A PROJECT REPORT ON

"ELEVATOR AUTOMATION USING VOICE RECOGNITION"

UNDER THE GUIDANCE OF

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SUBMITTED BY

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SHALAKA FOUNDATION'S KEYSTONE SCHOOL OF ENGINEERING

CERTIFICATE

THIS IS TO CERTIFY THAT PROJECT ENTITLED

"ELEVATOR AUTOMATION USING VOICE RECOGNITION"

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Is a record of the bonafide work carried out under the supervision of **Prof. Sharwari Kulkarni** and is approved as the partial fulfilment of the requirement of the award of degree in Electronic and Telecommunication Engineering of the University of Pune.

Prof. Sharwari Kulkarni **Guide** **Department of E&TC**	**Prof. Rajesh Barapte** **HOD** **Department of E&TC**	**Principal**

Place: Pune

Date:

Examiner

ABSTRACT

Automation is now widely preferred and utilized in almost every sector due to its precision, consistency, and long-term operational benefits, rivaling those of manual operating systems. One particular application of automation that holds promise is voice-controlled elevators, designed to assist individuals with disabilities. Even if a person lacks full or properly functioning hand organs, they can still utilize their voice to operate the elevator. Speech recognition technology plays a crucial role in converting spoken language into input data for controlling the elevator's equipment.

The system operates by receiving human speech as input. It then identifies the spoken words and translates them into commands for the control equipment. Precise and specific words are required to control the hardware, and the system can only recognize a predefined set of words. While these systems are generally highly accurate and easily trainable, they may not be able to recognize words beyond their taught vocabulary.

The functionality of the elevator primarily relies on the elevator algorithm, which determines when the elevator should stop. This decision is based on two conditions: the direction of travel and the current floor in relation to the destination floor.

ACKNOWLEDGEMENT

Every orientation work has an imprint of many people and it becomes duty to express deep gratitude for the same.

We would like to take this opportunity to express true sense of gratitude towards our project guide **Prof. Sharwari Kulkarni** for her valuable co-operation and guidance. Her insights and suggestions were instrumental in shaping our understanding of the subject and helped us to develop a better perspective on the topic.

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CHAPTER 1

1.1 PRELUDE

- The preliminary stage of the "Elevator Automation Using Voice Recognition" project involves conducting research on the existing elevator control systems and exploring the capabilities of voice recognition technology. This includes understanding the limitations and challenges of traditional elevator interfaces, such as the need to press buttons or interact with control panels. Additionally, it involves investigating the advancements in voice recognition technology and its application in other domains.
- Through this preliminary research, the project team gains insights into the feasibility and potential benefits of implementing voice recognition in elevators. They assess how voice recognition can enhance user experience by providing a more intuitive and convenient control method. They also consider the potential advantages of voice recognition, such as improved accessibility for individuals with disabilities and reduced touchpoints for increased hygiene.

1.2 MOTIVATION

- The motivation for the project "Elevator Automation Using Voice Recognition" is to enhance the user experience and improve the efficiency of elevator operations. By implementing voice recognition technology, users can control elevators simply by speaking commands, eliminating the need to press buttons or interact with traditional control panels.
- It also reduces the risk of germs transmission, as users won't have to touch potentially contaminated surfaces. Overall, the project aims to create a more user-friendly, efficient, and hygienic elevator system.

1.3 PROBLEM STATEMENT

- To implement an elevator automation with the help of voice recognition method.

1.4 OBJECTIVES OF THE PROJECT

- Implement Voice Recognition: Develop a robust voice recognition system that can accurately interpret and understand user commands. This involves training the system to recognize a wide range of voice inputs, including different languages, accents, and variations in speech patterns.
- Enable Hands-Free Operation: Enable users to operate elevators without the need to press buttons or interact with control panels manually. By using voice commands, users can simply state their desired floor or destination, and the elevator system will respond accordingly.
- Improve User Experience: Enhance the overall user experience by providing a more intuitive and convenient control method. Voice recognition technology eliminates the need for physical interaction, making it particularly useful for individuals with mobility challenges, those carrying heavy items, or those with limited dexterity.

CHAPTER 2

2.1 INTRODUCTION

The growing number of tall buildings has led to a higher need for elevator systems, which are essential for transporting people and goods efficiently. Elevators are incredibly valuable as they swiftly move individuals to their desired floors. Over time, the design of elevators and escalators has also progressed. However, in the present era, the risk of spreading diseases through interpersonal contact is a significant concern. Amidst the ongoing COVID-19 situation, the control of elevators has become a potential risk factor for the transmission of the virus. The conventional method of operating elevators by pressing buttons poses a potential threat of contracting and spreading the coronavirus.

