



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Automated Elevator-An Attentive Elevator to Elevate using Speech Recognition

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ABSTRACT: Elevator has over the time become an important part of our day to day life. It is used as an everyday transport device- useful to move goods as well as persons. In modern word, city and crowded area require multi floor buildings. According to wheelchair access laws, elevators/lifts are a must requirement in new multi-storied buildings. The main purpose of this project is to operate elevator by voice command.

This project is operated on the basis of voice, which could help handicap people or dwarf people to travel from one place to another without the help of any other person. The use of microcontroller is to control different devices and integrate each and every module, namely – voice module, motor module & LCD. LCD is to display the present status of the lift. The leading edge of our project is the “voice recognition system” which has an accuracy of 99% [6] which generates exceptional result while recognizing speech.

KEYWORDS: Arduino Uno; Smart Elevator; Voice Controlled; Embedded system.

I. INTRODUCTION

Elevator is very common to us now days. The use of elevators is expanding in different applications like they are used in carrying goods and carrying people vertically in tall buildings like offices, shopping malls and other skyscrapers. With increasing in technological advancement the reliability is getting worse. Some inventions are not even portable and require great efforts to handle. So we have decided to come up with a new idea which is fascinating as well as helpful. It is tried to make it more automatic through our project.

Speech recognition is the method by which the elevator can be controlled using voice. Whenever it is dealt with voice control, the first term come in our mind is Speech Recognition. Speech recognition is a technology in which the system will understand the words but not its meaning of the words. Speech is a best and ideal method to controlling the elevator. Automatic speech Recognition is a technique by which a computer takes a speech signal and Converts it into words [1]. Those words are used by microcontroller to gives appropriate command to all attached devices.

II. RELATED WORK

Kaladharan N “A Study of Speech Recognition” laid emphasis on types of speech recognition technology developed in recent years and working for the same. The researcher has described types of words,types of speaker models and other approaches for the voice recognition system which provides a basic knowledge about speech recognition system[3].

Reddy, D.R. &Ermann, “Tutorial on System Organisation for Speech Understanding” described large variety in the speech recognition concept and it is important to understand the differences between the systems. According to the researcher the classification of voice recognition system can be done according to the size of the vocabulary, type of speech,and the speaker dependence [2].

C. H. Lee; F. K. Soong; K. Paliwal, "An Overview of Speaker Recognition Technology" gives overview on speaker recognition technology.Speaker-dependent systems requires the user to record some words from the vocabulary to make the words recognizable to the system and execute the command successfully. A speaker-independent system does not need any type of recording, word, phrases to system use. A speaker independent system is so advanced that it is capable to operate for any speaker of a peculiar type (e.g., American English). A speaker adaptive system is developed



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to adapt its operation to the characteristics of new speakers[4]. These all systems are useful according to their application. Roger K. Moore has proposed innovative architecture for human-machine communication system based on recent findings in the field of neurobiology of living systems. Called PRESENCE— “Predictive sensor motor Control and Emulation” [5].

III. SYSTEM OVERVIEW

A. Power Supply

All the electronic circuits need the DC voltage power supply which is derived from the single phase AC main supply. For this purpose we have to use the regulated power supply. The regulated power supply is made from transformer, rectifier, filter, voltage regulator IC, etc. It will provide supply to all devices- Arduino, voice module, motor, LCD screen.

B. Voice Module V2

The Voice module V2 performs speech recognition independently in a stand-alone mode. The module could recognize the voice of the speaker. It receives commands and acknowledge through serial port interface. It takes voice as input and generates hex-code as output. The V2 module can store up to 15 samples of voice information. Those 15 samples are separated into 3 groups, with 5 in each group. Those voice commands will be recorded in memory. It will not lose even with power off. It works 5V-TTL interface. The serial data format: 8 data bits, no parity, 1 stop bit. The default baud rate is 9600 and it can be changed by software. Recognition accuracy of module is 99% (under ideal environment) [6].

