HOME AUTOMATION AND LEISURE USING VOICE COMMANDS

Mini Project report submitted in partial fulfillment of the requirements

for the degree of

Bachelor of Technology

in

Electronics and Communication Engineering

Submitted by

D.NEEHARIKA (15B81A0489)

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Ibrahimpatnam (M), Ranga Reddy (D), Telangana

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Certificate

This is to certify that the mini project titled **Home Automation And Leisure Using Voice Commands** submitted to the **CVR College of Engineering,** affiliated to **JNTU, Hyderabad** by **D.Neeharika, A.Rahul Kumar, K.Siddhartha** is a bonafide record of the work done by the students towards partial fulfillment of requirements for the award of the degree of **Bachelor of Technology in Electronics & Communication Engineering**.

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Acknowledgement

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Abstract

This abstract proposes the development of a home automation system using voice commands. The system will be developed using various module interfacings in a way more flexible and adaptable towards any residential structure. It will be designed in such a way that it communicates with Arduino board using Bluetooth and responds over speaker. This system will be more convenient and user-friendly than any other existing systems because here most of the tasks are done through voice commands and for every task done the user will be acknowledged through speaker.

Home automation can be considered as the advancement in technology of residential environment in order to enhance the quality of life of its inhabitants by providing services such as Tele health, multimedia entertainment, and power saving. In this context, this technology mainly focuses on investigating the means to improve the quality of life, particularly for disabled people. The home automation industry has been growing rapidly, which is mainly backed up by the need to provide systems to support elderly and disabled people who live in isolation. Thus, home automation must adapt to the needs of these citizens. The population structure of industrialized countries is changing; there will be less number of people to take care of the growing number of elderly citizens. This problem has encouraged a large number of studies involving robotics and automation. Rather than living in a old age home, it is more feasible to live in a house equipped with this technology .Moreover, it's very difficult for disabled or elderly people to switch on and off devices such as fans, air conditioners, lights, etc. Hence, they need help from someone to do these tasks. Therefore, the development of a system to assist them to turn on and off their home devices is crucial. The breakthrough in cutting edge voice command technology has an enormous potential in solving this problem.

KEYWORDS: Automation, Bluetooth, Voice-Based System, Home Appliances and Recreation.

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Chapter 1

EMBEDDED SYSTEMS

1.1 Introduction

An Embedded system is a combination of computer hardware and software. As with any electronic system, this system requires a hardware platform and that is built with a microprocessor or microcontroller. The Embedded system hardware includes elements like user interface, input/output interfaces, display and memory, etc. Generally, an embedded system comprises power supply, processor, memory, timers, serial communication ports and system application specific circuits.

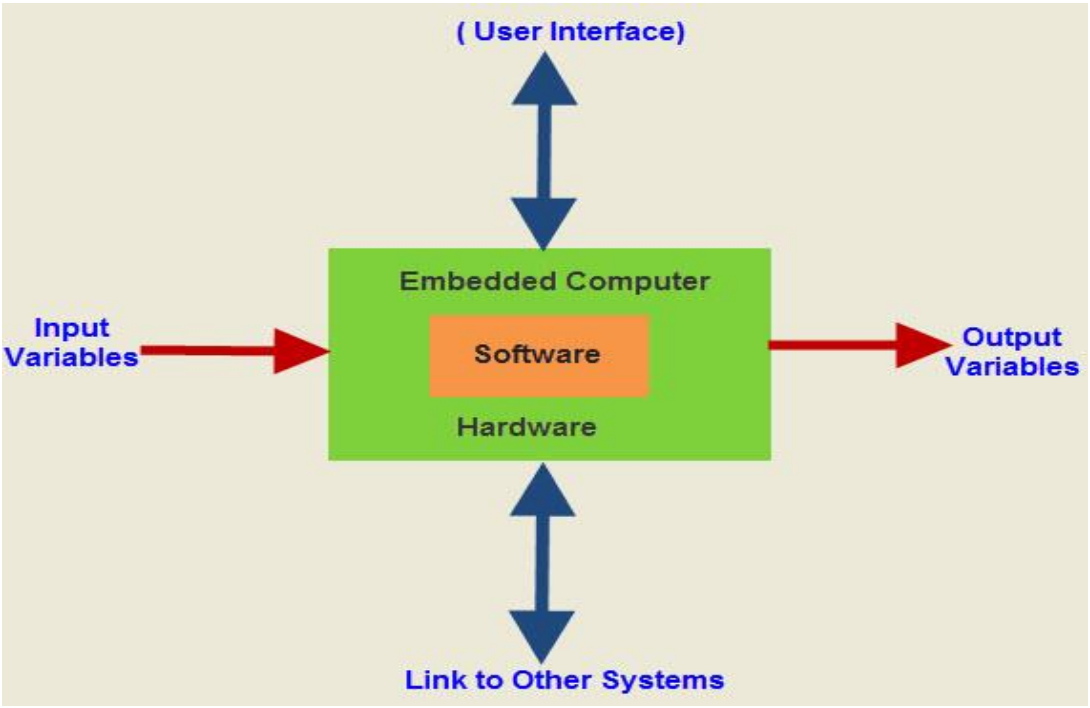

Figure 1.1

Embedded System

Embedded system software is written in a high-level language, and then compiled to achieve a specific function within a non-volatile memory in the hardware. Embedded system software is designed to keep in view of three limits. They are availability of system memory and processor speed. When the system runs endlessly, there is a need to limit the power dissipation for events like run, stop and wake up.

