DESIGN AND IMPLEMENTATION OF AN APPLICATION FOR VOICE OPERATED AUTOMATION SYSTEM

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Abstract: Computerization of the encompassing environment of a present day individual permits expanding his work proficiency and solace. There has been a huge improvement in the zone of an individual's standard undertakings and those can be mechanized. In the present times, we can discover the greater part of the general population sticking to their cell telephones and brilliant gadgets for the duration of the day. Subsequently with the assistance of a buddy cell phone, every day family assignments can be refined by embodying the utilization of the cellular telephone. Voice Operated Home Automation System (VOHAS) has been intended for devices running Android which acts as a medium to mechanize a 8 bit Bluetooth interfaced microcontroller, Arduino. It has been programmed to control various home apparatuses like lights, fans and numerous other home appliances all the more utilizing on/off transfer. This paper shows the computerized methodology of controlling the gadgets in a family that could be a replacement of conventional switches. The most celebrated and effective innovation for short range remote correspondence Bluetooth is utilized here to computerize the framework. The VOHAS framework for Android clients is a stage towards the simplicity of the assignments by controlling one or more distinct machines in any home environment

Index Terms – **Arduino, Mobile App, Bluetooth Module, Relay, Voice Operated Automation.**

I. INTRODUCTION

The 21st century which is the era of fastest period of evolution in the information technology. Every single day the concept behind the scene is getting more and more complex to provide the humanity with the best level of comfort. And whenever the thinking goes to think of the most prominent technology which has completely altered the people way of interaction with the normal World, then in that stage the clear concept of IOT (Internet of Things) pops up in mind.
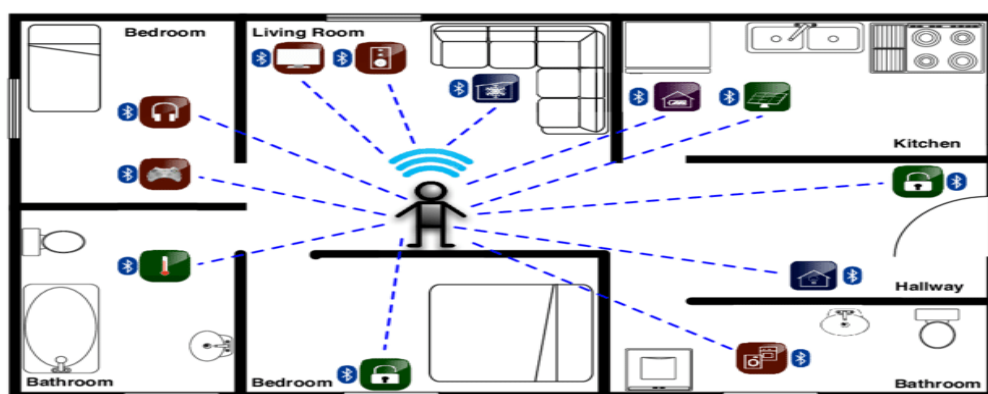

Figure 1: Voice Operated Automation

IOT is one of the emerging technology which has an astonishing impact on the daily life routine, whenever we come across dealing with the objects that are around us. The Internet is one of the major media that is responsible for the World to be connected to a global village, probably more than that. Well if Internet can be responsible for connecting the people together, then what if we carefully use the same technology in a much logical format to connect it to the objects that are around us? Is that logical and possible?

The answer to this question is totally positive, it is possible. And even if we analysis this concept, there are a certain number of examples and experiments and even the implementations that lead to the very successful results. Indeed, it's a great leap forward for the human welfare in terms of their interaction to the objects that are around

II. BASIC IDEA

After carefully analysis different ideas for the project proposal, I came across with one of the interesting and indeed the most emerging idea that would really cause a huge impact on the people interact with the objects. It took me a while to go through various literature reviews and methodologies to bring up with 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 IOT, in which I have used 'Android Based Voice Controlled Automation', in other words, this is a practice-based project in which I am coming up with the physical object. This IOT technology will result in controlling home utilities with the voice command produced by the user on its Android phone which will contain that software application.

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 facility is now just waiting for the voice order to perform the action.