The utilization of IoT technology enhances the reliability and safety of elevator systems, particularly in mitigating the risk of COVID-19 transmission. Furthermore, this advancement allows for easy accessibility by individuals with paralysis or physical disabilities. The proposed project involves the creation of a smart elevator that integrates with Atmega 2560 pro. It incorporates a Voice Recognition Module to accept commands, enabling control over the elevator's stepper motor for smooth vertical movement. Touchless interfaces, such as voice recognition, have diverse applications. For instance, in Ambient Assisted Living, touchless interfaces provide a natural and accessible interaction with various devices. Moreover, in environments that require utmost sterility like operating rooms, touchless interactions offer significant benefits.

The research outlined in this paper bears resemblances to the previously mentioned domains. It introduces a touchless interface utilizing voice recognition to control an elevator. With this interface, users can effortlessly select and confirm their desired floor without the need to physically touch any device. Our aim is to provide a natural interaction with the available devices, similar to the concept of Ambient Assisted Living. While it may not be as common to require a sterile environment in elevator settings as in surgical procedures, our approach can still contribute to maintaining a hygienic environment for both the elevator and its occupants, particularly in places like hospitals. It is important to acknowledge that conventional button panels commonly found in elevators are often designed with user-friendliness and intuitive operation in mind. This is particularly evident in the case of scenic elevators in skyscrapers.

2.2 LITERATURE SURVEY

Several research papers have delved into the incorporation of speech recognition technology into elevator systems, with a specific focus on enhancing accessibility for individuals with disabilities. For instance, one study focused on a CNN-based speech recognition system capable of supporting Marathi and English languages. It achieved impressive accuracy rates of 95% for Marathi, 85% for English, and 75% for both languages. [1]. An additional study put forward a novel elevator control system based on speech recognition, aiming to mitigate the transmission of COVID-19. This system employed a differential feature parameter algorithm utilizing Mel Frequency Cepstral Coefficients (MFCC) for speech recognition, along with Least Mean Square (LMS) adaptive filtering for noise reduction. The implementation of these techniques led to notable enhancements in accuracy. [2]. In addition to elevators, researchers have also explored the advancements in voice-activated wheelchairs. Through a series of experiments, a system was devised that could effectively navigate indoor environments and seamlessly transition between different floors while ensuring safety. [3]. Amidst the pandemic, touchless control panels have emerged as a significant development. A study put forth a novel approach for elevator control panels, utilizing an infrared light field to enable operation without the need for physical touch or the use of specialized materials or devices. This innovation offers a convenient and hygienic solution in the current touch-averse environment. [4]. Speech recognition technology has been effectively utilized in elevators across multiple languages. As an example, a recent study introduced a voice and speech recognition system specifically designed for smartphones, with a focus on the Tamil language. The system employed the Hidden Markov Model (HMM) technique, achieving an impressive accuracy rate of approximately 98%. This development showcases the potential for implementing speech recognition technology in elevators to cater to diverse linguistic requirements. [5]. In a different investigation, machine learning was employed to facilitate the control of elevator equipment through spoken words. This study exhibited noteworthy outcomes, showcasing exceptional accuracy and adaptability in the recognition of spoken words. The findings underscored the potential of machine learning in enhancing elevator systems, offering precise and flexible control mechanisms based on voice commands. [6]. A study proposed a system to aid individuals with visual impairments. The system comprised of a remote unit and an elevator unit connected through wireless communication. It incorporated voice confirmation of the elevator's status, providing valuable information to visually impaired individuals for enhanced navigation and usage. [7]. Moreover, a voice-controlled elevator system based on Arduino was developed to enhance accessibility for all individuals, including those with disabilities. This system also aimed to minimize physical touch, thus addressing concerns related to the spread of COVID-19. [8]. Another study focused on a voice-controlled elevator system tailored for differently-abled individuals, utilizing automatic speech recognition and text-to-speech systems. It achieved notable accuracy rates of 97% for floor numbers and 90% for directions and door operations. [9]. Collectively, these studies underscore the significant potential of speech recognition technology in improving accessibility and reducing the need for physical touch in elevator systems.

CHAPTER 3

3.1 SPECIFICATIONS

3.1.1 Hardware Specifications

- Power supply adapters
- Atmega 2560 pro
- Voice Recognization Module
- Stepper Motor driver
- Stepper motor
- I2C Serial Interface Module
- LCD display Stepper Motor

3.1.2 Software Specifications

- Proteus 8(For circuit diagram only)
- Arduino Software (IDE)

