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Implementation of an Intelligent Voice Controlled Home Automation System

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Abstract:
Automation is a trending topic in this 21st century coursing it plays a crucial role in our daily lives. The main attraction of any machine driven system is reducing human labour, effort, time and errors due to human negligence. With the advancementof technology,phones have become a necessity for each person on the planet. Software Applications are being developed on Androidphones that are useful in numerous ways. Another upcoming technology is natural language processing which enables users to command and control things with voice command.Combining these features, this paper presents a micro controller based voice controlled home automation system using smartphones. Such a system makes the users to have control over each appliance in his/her home with voice command. The user onlyneeds a smartphone and the control circuit. The control system consists of an Arduino Uno microcontroller that processes the user's commands and controls the switching ofthe appliances. The connection between the microcontroller and the smartphone is established via Bluetooth, a widespreadwireless technology used for sharing data.

Keywords **—Arduino Board, Bluetooth Module, Home Automation, Smartphone, Voice Control.**

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I. INTRODUCTION

This Smart home technology refers to a suite of devices, appliances or systems that tap into a common network and that you can control independently via a remote control or voice control. For example, you will be able to have your home's thermostat, audio speakers, TVs, lights, security, locks and appliances all connected to the smart home network.These you'll be able control from your smartphone, touch screen device and, due to recent advancements in speech recognition technology, voice-controlled home automation is no longer a thing of science fiction. This technology, voice-controlled home automation is very common nowadays on like before.

Figure 1: Diagram of automated home

When you compliment your life with fashionable technology like voice home automation, you're not solely streamlining your home however your life too. With how busy most people's lives are today, everyone wants to be as efficient as possible. What

a way to manage your time than with a voice-controlled home automation system?

A. *How can it make your home better?*

Having voice-controlled home automation means that you have gotability to consolidate all smart appliances in your home. You will be able to command your coffee machine to start producing coffee and turn your TV on/off while your baby falls asleep in your arms. No need to worry around for the TV remote or put your baby down before you takes that coffee.

And it is not all about convenience either. With voice-controlled automation, you have the best way to run your home smarter. You can command your smart speaker to turn on or off to conserve electricity. The same goes for the air conditioner and window blinds.

Even if you're at the bedroom of the house you can command your smart speaker to shut the garage door if you think you left it open. You have the power to control what happens at the other end of the house with just a voice command.

Then there is your schedule. Let's face it, most people today many job schedule, from the driver and cook to homework helper and mediator, all whilst having a full-time job. With home automationsystem you be able to keep your busy schedule organised with just one or two voice commands.

B. *Aims and Objective of the research*

The ultimate aims and objectives of this research paper are as follows.

1. To use a voice recognition technology to control home utilities i.e. light, TV and fan etc.
2. To implement a system that especially focuses on the needs of disabled people.
3. To implement a system that utilises Google voice recognition facility as input voice.

4. 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.

II. RESEARCH METHODOLOGY

There are various methods which can be used to complete this researchthat means tools and techniques which are both hardware and software based. Now here are some of the important point of identifying those tools, and this is where we identify them considering 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.
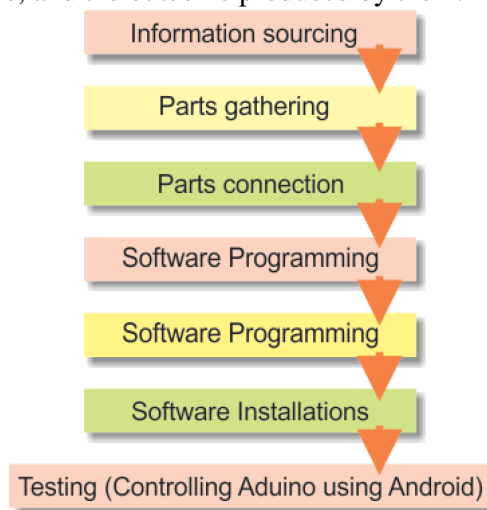