2.1. BLOCK DIAGRAM OF BOARD

The microcontroller is the main part of the project. Here in the diagram it explains that the voice command are taken from the microphone of the mobile or the pc and then pass to the Arduino. After the Arduino is executing he command then it passes to the relay board to turn the utilities on or off accordingly. Light, fan or ac are turned on/off as the relay board is turned on or off. Arduino Nano uses C Language. The Arduino company named it to "sketch".
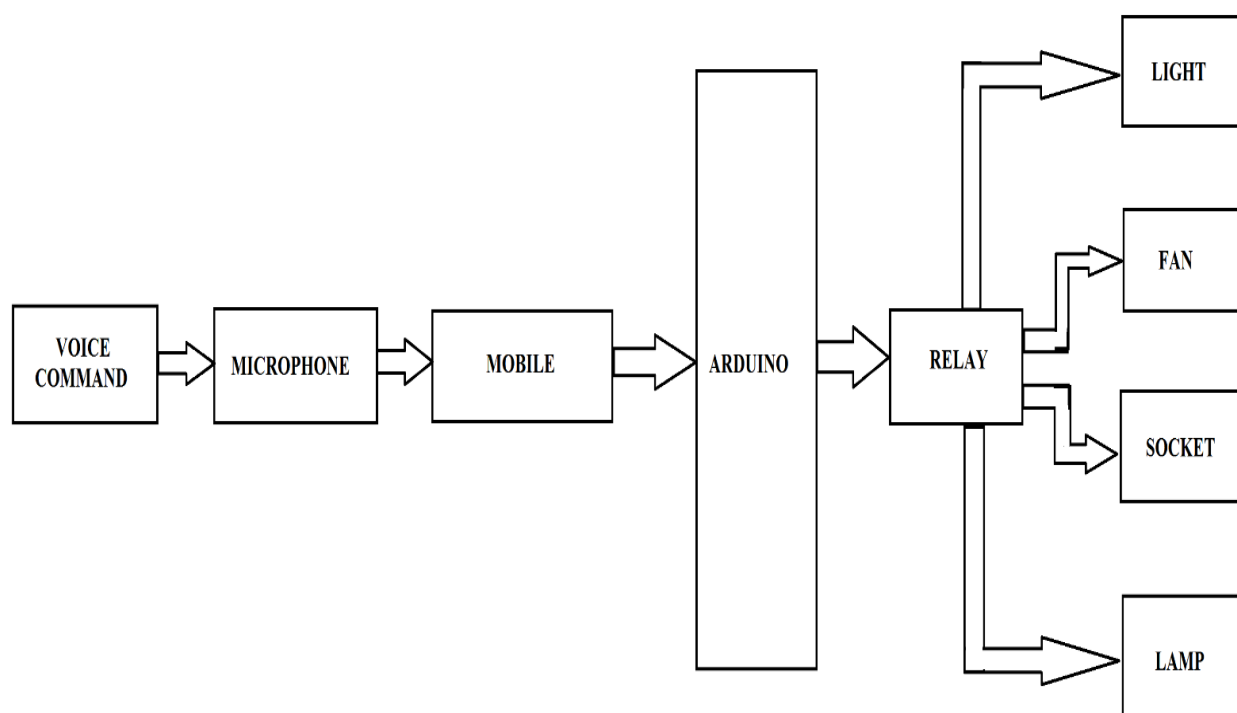