3.2 BLOCK DIAGRAM

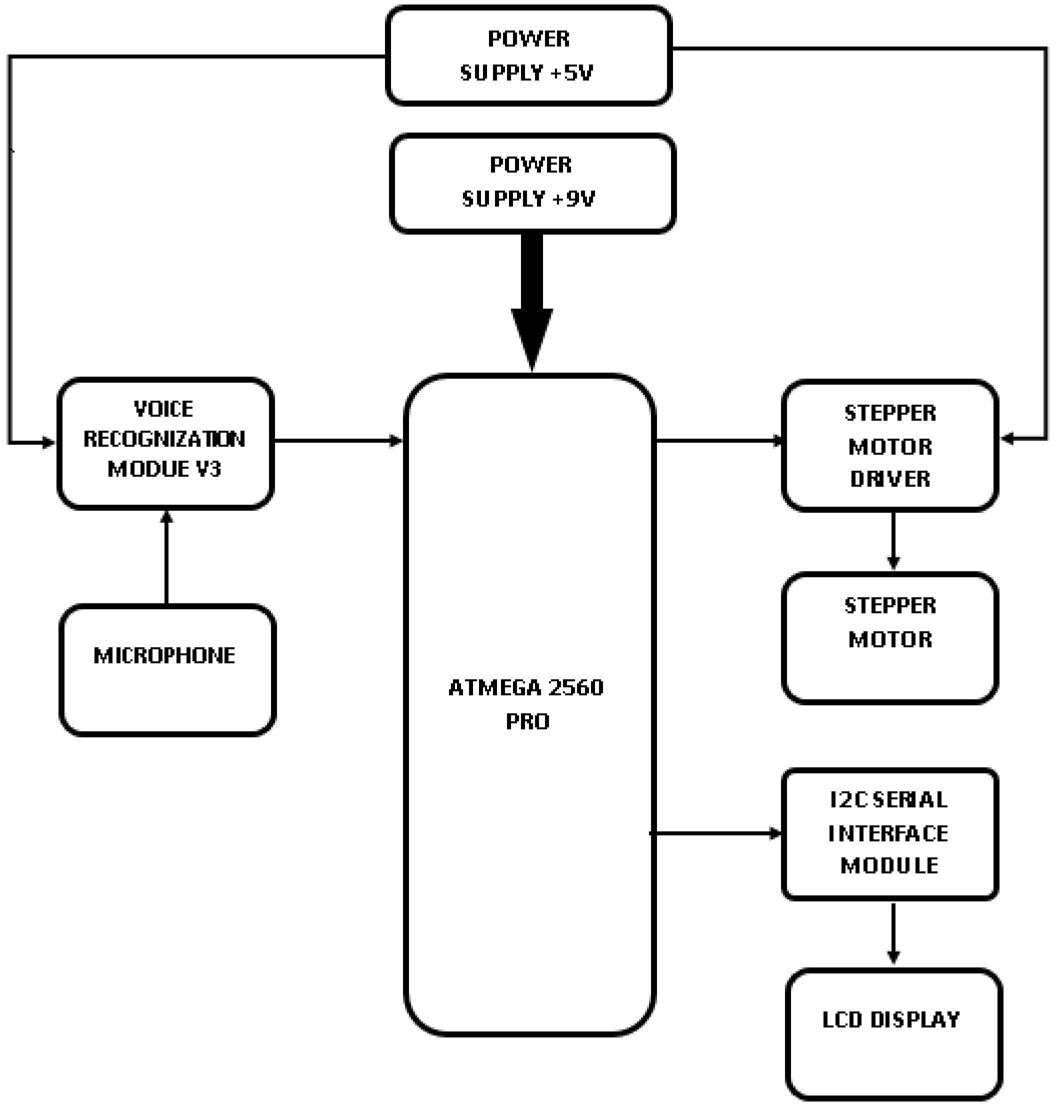

Figure 3.2

3.3 COMPONENT DESCRIPTION

1. ATMEGA 2560 Pro

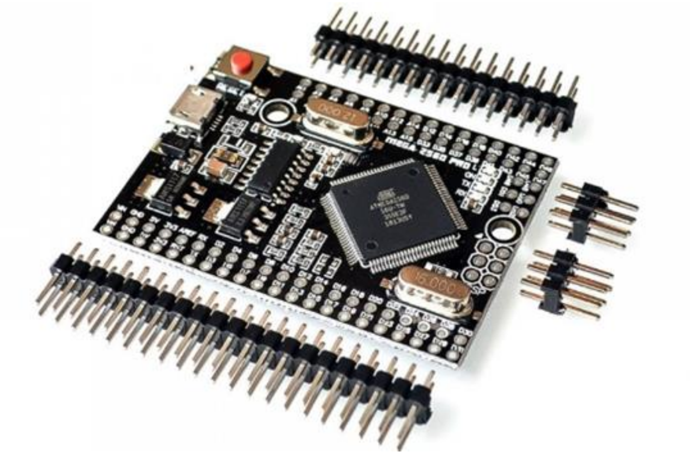

Figure 3.3.1

The ATmega2560 Pro is a controller board that utilizes the Atmel ATmega2560 processor. It shares similarities with the Arduino Mega 2560 board, but incorporates certain hardware design distinctions. Boasting an impressive array of features, the ATmega2560 Pro is equipped with fifty-four digital input/output pins, sixteen analog inputs, four UARTs for hardware serial communication, a sixteen MHz crystal oscillator, USB connectivity, a power jack. This microcontroller board provides a comprehensive set of capabilities. Additionally, programming can be conveniently accomplished using the Arduino IDE or compatible environments It finds wide application in robotics, automation, and various electronic projects due to its versatility and robust capabilities.