1.2 Types of Embedded Systems

Embedded systems can be classified into different types based on performance, functional requirements and performance of the microcontroller.

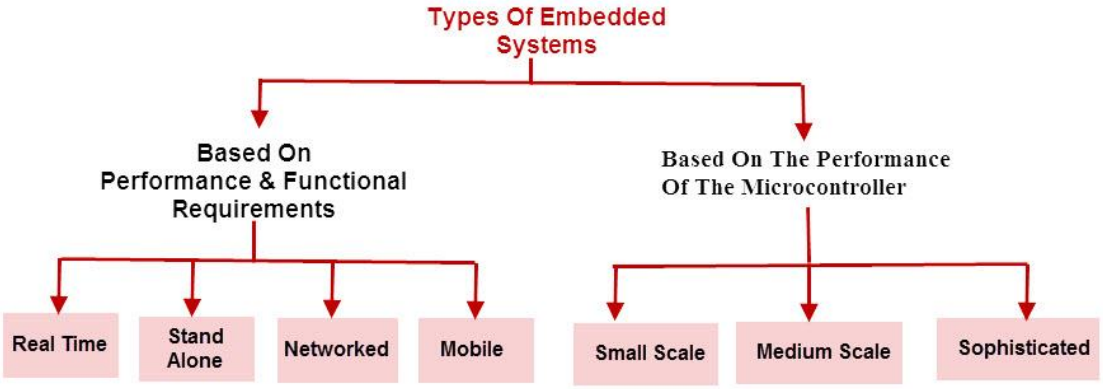

Figure 1.2

Embedded systems are classified into four categories based on their performance and functional requirements:

- Stand alone embedded systems
- Real time embedded systems
- Networked embedded systems
- Mobile embedded systems

Embedded Systems are classified into three types based on the performance of the microcontroller such as

- Small scale embedded systems
- Medium scale embedded systems
- Sophisticated embedded systems

Stand Alone Embedded Systems

Stand alone embedded systems do not require a host system like a computer, it works by itself. It takes the input from the input ports either analog or digital and processes, calculates and converts the data and gives the resulting data through the connected device-Which either controls, drives or displays the connected devices. Examples for the stand alone embedded systems are mp3 players, digital cameras, video game consoles, microwave ovens and temperature measurement systems.

Real Time Embedded Systems

A real time embedded system is defined as a system which gives a required o/p in a particular time. These types of embedded systems follow the time deadlines for completion of a task. Real time embedded systems are classified into two types such as soft and hard real time systems.

Networked Embedded Systems

These types of embedded systems are related to a network to access the resources. The connected network can be LAN, WAN or the internet. The connection can be any wired or wireless. This type of embedded system is the fastest growing area in embedded system applications. The embedded web server is a type of system wherein all embedded devices are connected to a web server and accessed and controlled by a web browser. Example for the LAN networked embedded system is a home security system wherein all sensors are connected and run on the protocol TCP/IP

Mobile Embedded Systems

Mobile embedded systems are used in portable embedded devices like cell phones, mobiles, digital cameras, mp3 players and personal digital assistants, etc. The basic limitation of these devices is the other resources and limitation of memory.

Small Scale Embedded Systems

These types of embedded systems are designed with a single 8 or 16-bit microcontroller that may even be powered by a battery. For developing embedded software for small scale embedded systems, the main programming tools are an editor, assembler, cross assembler and integrated development environment (IDE).

Medium Scale Embedded Systems

These types of embedded systems design with a single or 16 or 32 bit microcontroller, RISCs or DSPs. These types of embedded systems have both hardware and software complexities. For developing embedded software for medium scale embedded systems, the main programming tools are C, C++, JAVA, Visual C++, RTOS, debugger, source code engineering tool, simulator and IDE.

Sophisticated Embedded Systems

These types of embedded systems have enormous hardware and software complexities that may need ASIPs, IPs, PLAs, scalable or configurable processors. They are used for cutting-edge applications that need hardware and software Co-design and components which have to assemble in the final system.

1.3 Applications of Embedded Systems:

Embedded systems are used in different applications like automobiles, telecommunications, smart cards, missiles, satellites, computer networking and digital consumer electronics.

Figure 1.3

Embedded Systems in Automobiles and in telecommunications

- Motor and cruise control system
- Body or Engine safety
- Entertainment and multimedia in car
- E-Com and Mobile access
- Robotics in assembly line

Embedded Systems in Smart Cards, Missiles and Satellites

- Security systems
- Telephone and banking
- Defense and aerospace
- Communication

Embedded Systems in Peripherals & Computer Networking

- Displays and Monitors
- Networking Systems
- Image Processing
- Network cards and printers

Embedded Systems in Consumer Electronics

- Digital Cameras
- Set top Boxes
- High Definition TVs
- DVDs

1.5 Conclusion

Here are the main aspects of the project that had been discussed.