Figure 2.1: Block Diagram of the Voice Operated Automation
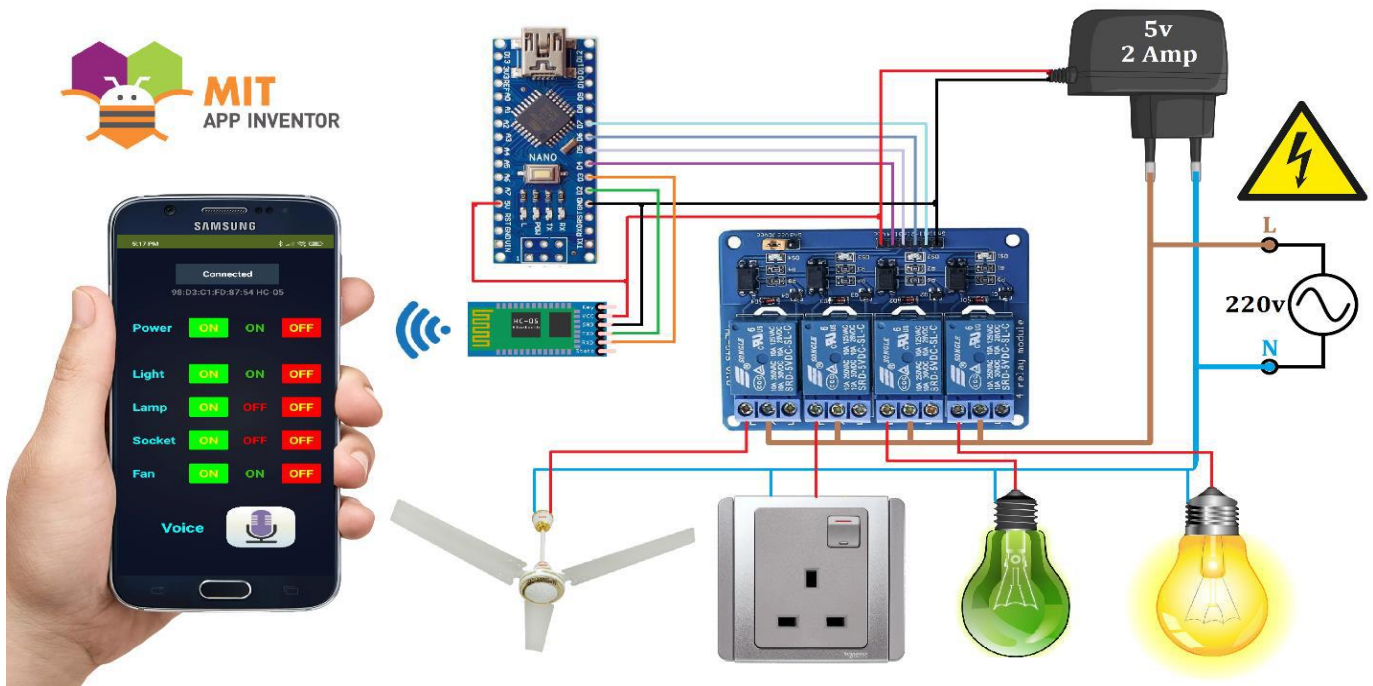
2.2. CIRCUIT DIAGRAM

Figure 2.2: Circuit Diagram of the Voice Operated Automation

2.3. WORKING OF PROJECT

Using the above mentioned components we implement our system on a breadboard. The microcontroller device with the Bluetooth module and relay circuit needs to be attached with the switch board. Then we need to launch the android based application on our Smartphone. Through the application we can instruct the microcontroller to switch on/off an appliance. After getting the instruction through the Bluetooth module the microcontroller gives the signal to the relay board.
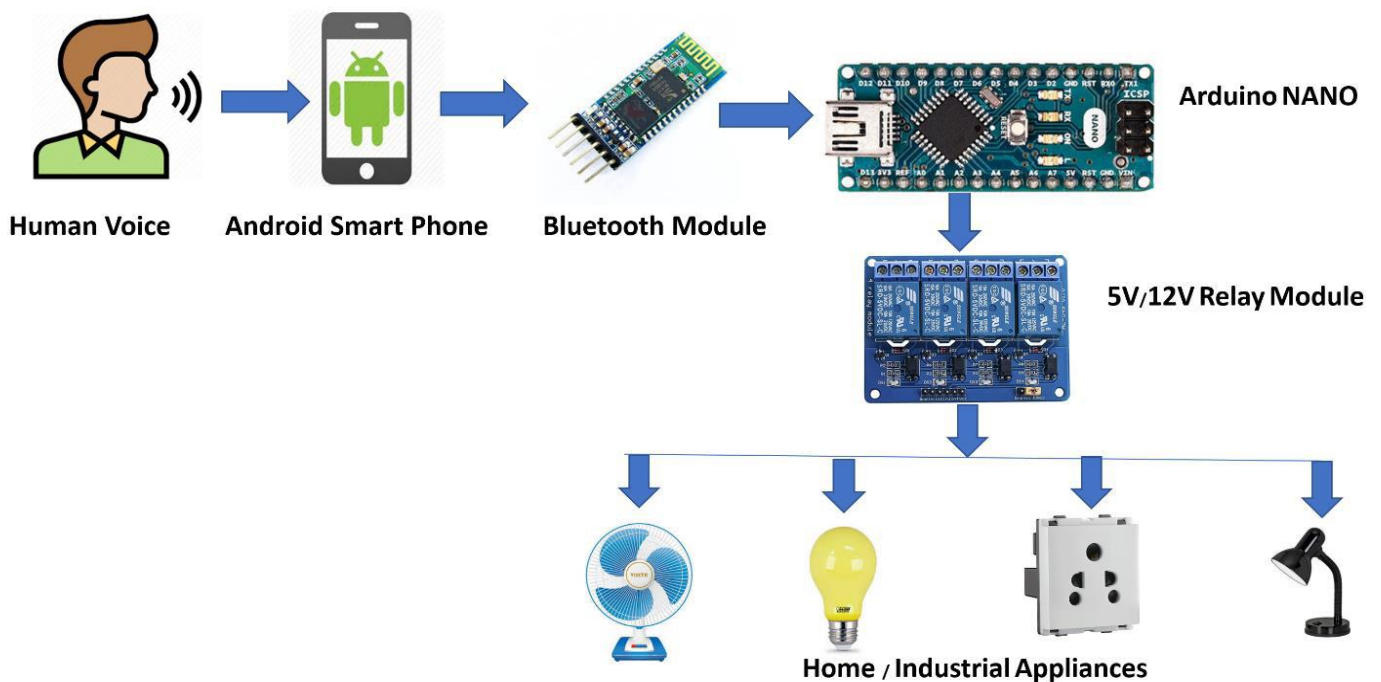