Figure 2: Diagram of automated home

Above sequence shows the number of steps that are involved in this research. Basically, it is simple methodology format that we are intended to follow, which involves not only software development but also, it's practical implementation with the hardware.
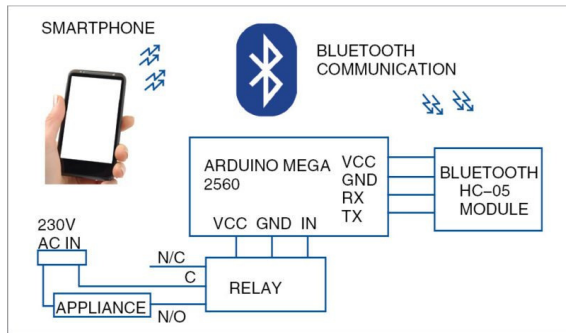
III.   SYSTEM IMPLEMENTATION

Figure 3: Block Diagram of the System

The Voice operated Android and Arduinobased Home automation system utilises an Android based Bluetooth enabled phone for its application and the Arduino Uno as the microcontroller. The key components of this system are: Android based phone, Bluetooth module, ArduinoUno, Relay boards

A. *Android Based Phone*

Android is an operating system for a mobile and its based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, the user interface uses touch inputs that closely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Android platform was used in this research because of its huge market globally and the user interface is user friendly. Applications on the Android phones extend the functionality of devices and are written primarily in the Java programming language using the Android software development kit (SDK). The voice recognizer which is an in built feature of The mobile application is Android based application which the user can operate to automate the appliances in his house. The designed UI of the application is shown below:
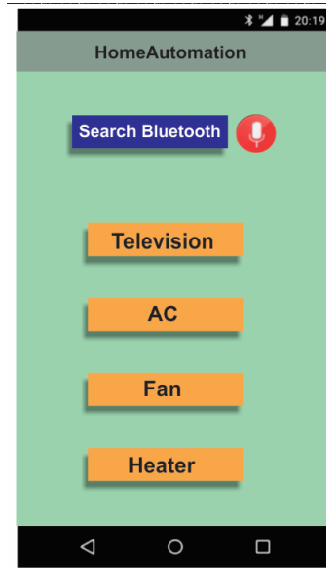

Figure 4: Interface for the Voice Control Application

The voice recognizer listens and converts what is said to the nearest matching words or text. The Bluetooth adapter present in the mobile phone is configured to send this text to the Bluetooth module on the Arduino Uno board that would in turn control the electrical appliances through the relay unit.

B. *Bluetooth Module*

Bluetooth is a wireless technology standard for sharing data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). The Bluetooth module being used allows us to transmit and receive signals. It receives the text from the Android phone and transmits it to the serial port of the Arduino Uno.
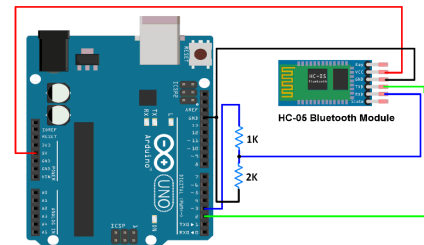

Figure 4: ArduinoInterface with Bluetooth module

C. Arduino Uno

The Arduino Uno is a microcontroller board with ATmega328p as the microcontroller. It has a total of 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed for the microcontroller to work. It is either need to connect it to a computer using a USB cable or power it with an AC-to-DC adapter. The Arduino circuit acts as an interface between the software part and the hardware part of this research. The Bluetooth module is meant to transmit the text to the Arduino Uno serial port. The text transmitted is matched against the various combinations of predefined texts to switch the appliances On/Off. The appliance name and a code for On/Off are stored as predefined command. For instance, to turnON a television the user needs to say "television on" and to turn it off the user needs to say "television off". The appliances are connected via the relay boards to pin numbers 2, 3 and 4 of the Arduino Uno. When the matching text is detected the corresponding pin number is given a high or low output signal to switch the appliance on and off respectively.