C. Arduino Uno

Arduino Uno microcontroller board based on the Atmega328P is used. The main advantage of using Arduino Board, which is an open-source platform device, is the all-inclusive nature of the board, providing with necessary ports to connect with the controller. Arduino uno is the heart of Voice controlled Elevator. It consists of 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. [7]

D. Device Driver

In this we are using L293 motor driver as the stepper motors require high current input, which is provided by L293, but is not provided by commonly used drivers such as L293D. The L293 are quadruple high-current half-H drivers. The L293 generates bidirectional drive of 1A at voltages from 4.5V to 36V. L293 is planned to drive high-current/high-voltage loads in positive-supply and inductive loads such as relays, solenoids, DC and bipolar stepper motors.

E. Stepper Motor

Stepper motors are designed to work on the principle of electromagnetism. The full rotation of a stepper motor is divided into number of expansive steps. There is a shaft made up of soft iron which is enclosed by the electromagnetic stators. So by giving the supply to stator the rotor will move the one by one step angle. The advantage of stepper motor is it can be controlled accurately without any feedback mechanism, as long as the motor works in an ideal environment. It has an advantage in the step size, it is 1.8 °/cycle. This defined standard helps us in defining the floors in the model.

IV. PROPOSED WORK

This project consists of mainly two components; voice module and microcontroller. Voice module is main part of this project. Voice module provides communication mechanism between user and microcontroller. Microprocessor is capable to communicate all input and output device at same time. Stepper motor is used to move lift upward and

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downward according to command of programmed microprocessor. Visual information of elevator provided on the LCD display.

In this project, demonstration of the working of a lift is simulated with the help of Arduino Board along with the usage of Voice Module. The voice module used is Voice Module v2, which operates at 5 V and communicates serially. It can store 15 pieces of information, however considering the requirements only used 3 voice signals, for 3 different floors. The voice module outputs the data serially to the controller. The implementation of the aforesaid commands using the voice signals is to be performed by an appropriate motor. In this project, motor with capacity of 4.2 kg-cm torque nema17 motor in bipolar mode is used [7]. The choice for nema17 (National Electrical Manufacturers Association) motor was based on its standardized parameters. The nema17 stepper motor is being driven by L293 motor driver.

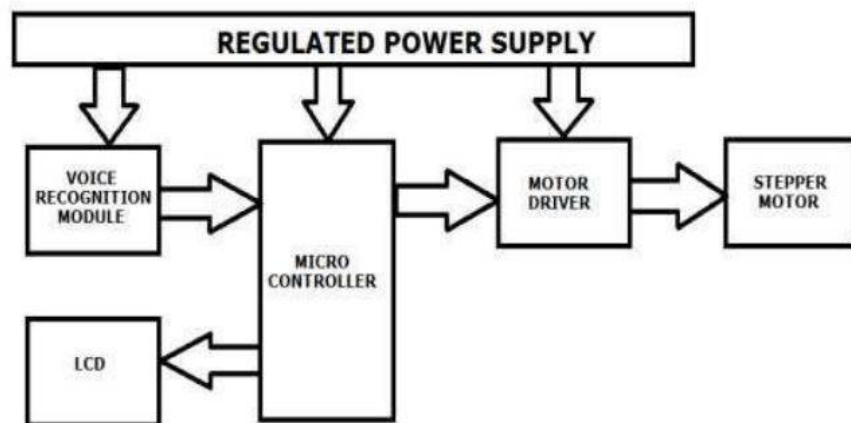


Fig 1. Block Diagram

This system is operated on the basis of voice, so that the voice of any person can be used to control the elevator, the voice signal of any person is converted in to hex-code by Voice module V2. The programmed Arduino uno board uses that hex code and give proper task to stepper motor. The use of microcontroller is to control different devices and integrate each and every module, namely – voice module, motor module & LCD. LCD is to display the present status of the lift. The block diagram of voice controlled elevator is shown in fig 1. The communication between integrated modules happen using minimal 3-wire RS-232 protocol. Also, a 12V supply is required to be used.