Figure 2.3: Working Process

The application first searches for the Bluetooth device. If it is available, then it launches the voice recognizer. It reads the voice and converts the audio signal into a string. It produces a value for each appliance which will be given to the microcontroller device. The microcontroller uses the port in serial mode. After reading the data it decodes the input value and sends a signal to the parallel port through which the relay circuit will be activated.

III. LITERATURE SURVEY

➢ **"An elegant voice operated automation system using GSM and ARM-based architecture", V.L.K.Bharadwaj Manda, Voona Kushal and N.Ramasubramanian 0278-6648/18©2018IEEE.**

It is voice operated automation system developed using GSM and ARM processor The central processing unit of this system is the NXPLPC11U24 microcontroller. Many peripheral devices cannot be attached using ARM Processor.

➢ **"Smart voice operated Automation System Using Bluetooth Technology",Muhammad Asadullah 978-1- 5090-3310-2/17/\$3\.00 ©2017 IEEE**

It is a home automation system developed using Arduino board, Bluetooth module HC-06, smartphones. Bluetooth has lower bandwidth and shorter range.

➢ **"Smart Home Automation and Security System using Arduino", Siddharth Wadhwani1, Uday Singh2, Prakarsh Singh3, Shraddha Dwivedi4 Volume: 05 Issue: 02 | Feb-2018**

It is a voice operated automation system using Arduino Nano board and Wireless fidelity technology. It accepts command only through clicks

It is one of the major requirement 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 requires 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, a logical conclusion with the judgement solution all are an integral part of the literature review.

'Automation' is basically a word that involves the use of machine rather than the human physical effort to manually perform the task. In other words, this technique is being proposed for the benefit of the mankind and its trend is growing up in 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 the researchers are still working hard to make this more beneficial, efficient and secure for everyone, most important ecological and economical at every level.

There are certain projects in home automation that are using the Wi-Fi technology for its 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 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 Wi-Fi 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, raspberry pie, and these are interfering with the home appliance while in that case is the shutter of the windows. Interface card 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 voice operated automation is the use of 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 data server which is cloud-based. And after collection of data, it is stored into Hadoop distributed file system (HDFS). To process this data MapReduce uses the special framework of the data that is received from HDFS and later take it back to the HDFS for storage. And finally, it provides a 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 to use Raspberry Pi is its several advantages over the others. Firstly, it is quite power device which gives the best platform while working with the voice operated 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 voice operated automation appliances. And for that purpose, Arduino board has been used to control these appliances. This project is based on the mobile applications which have an ability to generates messages alerts according to the 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 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 analysis the structure of this system, it has been developed in a quite straightforward fashion. As usual, 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 a 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, Bluetooth module has been introduced with the password authentication. So, if anyone desire 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.