Figure 5: Arduino Uno board

D. Relay Boards

A relay is an electromagnetic switch. That is, it is activated when a current is applied to it. Normally a relay is used in a circuit as a type of switch. There are various types of relays and they operate at different voltages. When a circuit is built the voltage that will trigger it has to be considered. In this research the relay circuit is used to turn the appliances on/off. The high/low signal is supplied from the Arduino Uno microcontroller. When a low voltage is given to the relay of an appliance it is turned off and when a high voltage is given it is turned on. The relay circuit to drive four appliances in the Voiceoperated Android and Arduino Home automation system is shown below. The number of appliances can be modified according to the user's requirements.
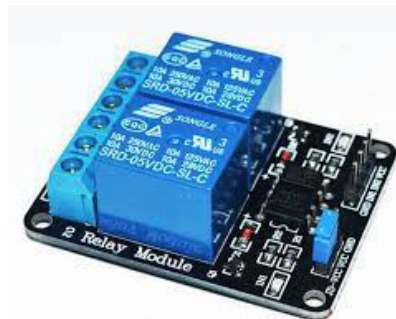

Figure 6: Relay module

IV. SOFTAWRE DESIGN

In Unified Modelling language, activity diagram shows the workflow with the steps of activities and actions from beginning to the end of the process in a system. According to our project, each step across is followed by the other one, so for that, every condition is satisfied in each step so that the next step is to peruse. Below activity diagram of our project illustrates all the steps that are involved and the decision that is followed corresponding to the output from each step.
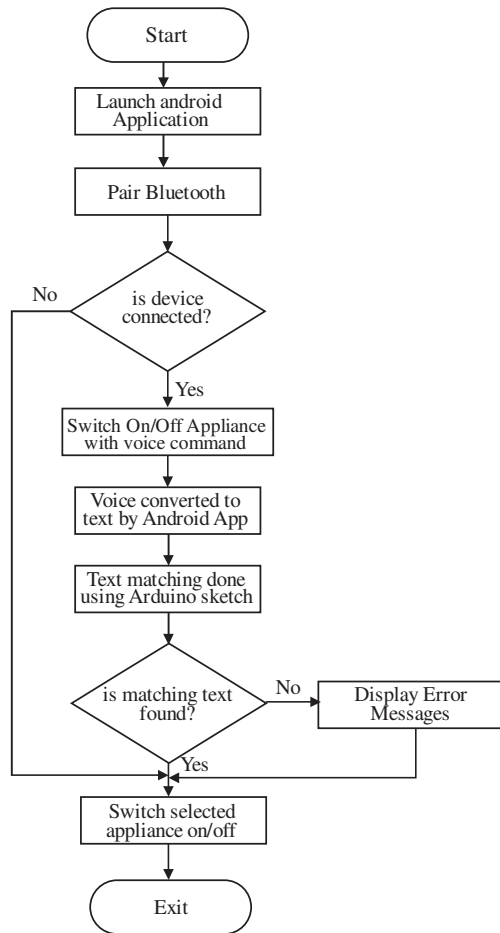
Figure 7: Flow Chart diagram

Figure 8: Code development

V. CONCLUSIONS

This paper describes Arduino module and presents its potential deployment in smart home environment. Examples of prototype applications in home automation utilizing HC-05 Bluetooth network are illustrated. This system has attractive features such as remote control. The system will enable us to bring every appliance at every corner of our home under our control from a single point without having to get up and manually switch on or off the appliance. The use of a Bluetooth module assists the use of this system from various locations in our house.

The system is further simplified by allowing appliances to be controlled by our voice. The user need not have to have to immense knowledge over the language of English. Just by saying the appliance name and the corresponding number assigned to that particular appliance, and telling it to switch on or off will enable the user to have complete control over any appliance without any effort.

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