V. SIMULATION AND RESULTS

The testing is performed in a software simulator named proteus as it consists of microcontroller & associated peripherals. However, voice module v2 is not available in simulator. But, still the Access Port software provided with the voice recognition module v2 is able to calibrate the module & also has the capability to modify the contents. So, in a way it can be useful as alive simulation software.

But the real test of the success of the project lies in the upliftment/downliftment of the floor. So, in a way simulation software are available, but not at the same time and hence this simulation software provided no substitute to the real testing.

As this circuit cannot be simulated in any of the software simulator so given below is the proper hardware circuit which gives the proper understanding of this project. Here in this prototype there are voices of three floors i.e. first, second, third recorded and when words spoken in the microphone the voice module processes this vice into signals and lift goes upwards or downwards.

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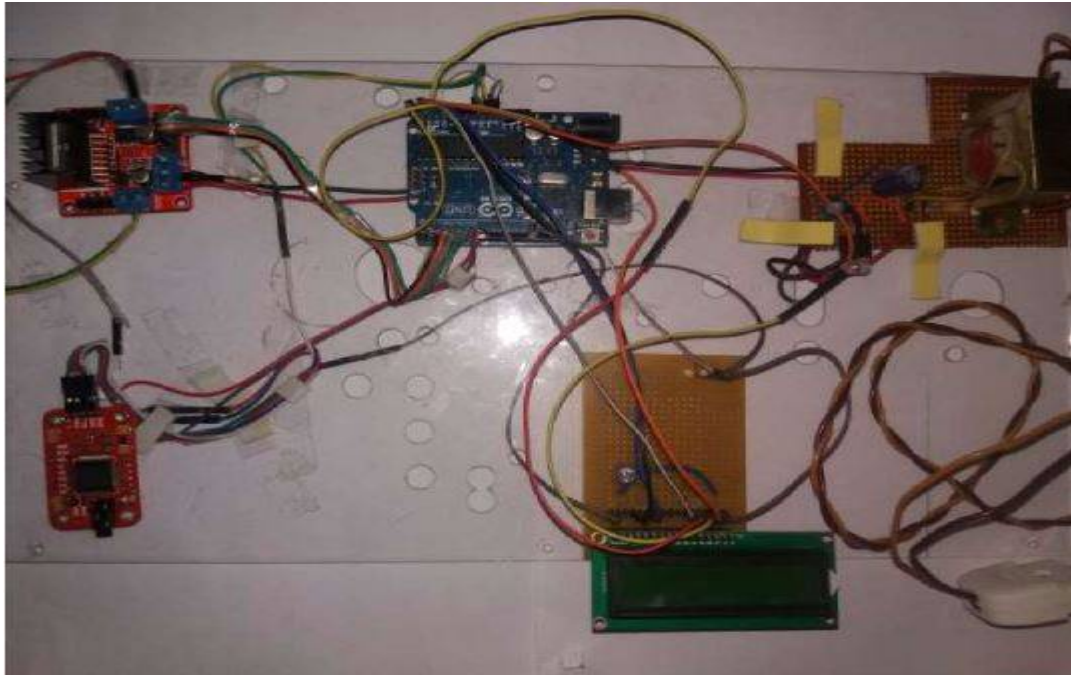


Fig 2. Actual Circuit Board Utilization of Pins

VI. CONCLUSION

The voice controlled elevator is of a great use as it works effortlessly. This project tries to throw a light on voice recognition system which can be used to modify the conventional elevator and make it more efficient and usable for physically challenged people. The prototype of elevator is useful instrument for research in specialization of voice signal acknowledgment, computerization and control advances as well useful in finding potential applications in this field. This project acts as a human-machine communication system.

VII. FUTURE SCOPE

The performance parameters can be sufficiently improved if it is planned to be a real world solution.

The suggested improvements that can be performed are,

1. Usage of Servo Motor instead of Stepper Motor, so that all parameters are within our control and so we can modify them easily.
2. Usage of a high-end Controller, so that high speeds and dedicated technologies could be delivered.
3. Usage of multiple command based systems, using speech plus button and also inclusion of a few sensors to improve result.

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ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

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(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

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