Chapter 2

HARWARE DESCRIPTION

2.1 Introduction:

Automation plays a key role in human life. Home automation allows us to control household electrical appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated. Home automation not only refers to reduce human efforts but also energy efficiency and time saving. The main objective of home automation and security is to help handicapped and old aged people who will enable them to control home appliances and alert them in critical situations.

This project put forwards the implementation of home automation and security system using Arduino microprocessor and Android smart phone. Home appliances are connected to the microprocessor and communication is established between the Arduino and Android mobile device or tablet via Bluetooth module. We would develop an authentication to the system for authorized person to access home appliances. The device with low cost and scalable to less modification to the core is much important. It presents the design and implementation of automation system that can monitor and control home appliances via android phone or tablet

Voice controlled wireless smart home system has been presented for elderly and disabled people. The concept of controlling home appliances using human voice is interesting. The proposed system has two main components, they are

(a)Voice recognition system and (b) wireless system. This system to control home appliances uses a voice controlled android application. By the increasing use of PC (personal computers), internet, mobile phone and wireless technology, it makes it easy for a user to remotely access and controls the appliances.

A lot of research has been done and many solutions have been proposed to remotely access the home appliances. Some of them used internet, wireless technology to communicate and control home appliances, others used Bluetooth and GSM technology for controlling the home appliances.

The main aim of our system is to build a perfect companion for someone to be at home. Generally, home automation research targeted many needs like applications that provide the luxury and smart requirements while some threw light on the special needs for elderly and disabled etc. our system is a computer based system that can accept voice to direct commands and process them. The system provides us switching any device ON/OFF.

2.2 Components Required:

- Arduino R3
- 4 Channel Relay
- HC-05 Bluetooth module
- SD Card module
- Bread Board

2.2.1 Arduino R3:

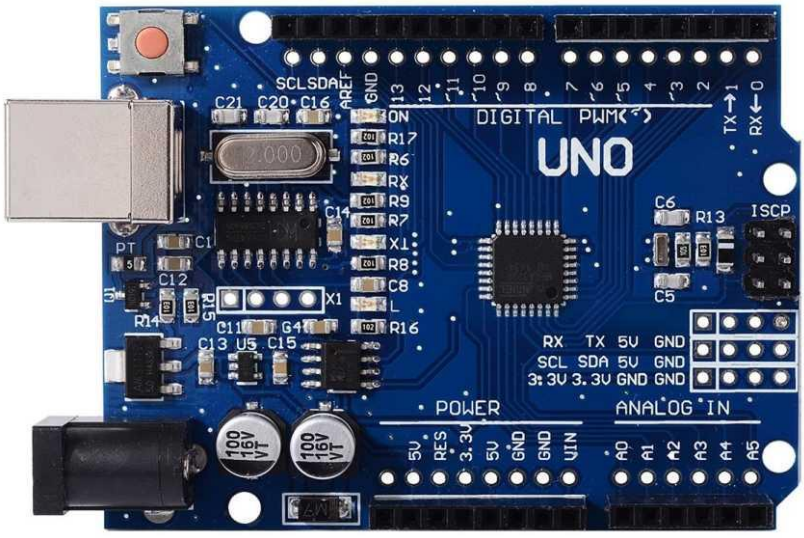

Figure 2.2.1

Description:

The Arduino UNO is a widely used open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc .The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced

to various expansion boards (shields) and other circuits. The board features 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Technical Specifications:

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volt
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g

Pin functions:

- **VIN**: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3V3**: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins
- **IOREF**: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shields which block the one on the board.
- **Serial**: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts**: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM** (**P**ulse **W**idth **M**odulation): 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function and read input with analogRead() function.
- **SPI** (**S**erial **P**eripheral **I**nterface): 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI** (**T**wo **W**ire **I**nterface): A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- **AREF** (**A**nalog **Ref**erence): Reference voltage for the analog inputs.

2.2.2 4 Channel Relay:

