indomitable person who successfully takes his/her industry to such a position in which his/her industry can earn maximum profit by successfully overcoming the initial difficulties that come after establishing a new industry.”

### **8.3. Schemes Of Assistance by Entrepreneurial Support Agencies at National, State, District-Level, And Organizations**

Various organizations were set up at national and state levels to encourage and support small-scale industries. In certain cases, small-scale industries have been defended from the bigger industries. Many organizations Working at national and state levels provide various packages of assistance to small entrepreneurs. Although setting up small industries, promoting them, and helping them in every way is a task under the state government, yet the Government of India understood its importance in the national perspective and understood the need to create and coordinate various development projects and established various organizations. Following is a brief description of various main. organizations and their functions for providing assistance to small-scale industries:

- (i)District Industry Centers, DICs
- (ii) Commercial Banks,
- (iii) State Financial Corporations, SFCs
- (iv) Small Industries Service Institutes, SISI

- (v) Small Industries Development Bank of India, SIDBI
- (vi) National Bank For Agriculture and Rural Development, NABARD
- (vii) National Small Industries Corporation, NSIC
- (viii) National Research Development Corporation, NRDC
- (ix) Technical Consultancy Organizations Commission, TCOC
- (x) Khadi and Village Industries Commission, K VIC
- (xi) Science and Technology Entrepreneur Park, STEP
- (xii) Micro, Small, and Medium Enterprises
- (xiii) Technology-Business Incubators
- (xiv) National Institute for Entrepreneurship and Small Business Development (NIESBUD)
- (xv) Hardicon Ltd

For more information, on the above-mentioned schemes, one can visit google.

# **CHAPTER 9**

## **FUTURE EXPANSIONS AND CONCLUSION**

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**9.1. Future Expansions**

**9.2. Conclusion**

# **Chapter 9 :- FUTURE EXPANSIONS AND CONCLUSION**

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## **9.1 Future Expansions**

Looking at the devised solution, one keen reader would readily point that, the computer is a bit of overhead. The computer is a device with enormous capability and our application fails to make most of it. We tried to replace the computer with a micro-controller. A micro-controller is a small IC with a microprocessor, memory, and IO support, which is comparatively very cheap and requires fewer resources. Micro-controllers come with built-in support for USB and Bluetooth connectivity with traditional serial ports and also programming support for these ports. Micro-controllers come with custom SDKs and can be used to serve our goal with reduced efforts. We studied theoretically with micro-controllers and it seemed possible to be implemented in reality. Given enough time and wise thinking, one can proceed with this application and move the computer part to the micro-controller. This modification will highly add value to this project by expanding its usability to a great extent. This can create a whole new dimension of remote controlling it takes the control as near as to one's palm for always and everywhere. Moreover, by deploying wireless sensors inside the home smart home can be made smarter. Recent works on smart home are governed by the concepts of wireless sensors. Remote systems can be controlled in a more flexible ways by integrating wireless sensors to the system.

## 9.2 Conclusion

As it can be seen in the report's development, all the objectives have been accomplished. It has not been an easy project and it required many hours of research to match expectations.

This project is based on what has been learned during the degree, expanding the knowledge in different areas to obtain a final project where three main electronic parts meet (Bluetooth, IR Sensor, and Android Application) ; electronic design (hardware), programming (software) and communication between devices. The fact of having chosen home automation as a subject to work on has been fulfilling because it is an issue which is currently in full expansion and has a promising future. This technology is in constant expansion and its scope is growing to cover more important areas like security, accessibility and user's comfort.

In addition, there is another technology that has been developed, which is currently highly used and that is mobile applications. Even though there are many platforms that allow users to create an application, the handicap has been creating an application capable to communicate with other devices and also making it exclusive to remotely control them. Personally, it has been the very first time that I created a mobile application and the hardest thing to complete the project was to make it work as desired. It has also been the most satisfying part.

As a summary, I have dealt with important parts of the degree I studied, using the knowledge acquired and increasing it, obtaining the know-how to get myself out in the professional market.

Controlling the home utilities via different methods is just an amazing step forward towards the development in Automation sector, as this involves totally a wireless medium to create the connection. There are many Automations based applications which have been developed to initiate the working on this technology which also includes voice-

controlled wheelchair etc. All the previous experiments and trials which are done before, we have utilised the same concept to implement it in an efficient manner, so that more people can be benefited which involves just a say of word to make the things work, or just by pressing a button on remote i.e. home utilities. Without a doubt, this technology will bring revolution in the people's life if that is implemented on the larger scale.

After performing deep research and study, we have introduced a platform, in which more efforts can result in the better format in future. But according to all the existing technology, this is something new in a number of aspects and it is worth to be accepted by a wide number of people because of its advantages towards the elderly and special people. Controlling the utilities like fan, light and lamp etc, in the wireless medium is absolutely an outstanding progress in this century, vulnerabilities and security issues are still under concern to make this technology even better than ever before.

We are looking on this technology with better focus to make the life even easier. It is the century where everyone is focussing on bringing the comfort in the people life. This is just one step leap towards the future goal, there are many other things which are coming ahead with more challenges. We must make sure while introducing any project, that it keeps the legal, ethical, social and environmental concerns to its best because these are the basic pillars for the success of any work that is done for the people welfare.

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