3.1 HISTORY OF PROJECT

The Internet of Things has seemingly permeated throughout every facet of our domestic and professional lives. However, true home automation came well before the stylized future of The Jetsons was dreamt up. Here are some facts you may not know about our automated history:

- Nikola Tesla created the first remote control in 1898 to operate a toy boat. He actually tricked the crowd into thinking they could shout commands to control the boat — an early glimpse into the future popularity of voice control.
- The vacuum cleaner as we know it today was invented in 1901, and fridges, irons, and washing machines followed soon after.
- The microprocessor was created in 1971, ushering in a huge leap towards affordable home technology,

When it comes to sound and voice, the first instance of its use in home automation was in 1985 via The Clapper, an electrical light switch governed by a short, sharp noise, like a clap. Unfortunately, it was pretty sensitive, and would turn lights on and off when someone sneezed, a door slammed, or a dog barked.

3.2 NEED OF PROJECT

The concept of voice operated automation with the help of switch or remote is an old technique. To overcome this here is a solution namely voice-controlled home appliance project. Voice controlled device is one of the major areas of prospect research. Imagine a world where the consumer can do each and every mission by just talking. We have previously seen some of the automobile industries have applied this to cars. Voice Controlled Home Appliances has several applications such as home appliance controlling as well as in industry. So mainly we are going to Control home appliance using voice commands. This proposed system uses human voice command to home appliances controlling. There are two kinds of control operations. In the first one, the user has to speak into a microphone connected to the electronic circuit. And in another type user can speak in Android mobile or any other device and then this device sends commands to the project through wireless communication technique. In this project, we have used the second type of operation, which means voice controlling through the Android mobile application. One of the main purposes of this technique is to reduce the human efforts.

3.3 OBJECTIVE OF A PROJECT

The success of any project depends on the ultimate reason for which it has been proposed. There must have some number of aims that could result in the motivation process of designing the project. Aims are certain number 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 which has never existed before. The application software will work along with the google voice recognition services, where it will get the voice command 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 Arduino Nano device via Bluetooth or Wi-Fi, 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 more short and logical form, following are some of the major aims and objectives of our project.
• This project is designed to use the 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 the text format.
• Ultimately application software will transfer that command in the text format to the Arduino Nano using Bluetooth or Wi-Fi 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 the certain command that is programmed.
• The aim is to use this IOT technology for the people of all ages, gender and even with some disability to enjoy the life in a more pleasant way.
• Now we are getting up to turn our home appliance on or off. If we are making the home controlling system, more easy and reliable to the user like disable people then they will be benefited from our system. It will become the best system for the disabled people and for the elderly people to use their mobile phone and control the home utilities. The goal of this system is to help disable and elderly people.

Better aims and objectives come into consideration when the project is supported by the good literature review, methodology and other things that can cause a satisfactory improvement. And accordance with the previous experiments and research work, the better

product could be possibly expected. Objectives of this project can rather be put in the more fashionable format in the future based on our current research work and designing an ultimate product.