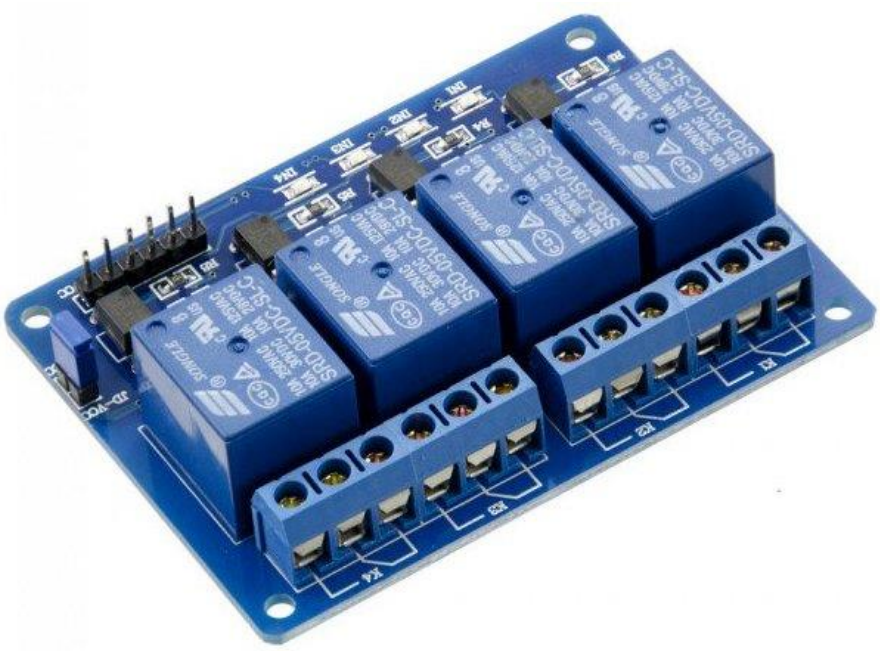

Figure 2.2.2

This is a 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller.

Principle:

Relay acts a simple digital switch, based on the digital input it will be either closed or opened. Here, we are using an active low relay (i.e) relay is switched on for 0V (LOW) and is switched off for 5V (HIGH). Each relay has 3 outputs as shown in the figure, middle port is a common terminal and other two are always open and always closed ports.

Pin Description:

Input:

VCC: Positive supply voltage

GND: Ground

IN1--IN4: Relay control port

Output:

Connect a load, DC 30V/10A，AC 250V/10A

2.2.3 HC-05 Bluetooth Module:

Figure 2.2.3a

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for 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 complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

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. Master module can initiate a connection to other devices.

Hardware Features

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmits power.
- 3.3 to 5 V I/O.
- PIO (Programmable Input/Output) control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector.

Software Features

- Slave default Baud rate: 9600, Data bits: 8, Stop bit:1,Parity:No parity.
- Auto connects to the last device on power as default.
- Permit pairing device to connect as default.
- Auto pairing PINCODE:"1234" as default.

Pin Description:

ENABLE:

When enable is pulled LOW, the module is disabled which means the module will not turn on and it fails to communicate. When enable is left open or connected to 3.3V, the module is enabled (i.e) the module remains on and communication also takes place.

VCC:

Supply Voltage 3.3V to 5V

GND:

Ground pin

TXD & RXD:

These two pins acts as an UART interface for communication

STATE:

It acts as a status indicator. When the module is not connected to / paired with any other Bluetooth device, signal goes Low. At this low state, the led flashes continuously which denotes that the module is not paired with other device. When this module is connected to/paired with any other Bluetooth device, the signal goes high. At this high state, the led blinks with a constant delay say for example 2s delay which indicates that the module is paired.

BUTTON SWITCH:

This is used to switch the module into AT command mode. To enable AT command mode, press the button switch for a second. With the help of AT commands, the user can change the parameters of this module but only when the module is not paired with any other BT device..

Hardware Connections:

As we know that VCC and GND of the module goes to VCC and GND of Arduino. The TXD pin goes to RXD pin of Arduino and RXD pin goes to TXD pin of Arduino i.e (digital pin 0 and 1).The user can use the on board led. But here, led is connected to digital pin 12 externally for betterment of the process.

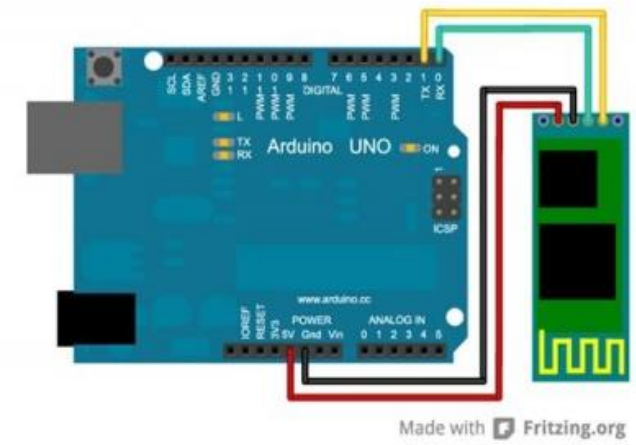

Figure 2.2.3b

2.2.4 SD Card Module:

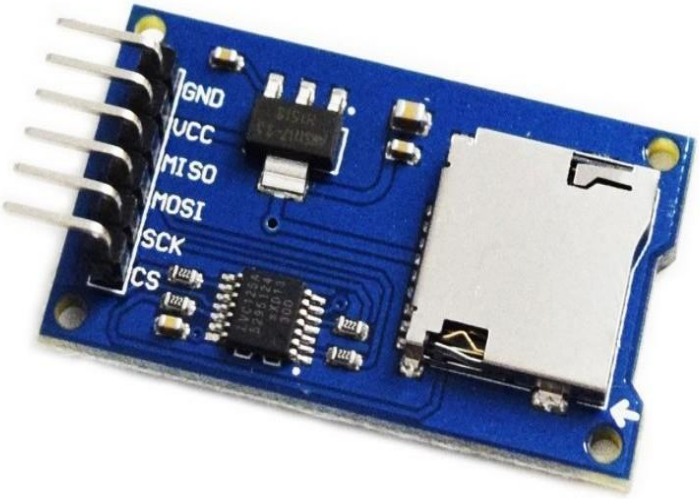

Figure 2.2.4

The SD Card Module is a simple solution for transferring data to and from a standard SD card. The pin out is directly compatible with Arduino, but can also be used with other microcontrollers. This module has SPI interface which is compatible with any SD card and it use 5V or 3.3V power supply which is compatible with Arduino UNO/Mega.SD module has various applications such as data logger, audio, video, graphics.