2. Voice Recognition Module

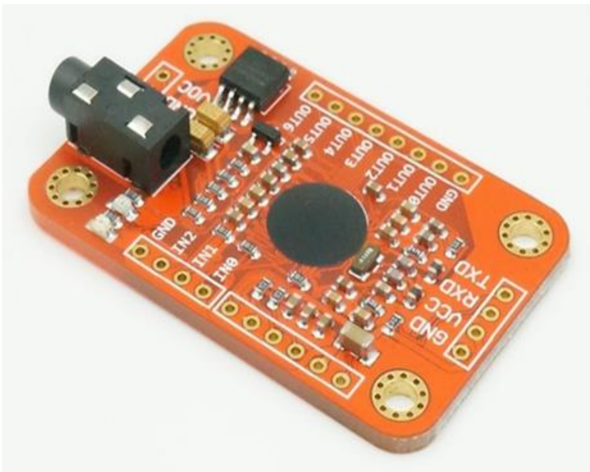

Figure 3.3.2

The Voice Recognition Module is a user-friendly and compact board designed for convenient control of voice recognition. This module operates on speaker-dependent voice recognition technology and has the capability to support up to 80 voice commands. Simultaneously, a maximum of 7 voice commands can be processed. The module allows users to train it with specific sound patterns to be recognized as commands. Prior to utilizing the module for voice command recognition, users are required to train the module by providing the desired sound patterns.

3. Stepper Motor Driver

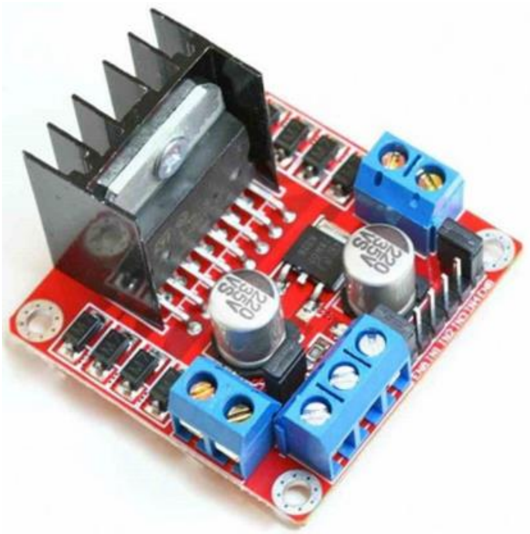

Figure 3.3.3

The ATmega2560 Pro offers seamless connectivity for hobby servos, providing two connections for 5V and 12V servos, all managed by the Arduino's dedicated high-resolution timer 4. Furthermore, it features four h-bridges equipped with the L293D chipset, enabling each bridge to deliver a current of 0.6A while ensuring thermal shutdown protection. This microcontroller board also supports up to two stepper motors with single coil, double coil, or interleaved stepping modes, incorporating internal kickback protection diodes. Remarkably lightweight, weighing just 0.2 grams, it combines power and versatility for a diverse range of projects.

4. Stepper Motor

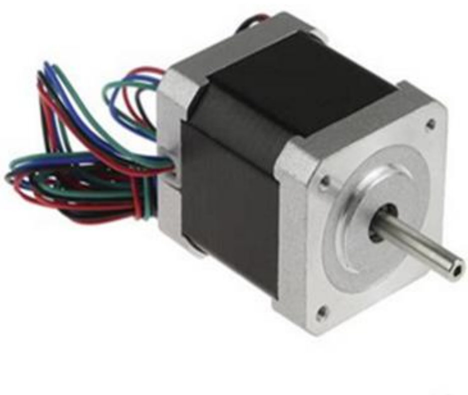

Figure 3.3.4

A stepper motor, referred to as a step motor or stepping motor, is an electric motor that operates without brushes and utilizes a brushless DC design. Its distinguishing feature is the division of a complete rotation into a series of equally spaced steps. Remarkably, the motor can be instructed to move and maintain its position at any of these steps, even without the need for a position sensor to provide feedback. The crucial factor lies in selecting the appropriate motor size in terms of torque and speed to suit the specific application requirements.

5. I2C Serial Interface Module

Figure 3.3.5

This module is a type of I2C LCD module that communicates using the I2C protocol. Requiring only a few connections to a microcontroller, the 16x2 LCD module offers the convenience of displaying text and basic graphics. This feature makes it a popular choice in the realm of embedded systems and robotics. Its simplicity and versatility make it an ideal component for incorporating visual output into a wide range of applications. To use it, connect four wires and install a library for communication. They are popular for displaying information in electronic projects.