IV. FLOW CHART

This kind of diagram explains the flow of the application that is to be developed. In other words, all the information that is processed is through data flow diagram. It represents certain kind of symbols that shows activity that is performed at each step and it justify all the steps accordingly that are followed in a certain sequence one after the other. Following is the data flow diagram of our project and it illustrates all the information process from the beginning to end.
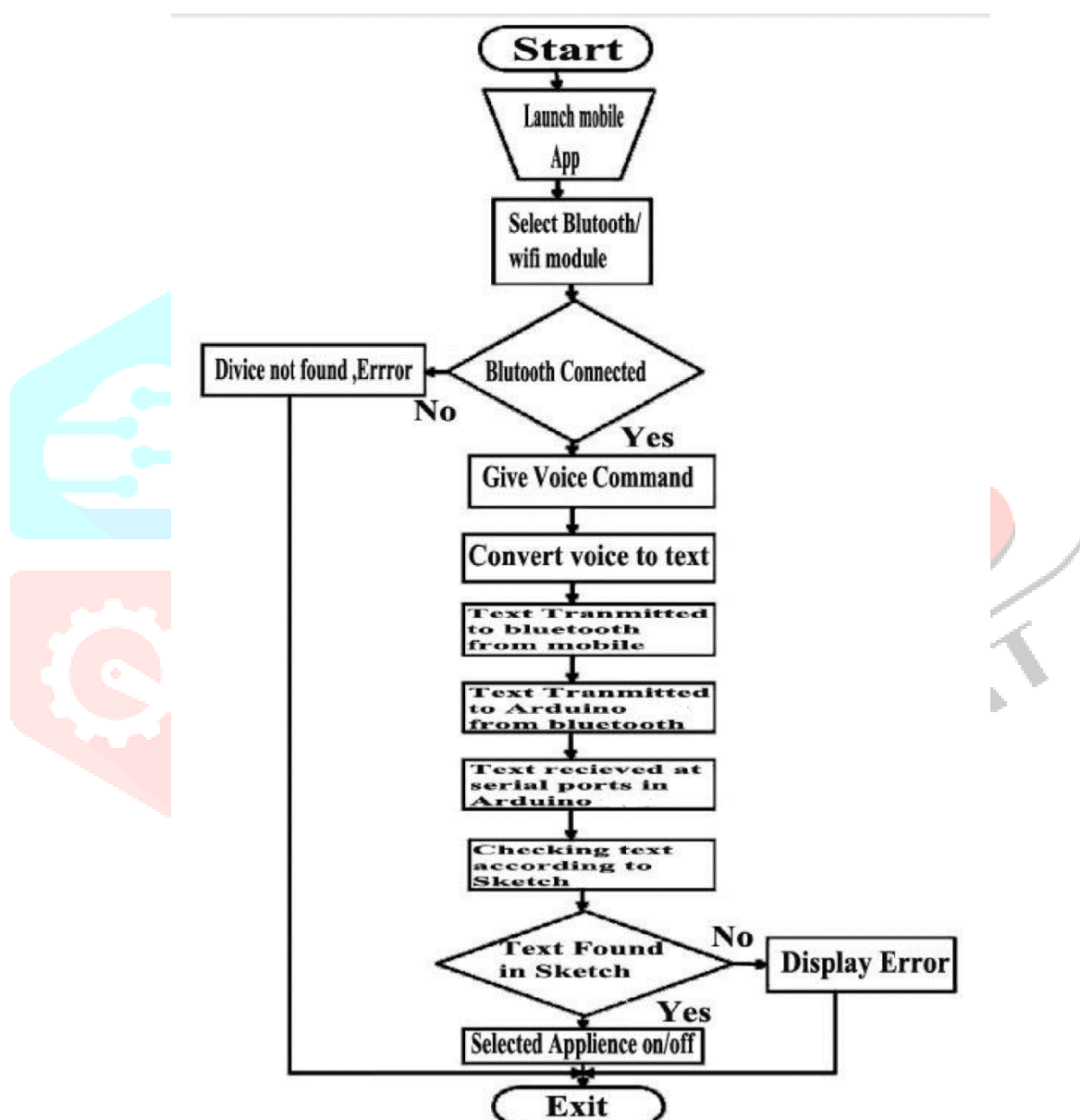

Figure 4.1: Flow Chart of the Voice Operated Automation System

V. RESULT

Controlling of two device of household appliances are successfully achieved, the fan and light bulb. The fan can be voice controlled for three levels of speed, full speed, and medium speed and off state. The bulb can be voice operated upon two levels of ON and OFF, and the same system can also be used to operating heavier loads in household, example an air conditioner (refer to Table).