Specifications:

- Operating voltage 5V
- SPI Communication method
- SD card Socket
- Supports FAT16 and FAT32
- Support 2gb to 4gb

Hardware and Software Required:

- SD Card Module
- Arduino Uno

- Arduino IDE

Hardware Connections:

The SD Card Module should be connected to Arduino Uno has follows:

- VCC - 5V
- GND - GND
- MOSI(Master Out Slave In) - pin 11
- MISO(Master In Slave Out) - pin 12
- CLK - pin 13
- CS(Chip Select) - pin 4

A **memory card**, **flash card** or **memory cartridge** is an electronic flash memory data storage device used for storing digital information. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets, PDAs, portable media players, video game consoles, synthesizers, electronic keyboards, and digital pianos.

2.2.5 Temperature Sensor (LM 35):

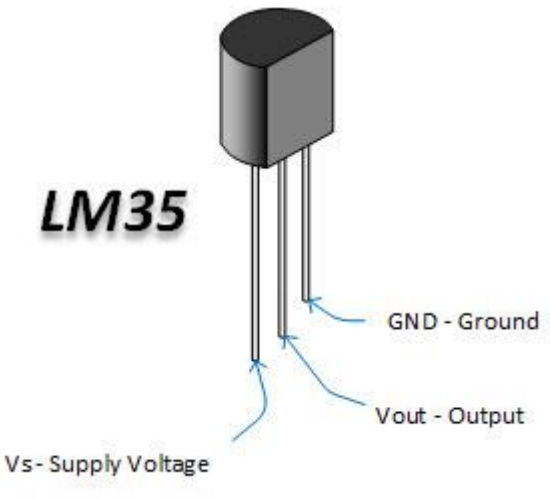

Figure 2.2.5

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. Since it has Linear + 10.0 mV/°C scale factor it is very easy to calculate temperature value.

The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air.

Features:

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee (at +25°C)
- Rated for full −55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1⁄4°C typical
- Low impedance output, 0.1 W for 1 mA load

2.3 Conclusion:

Therefore, components required for the project are specified in detail with their pin description and features.

Chapter 3

PROJECT DESCRIPTION

3.1 Introduction:

Figure 3.1

Early home automation began with labor-saving machines. Self-contained electric or gas powered home appliances became viable in the 1900s with the introduction of electric power distribution and led to the introduction of washing machines (1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers.

In 1975, the first general purpose home automation network technology, X10, was developed. It is a communication protocol for electronic devices. It primarily uses electric power transmission wiring for signaling and control, where the signals involve brief radio frequency bursts of digital data, and remains the most widely available. By 1978, X10 products included a 16 channel command console, a lamp module, and an appliance module. Soon after came the wall switch module and the first X10 timer.

A **voice command device** (VCD) is a device controlled by means of the human voice. By removing the need to use buttons, dials and switches, consumers can easily operate appliances with their hands full or while doing other tasks. Some of the first examples of VCDs can be found in home appliances with washing machines that

allow consumers to operate washing controls through vocal commands and mobile phones with voice-activated dialing.

Newer VCDs are speaker-independent, so they can respond to multiple voices, regardless of accent or dialectal influences. They are also capable of responding to several commands at once, separating vocal messages, and providing appropriate feedback, accurately imitating a natural conversation. They can understand around 50 different commands and retain up to 2 minutes of vocal messages. VCDs can be found in computer operating systems, commercial software for computers, mobile phones, cars, call centers, and internet search engines such as Google.