6. LCD Display 16*2

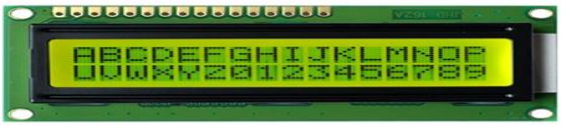

Figure 3.3.6

16x2 LCD operates at the voltage of 4.5V to 5.5V range and consist of sixteen pins. It has two rows and sixteen columns with each column to represent one character at a time. The lcd Module consist of pins through which we can adjust the contrast or the background light intensity as per our requirement.to display the data it has seven data pins through which we can display characters special character and numeric values.

OVERALL CONCEPT

For this project, we opted to utilize the ATMEGA 2560 Pro microcontroller as our core component. It was seamlessly integrated into the system, establishing a connection with a voice recognition module via the UART protocol. This communication protocol facilitated efficient data exchange and ensured smooth interaction between the microcontroller and the voice recognition module. The voice recognition module features an IC from Win bond Company that amplifies the voice input signals, which typically range around 50 mill watts. The IC converts these low-amplitude AC signals into five-volt DC signals. The voice recognition module performs speech processing tasks once it is trained according to the user's requirements.

Upon receiving voice commands from the user, the voice module undertakes the crucial task of processing and converting them into direct current (DC) signals. This transformation enables seamless integration with the rest of the system, facilitating further processing and execution of the user's commands. These signals are then transmitted via the UART port on the voice module. Upon receiving the signal, the ATMEGA controller analyzes it using an in-built database included in the program. In order to control the movement of the elevator, the controller utilizes the pulse-width modulation (PWM) signal port. This PWM signal is then transmitted to the input of the stepper motor driver module. By leveraging this mechanism, the controller effectively regulates the rotation of the motor shaft, enabling precise control over the elevator's vertical movement. Depending on the desired direction, the motor shaft can be rotated either clockwise or counterclockwise, allowing the elevator to ascend or descend accordingly.

As the elevator moves, it triggers limit switches mounted on the chassis frame of the elevator support. This generates a signal that is transmitted to the controller. The controller then passes this signal to the I2C module, which is a serial interface module which display floor on LCD display.