TESTING METHODS	TESTING FACTORS	DEVICE RESPONSE	OUTPUT ACCURACY
AMPLITUDE OF VOICE	Normal conversation 60dB	Device responds 3 out of 5 times	60%
	Whisper 35dB	Device responds 1 out of 5 times	20%
NUMBER OF WORDS	Minimum 2 words	Device responds accurately 2 out of 2 times	100%
	Maximum 5 words	Device responds accurately 2 out of 5 times	40%
DISTANCE FROM MICROPHONE	Lesser distance 5 Inches	Accurate response 4 out of 5 times	80%
	Greater Distance 2 Feet	Accurate response 2 out of 5 times	40%
ENVIRONMENTS	Quite	Accurate response 4 out of 5 times	80%
	Noise	Accurate response 1 out of 5 times	20%
MULTIPLE SPEAKERS	Multiple speakers	Device responds accurately 1 out of 5 times	20%
	Individual speaker	Device responds accurately 4 out of 5 times	80%
ROOM SIZE	Small room	Accurate response 3 out of 5 times	60%
	Large room	Accurate response 1 out of 5 times	20%

VI. CONCLUSION

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

6.1 APPLICATION

1. The Voice Activated Home Automation system will help us control different loads (electrical appliances) with simple voice commands.
2. This kind of system is very useful for people with disabilities.
3. Further, the project can be expanded by adding different sensors (light, smoke, etc.).

6.2 ADVANTAGE

1. Optimized control

With all your devices and appliances connected to the same control system, and it's unifying app, it's easier to operate each of these items individually. Never again will you need to search for the missing remote to readily use each device. Instead, you only need to say a command, and the smart device will complete the task. This makes the entire process more convenient and saves you time for other endeavors. The key is to remember it is not simply the voice assistant you select, often from Amazon, or Google, but the control system working behind the scenes, that give you the most robust voice control experience. Alone, either will give you a taste, but are limited in operation. Married with a control system, either can perform admirably, and AI offerings from companies like Josh AI are bringing exciting advances.

2. Increase energy efficiency

With the ability to adjust your thermostat and lights with your voice, you'll gain more control over how much energy your home uses at a given time. As a result, you'll save money and live more cost-effectively. This will also allow you to stay informed on the overall climate of your home and make adjustments with ease.

3. Flexibility for new device

Voice operated automation technology connects various devices to the same hub. As such, it's often very useful to have a professional set up a new connection with different types of appliances. This takes the stress out of replacing older appliances and the hassle of connecting them to your network. Additionally, you'll be able to add as many new smart systems as you wish, making it easy to diversify your tech usage to suit your lifestyle.

4. Improve home security

Another great feature of voice automation technology is that it can make your security system more effective. With the ability to check your home cameras instantaneously from any screen in the house, you'll know what's happening on your property. This knowledge is key when faced with uncertain or potentially dangerous situations

6.3 DISADVANTAGE

Voice controlled home automation systems have a number of disadvantages that need to be considered before deciding to install such a set up.The first, and largest problem is the fact that many voice controlled systems are not completely hands free. Voice control systems that run on mobile devices still require you to press a button on your device before you can issue a command. Doesn't this negate that whole point of having voice control? You still need to get your phone out of your pocket, open the app and hit the appropriate button and THEN you can issue the voice command. This is not really any more convenient or time saving, it would be just as easy, and even quicker to simply use an app such as iViewer and press the button for the command you want to send. Even if the app has a hands free mode for voice control, it still needs to be open and running on the device the whole time – this drains the battery and means the device cannot be used to other functions.

To be useful, a voice controlled home automation system needs to be completely hands free. This means that you need the ability to be able to issue a command at any time, without the need to first activate a listening mode. There are systems available that offer this, but they require special hardware to be installed in the house. This can be expensive, and often they are only guaranteed to work with certain brands of home automation hardware.

On all the systems we have seen demonstrations of, the voice prompts and information given back are slow. There are videos out there showing a user asking the system what the temperature is in a certain room, by the time the system responds – you could have quickly seen this info yourself on your iViewer GUI as well of any other info you wanted to show on the same page. Or maybe you want to know what the weather forecast is for the next week – with a simple glance at a GUI on a tablet or phone you can see the whole weeks weather. The time it would take for the system to read that information out to you would be excruciating.

6.4 FUTURE SCOPE

Further we are developing the system to integrate the existing wireless networks present in the houses to transmit data from mobile to the microcontroller to be able to use it at a larger scale. We propose to use voice recognition to provide security measures, so as to be able to provide restricted access to particular persons. We are developing the system so that the user can control the appliances remotely over Internet. We would increase the scale of the control of appliances such as controlling speed of fan, temperature of AC, changing particular channel of TV, choosing music tracks, etc., We are trying to develop an intuitive interface for the user so as to ease the process of controlling and make it interesting.

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