3.2 Block Diagram:

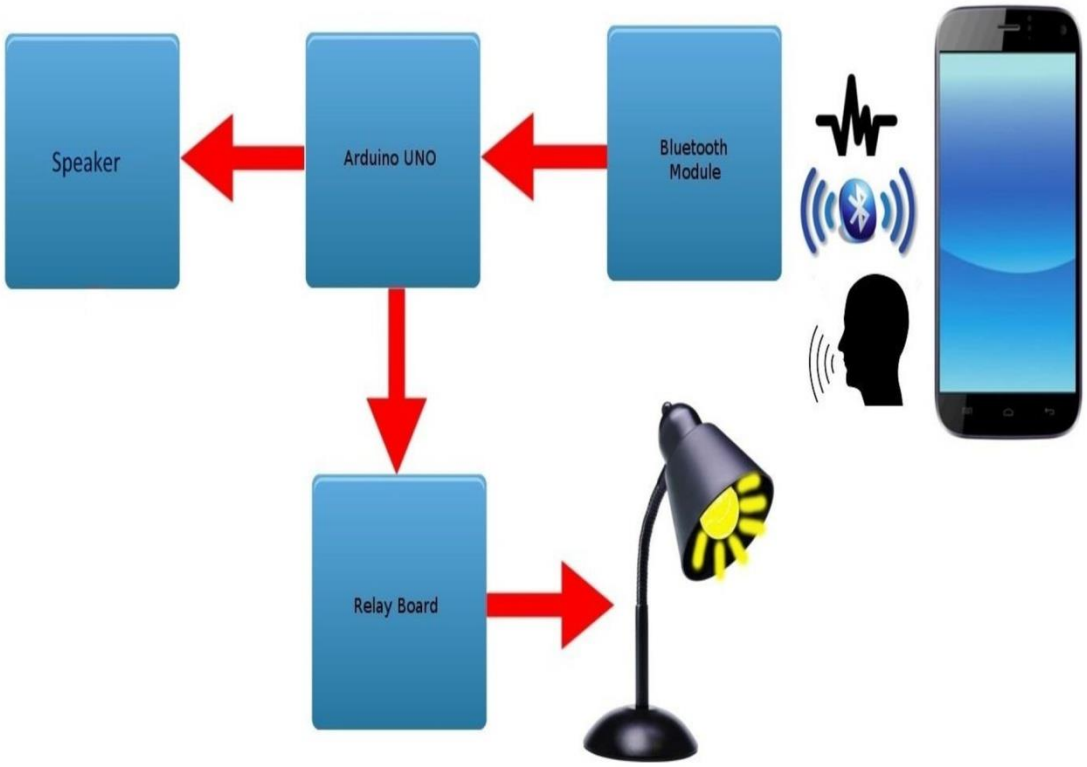

Figure 3.2

3.3 Wiring:

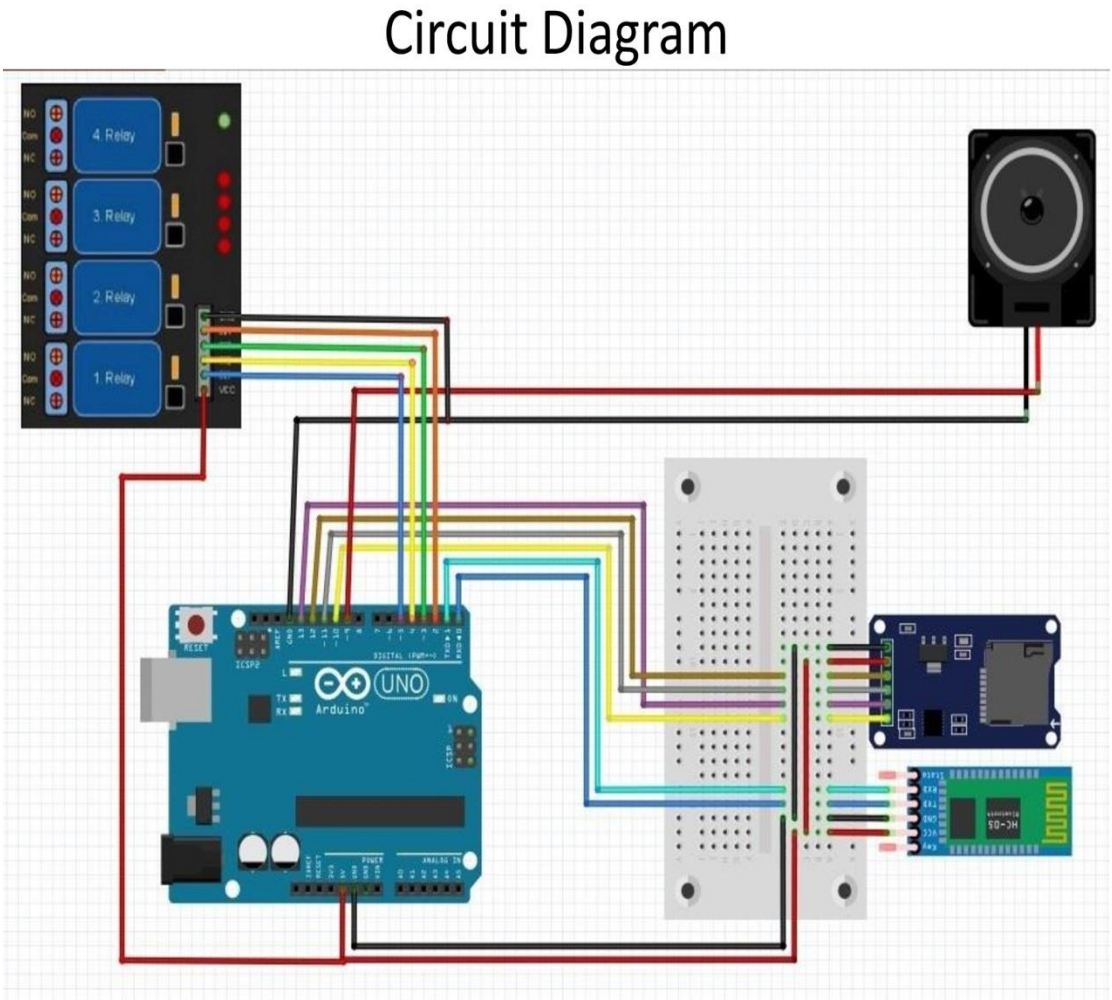

Figure 3.3

3.4 Project Working:

Home automation or **domotics** is building automation for a home, called a **smart home** or **smart house**. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things.