3.4 CODE

```
#include <SoftwareSerial.h>
#include "VoiceRecognitionV3.h"
#include <Stepper.h>

#include <LiquidCrystal_I2C.h>
  // set the LCD address to 0x3F for a 16 chars and 2 line display
LiquidCrystal_I2C lcd(0x27,16,2);

const int stepsPerRevolution = 800;

VR myVR(10,11);    // 10:RX 11:TX, you can choose your favourite pins.
uint8_t records[7]; // save record
uint8_t buf[64];
Stepper myStepper = Stepper(stepsPerRevolution, 6, 7, 8, 9);

#define groundfloor    (0)
#define floor1   (1)
#define floor2   (2)
#define floor3   (3)

int pos;

void printSignature(uint8_t *buf, int len)
{
  int i;
  for(i=0; i<len; i++){
    if(buf[i]>0x19 && buf[i]<0x7F){
      Serial.write(buf[i]);
    }
    else{
      Serial.print("[");
      Serial.print(buf[i], HEX);
      Serial.print("]");
    }
  }
}

/**
  @brief   Print signature, if the character is invisible,
           print hexible value instead.
  @param   buf  -->  VR module return value when voice is recognized.
             buf[0]  -->  Group mode(FF: None Group, 0x8n: User, 0x0n:System
             buf[1]  -->  number of record which is recognized.
             buf[2]  -->  Recognizer index(position) value of the recognized record.
             buf[3]  -->  Signature length
             buf[4]~buf[n] --> Signature
*/
void printVR(uint8_t *buf)
```

```
{
  Serial.println("VR Index\tGroup\tRecordNum\tSignature");

  Serial.print(buf[2], DEC);
  Serial.print("\t\t");

  if(buf[0] == 0xFF){
    Serial.print("NONE");
  }
  else if(buf[0]&0x80){
    Serial.print("UG ");
    Serial.print(buf[0]&(~0x80), DEC);
  }
  else{
    Serial.print("SG ");
    Serial.print(buf[0], DEC);
  }
  Serial.print("\t");

  Serial.print(buf[1], DEC);
  Serial.print("\t\t");
  if(buf[3]>0){
    printSignature(buf+4, buf[3]);
  }
  else{
    Serial.print("NONE");
  }
  Serial.println("\r\n");
}
void upstep(int z)
{ int a=0;
a=z*2;
   for(int y=0;y<a;y++){
    Serial.println("clockwise");
  myStepper.step(stepsPerRevolution);
  delay(500);
}
}
void downstep(int v)
{int b=0;
b=v*2;
   for(int w=0;w<b;w++){
    Serial.println("anticlockwise");
  myStepper.step(-stepsPerRevolution);
  delay(500);

}
}

void setup(){
```

```
  lcd.init();
   lcd.clear();
   lcd.backlight();
   //lcd.setCursor(2,0);

  /** initialize */
  pos =0;
  myVR.begin(9600);
   // Set the speed to 20 rpm:
  myStepper.setSpeed(20);

  // Begin Serial communication at a baud rate of 9600:
  Serial.begin(9600);
  Serial.println("Elechouse Voice Recognition V3 Module\r\nControl LED sample");

  if(myVR.clear() == 0){
    Serial.println("Recognizer cleared.");
  }else{
    Serial.println("Not find VoiceRecognitionModule.");
    Serial.println("Please check connection and restart Arduino.");
    while(1);
  }

  if(myVR.load((uint8_t)groundfloor) >= 0){
    Serial.println("groundfloor loaded");
  }

  if(myVR.load((uint8_t)floor1) >= 0){
    Serial.println("floor1 loaded");
  }
    if(myVR.load((uint8_t)floor2) >= 0){
    Serial.println("floor2 loaded");
  }

  if(myVR.load((uint8_t)floor3) >= 0){
    Serial.println("floor3 loaded");
  }
}

void loop(){

  int ret;
  ret = myVR.recognize(buf, 50);
  if(ret>0){
    switch(buf[1]){
      case groundfloor:
      if(pos==1)
      {
        downstep(1);
      }
```

```
if(pos==2)
    {
      downstep(2);
    }
    if(pos==3)
    {
      downstep(3);
    }
    delay(500);
   pos=0;
   lcd.clear();
   lcd.print("GROUND FLOOR");
      break;

    case floor1:
     if(pos==0)
    {
      upstep(1);
    }
    if(pos==2)
    {
      downstep(1);
    }
    if(pos==3)
    {
      downstep(2);
    }
    delay(500);
    lcd.clear();
   pos=1;
   lcd.print("FLOOR 1");
      break;

      case floor2:
    if(pos==0)
    {
     upstep(2);
    }
    if(pos==1)
    {
      upstep(1);
    }
    if(pos==3)
    {
      downstep(1);
    }
    delay(500);
   pos=2;
   lcd.clear();
   lcd.print("FLOOR 2");
```

```
 break;

        case floor3:
            if(pos==0)
      {
       upstep(3);
      }
      if(pos==1)
      {
        upstep(2);
      }
      if(pos==2)
      {
       upstep(1);
      }
      delay(500);
      lcd.clear();
     pos=3;
     lcd.print("FLOOR 3");
        break;

      default:
        Serial.println("Record function undefined");
        break;
    }
    /** voice recognized */
    printVR(buf);
  }
}
```