A home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses either wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the Internet.

While there are many competing vendors, there are very few worldwide accepted industry standards and the smart home space is heavily fragmented. Manufacturers often prevent independent implementations by withholding documentation and by litigation.

Home automation has recently come into the limelight and thus has undergone large scale development. Everything from lights and gas stoves to a garage door can be controlled using a central panel in the house or through wireless devices using an application or even voice commands. It has been a huge advancement in technology, where it proves very useful in big houses or for the disabled such as for the blind etc. It goes from basic switch controls that turn the lights on/off to creating different environments in the house based on requirements or mood, calling an Uber cab for you, controlling the HVAC systems of the house, Audio Visual entertainment systems etc. and many other advanced functions in the technological aspect. Home automation is not only a luxury, but for certain demographics like the quadriplegic, the elderly and the disabled, it can be of great assistance. A home automation system makes them independent and self-reliant to a certain extent. The current market leaders in home automation technologies are Google Home, Amazon Echo, Alexa, Wink Hub, Logitech Harmony and Apple HomeKit. All of these are only the control hubs and require the purchase of home automation compliant appliances to function. Examples of such appliances are Phillips Hue, Nest Thermostat, Canary, Sentri, Google Cast and Avion. The papers we studied did not rely on such devices. Instead they built their own test network of devices using cost effective components like micro-controllers and relay circuits on which they ran their respective algorithms.

The key steps of this implementation are:

a) Voice Recognition using a microphone or a smart phone with the help Google Voice Assistant.

b) Command Transmission using Bluetooth and recognition of the commands using a microcontroller.

c) Based on the command control signals are sent to relay and thus switching on the devices.

d) Giving acknowledgement after a particular instruction is executed through speaker.

3.5 Algorithms:

1. **Keywords extraction algorithm**: As we know a command sentence usually consists of different kind of words. Some of the words in a command are important to us while other words are not necessary. We us a word filter to extract some of the keywords from the command. After analyzing the command sentences, we find that usually typical command contains three kinds of keywords, target, action and degree. Usually we use name of the appliances and to be switched on or off.

   The diagram is as follows:

Figure 3.5

2. **The smart control algorithm:** The sole duty of a home automation system is not only executing the given command but also avoiding the redundant commands and provide alternative. For example, let us consider we give a command to switch on the light and after sometime we give the same command to switch on the light then we get an exception saying that its already on do you want it to be switched off.

3.6 Conclusion:

Therefore, implementation of our home automation system using voice commands is discussed in detail.

CHAPTER 4

SOFTWARES USED

Arduino (IDE):

The open-source Arduino Software (IDE) makes it easy to write code and upload it board. It runs on Windows, Mac OS and Linux. The environment is written in Java and based on processing and other open-source software. A program for Arduino is written in wiring language, which is similar to embedded C. It also has features like serial monitor and serial plotter which is useful in testing the code. This software is preloaded with various libraries which can be used in interfacing various components, sensors and modules.

TTS (Text To Speech):

There are many open source platforms which facilitate us to convert text to audio files. We acquire all the possible set of replies and store them in SD card.

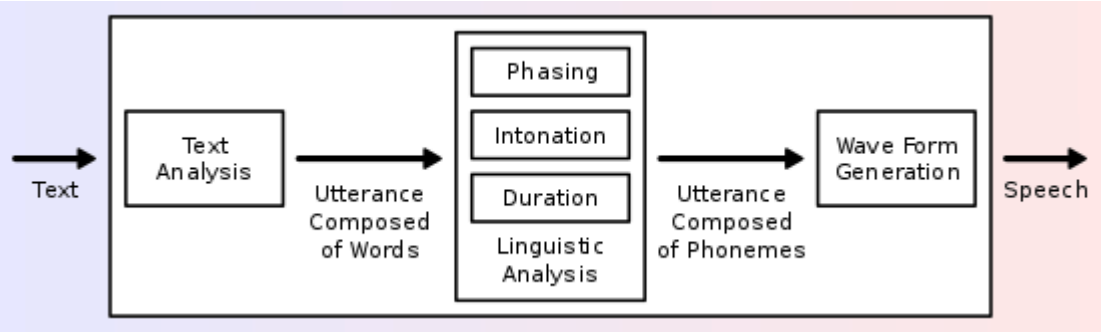

Figure 4.1

MP3 TO WAV Converters:

Files generated by TTS are generally in mp3 format which is not supported by Arduino. So, there is a need for a conversion from mp3 to 8-Bit Unsigned PCM wav format which can be played through Arduino.

CHAPTER 5

OUTPUT

Here, is the complete home automation system with light, fan, charger and heater which can be controlled through voice commands and acknowledgement is given through speaker.

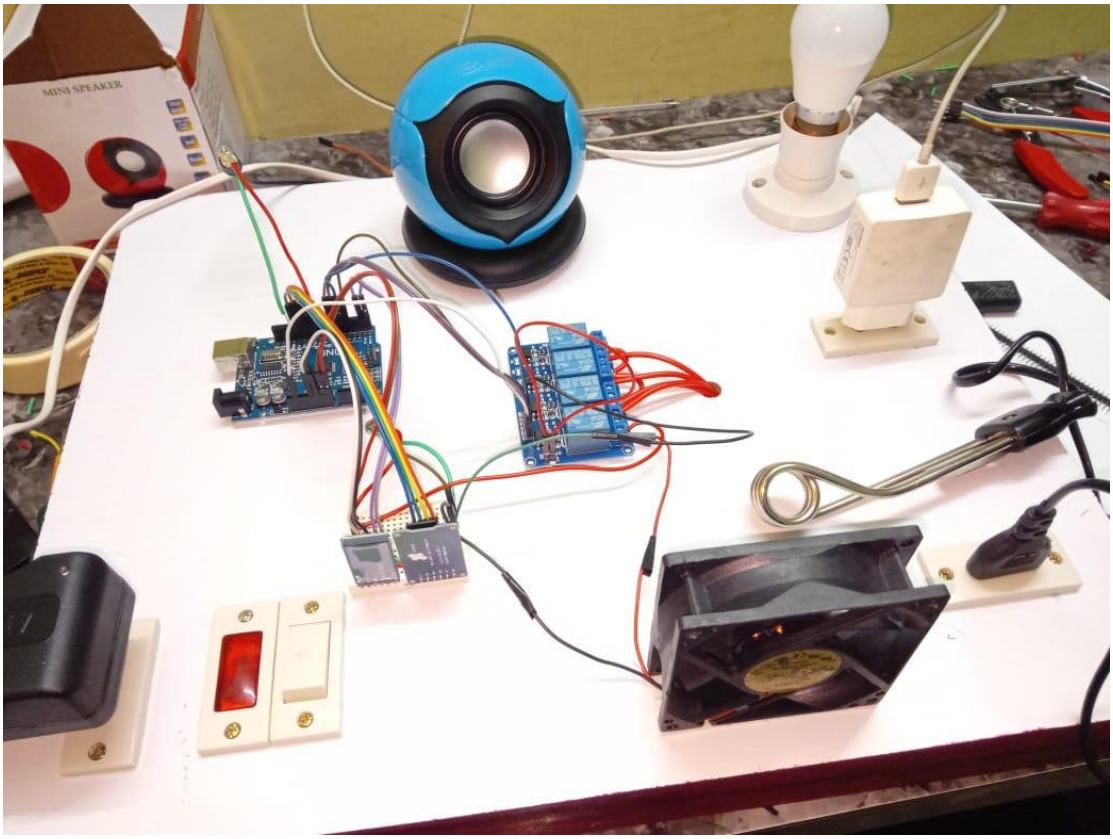

Figure 5.1

CHAPTER 6

ADVANTAGES AND APPLICATIONS

6.1 Advantages

- Provides safety from electrical short circuits while using conventional wall switches to operate loads.
- Saves a lot of time and enables us to operate from anywhere inside the house.
- No need of separate remote or switch board for controlling various electrical and electronic applications.
- This technology is especially useful in home environment, where there exits hardly any infrastructure to interconnect appliances.
- Easy to use more interactive interface when compared to previous systems.

6.2 Applications and Technologies

- The inefficiency of operation of conventional wall switches can be overwhelmed using various home automation systems (without using conventional switching methods).
- The loss of power can be reduced and manpower required for home automation is very less compared to conventional methods.
- The IR, RF, android application, Arduino, Bluetooth, DTMF, etc., based home automation systems can be more efficient, provides ease of operation.
- Provides safety from electrical power short circuits while using conventional wall switches to operate loads.
- Home automation system with automated door locking and security cameras facilitates more security.
- By using a home automation system, we can save a lot of time to operate home appliances from anywhere (without wasting time to move from office to home for just unlocking door for family members to enter the home).

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

In this project we have successfully implemented voice controlled home automation system controlling relays using Arduino with Bluetooth module HC-05. This project can be used for controlling ‘n’ number of input controls (i.e) by extending number of relays.

Our implemented module is more reliable and flexible in order to control any loads and the coverage area for wireless control is 10-20 meters. Hence this project can be useful for a real time voice controlled home automation. Thus Arduino based voice controlled home appliances proves to be a better remote controlled operation on home appliances using Bluetooth module HC-05.

This project can be extended for many automation applications such as industrial automation, automotive, military, healthcare, transportation and so on. Further the coverage area can also be increased by the use of GSM modules and Wi-Fi Modules.

CHAPTER 8

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