3.5 CIRCUIT DIAGRAM

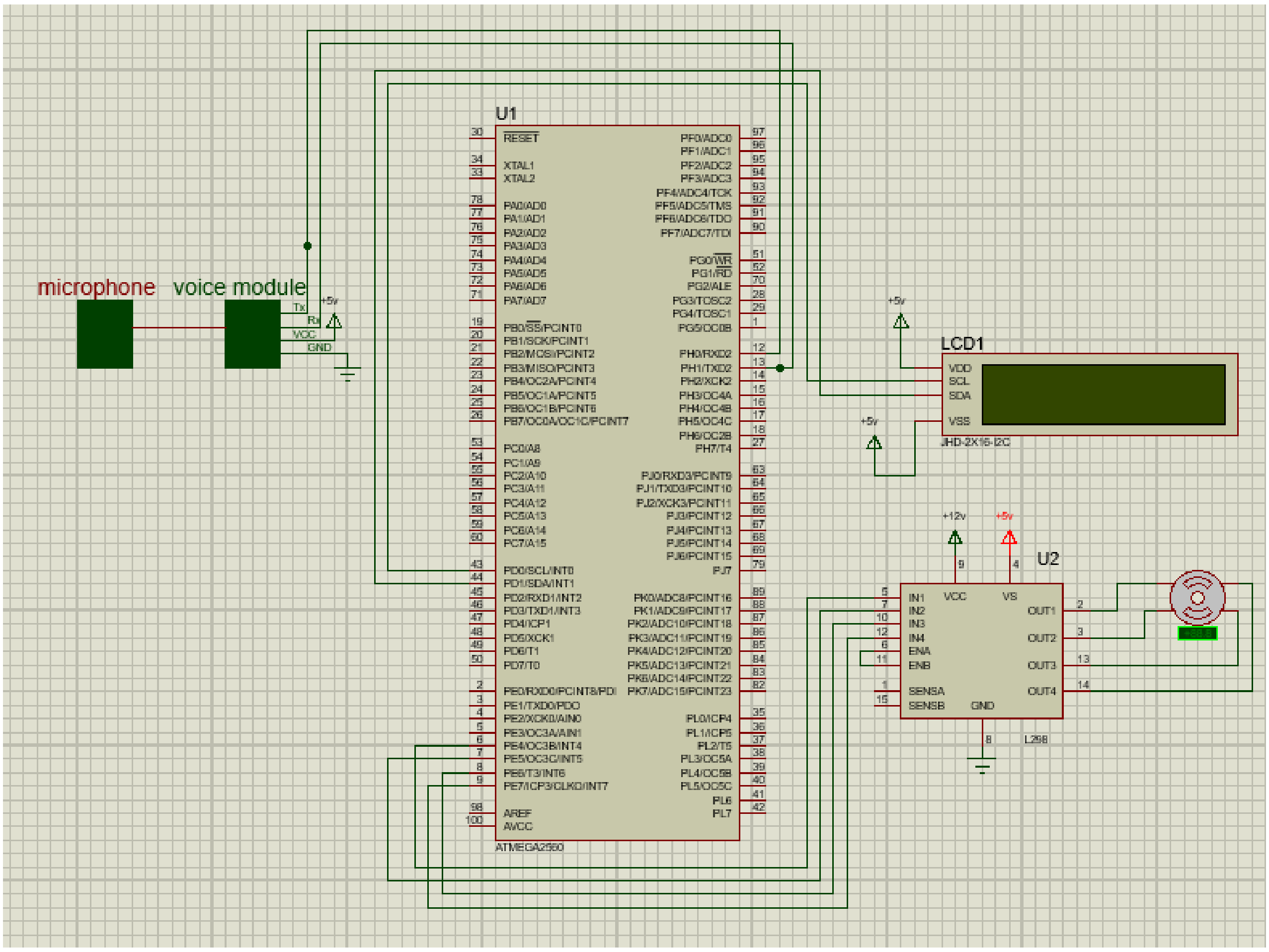

Figure 3.5

3.6 FLOWCHART

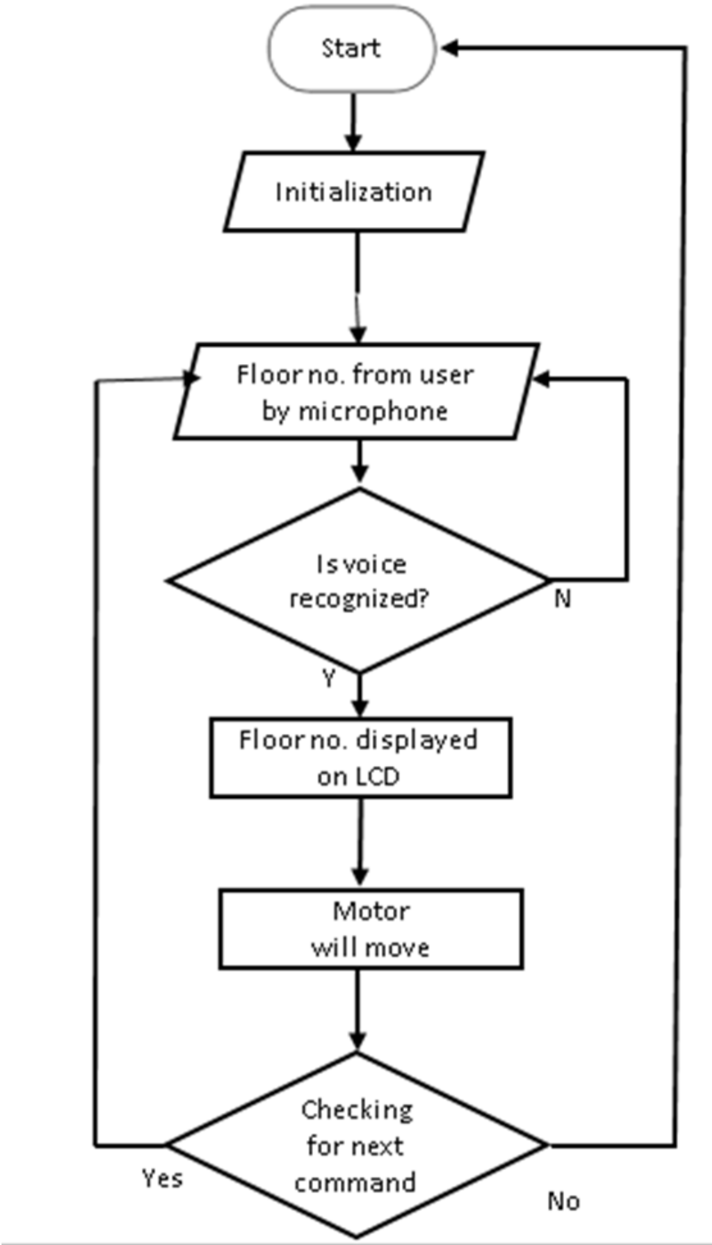

Figure 3.6

3.7 ADVANTAGES

- Reduced power consumption
- Reduced need of manual control
- Remote application control for easier and timely access
- Reduced chances of operation and repairs
- Reduced need of regular maintenance

3.8 APPLICATIONS

- Special used in chemical industries for chemical transport.
- Used in tech companies to avoid bacteria contact on button.
- Useful in old age home building which can help old people.
- Customers can also access these elevators in hospitals, or this elevator can be used for personal access.

CHAPTER 4

4.1 RESULT

Figure 4.1.1

Figure 4.1.2

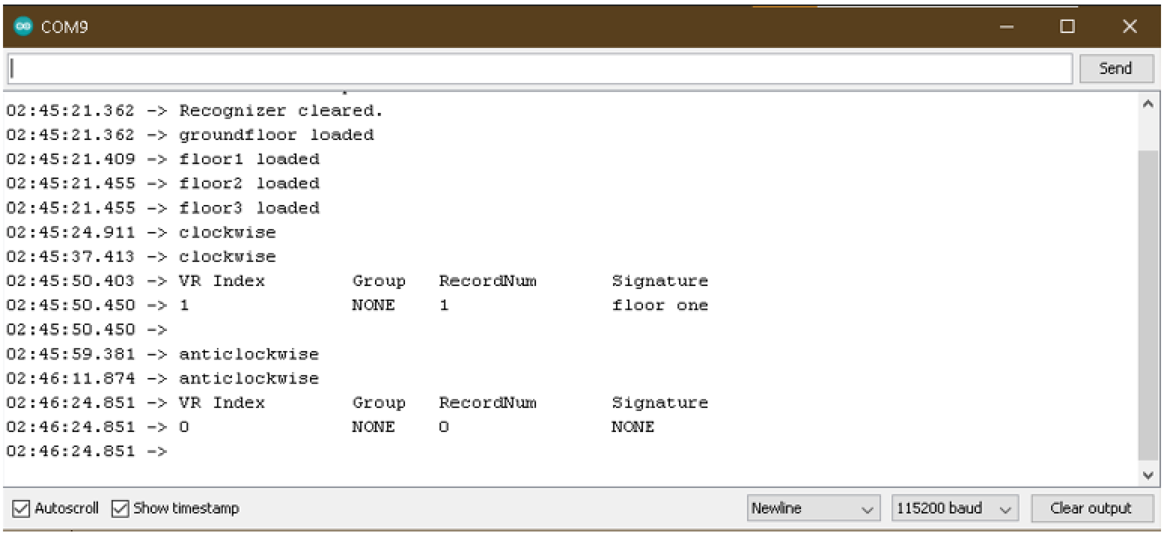

Figure 4.1.3

4.1 CONCLUSION

Elevators have become an integral part of our daily lives, offering convenient transportation in various settings. The advent of voice-controlled elevators has brought forth a remarkable advancement, allowing for effortless operation. This system proves particularly valuable in the current era, as it mitigates the need for physical touch, thereby reducing the risk of spreading viruses like the coronavirus. By simply issuing voice commands to the system, users can seamlessly interact with the elevator, ensuring a safe and hygienic user experience. The utilization of voice-controlled elevators presents a long-term solution that operates autonomously, offering numerous advantages. Given its remarkable benefits, we highly prioritize the use of such elevators. However, it remains crucial and mandatory for individuals to take personal precautions. We are confident that implementing this system will provide significant assistance in maintaining a safe and secure environment. By combining individual responsibility with the capabilities of voice-controlled elevators, we can ensure enhanced safety and peace of mind. The built-in speech recognition system serves as the vital communication link between the user and the elevator control mechanism based on the ATmega2560 Pro microcontroller. In our implementation, we employed a stepper motor to facilitate the movement of the elevator, precisely responding to the voice or speech commands provided by the user via the voice recognition module. This integration of technology enables seamless interaction and efficient control over the elevator system, enhancing user experience and convenience.

4.2 FUTURE SCOPE

- Use of CNN (Convolutional Neural Network) with language selection for operating elevator.
- Use of face recognition to operate elevator with cloud database.
- Implementation of RF ID for security and emergency alert.
- Implementation of noise cancellation due to excessive sounds and noises.

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COMPONENTS LIST

SR.NO	COMPONENT NAME	QUANTITY	PRICE
1	Power supply adapters	1	220
2	ATmega 2560 pro	1	690
4	I2C serial interface module	1	66
5	Voice recognition module	1	2199
6	Stepper Motor driver	1	100
7	LCD display	1	131
8	Stepper motor	1	680
9	Power card Circuit	2	140
		TOTAL	4226 Rs