

Voice Based Writing Machine Using Speech Recognition

J.Jenitta^[1], Roshan M.N^[2], Sushmitha^[3]

Dept of ECE^[1], AMC Engineering College, India

Dept of ECE^{[2]/[3]}, AMC Engineering College, India

Abstract

The people who are not able to write are losing the opportunities in this competitive society. This proposed system is developed for the physically disabled and differently abled people who do not have the ability to write, due to absence of arm, which may limit the quality of creative expressions. This proposed system is helpful for physically challenged person who does not have ability to write due to absence of arm. The lack of writing arm may limit the quality of creative expressions. But same person can speak and that vocal words sensed by the microphone, processed by the Arduino Uno which actuate the robotic arm assembly. The Mechanical arrangement with the pen made such that it moves on Axial co-ordinates and capable of writing words on the paper. The fastest processing speed of Arduino Uno has utilized to achieve high speed of writing operation. This paper describes the functions of writing machine and its results.

Keyword: Arduino uno, Speech recognition, Writing arm.

1. Introduction

The area of the proposed system is mainly robotics and communication. Robotics can be described as the current pinnacle of technical development. Robotics is a confluence science using the continuing advancements of mechanical engineering, material science, sensor fabrication, manufacturing techniques, and advanced algorithms. The study and practice of robotics will expose a dabbler or professional to hundreds of different avenues of study. Robotics can be defined as the science or study of the technology primarily associated with the design, fabrication, theory, and application of robots. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing. Speech recognition is the process of converting an acoustic signal, captured by microphone or a telephone, to a set of words. There are two important part in Speech Recognition - i) Recognize the series of sound and ii) Identified the word from the sound. This recognition technique depends also on many parameters - Speaking Mode, Speaking Style, Speaker Enrollment, Size of the Vocabulary, Language Model, Perplexity, Transducer etc. Speak Mode for speech recognition system - one word at a time (isolated-word speech) and continuous speech. Depending on the speaker enrolment, the speech recognition system can also divide - Speaker dependent

and Speaker independent system. In Speaker dependent systems user need to train the systems before using them, on the other hand Speaker independent system can identify any speaker's speech Vocabulary size and the language model. Language model or artificial grammars are used to confine word combination in a series of word or sound. The size of the vocabulary also should be in a suitable number. Large numbers of vocabularies or many similar sounding words make recognition difficult for the system.

2. Literature survey

In [1] Abhishek & Anil Kumar explain about the development of a CNC machine which moves the three directions of X, Y and Z; where the X and Y axis determine the position and the Z axis determines the depth. The device was built and controlled using stepper motors and linear movements of the DVD drivers and ARDUINO controllers. Also a stepper motor driver is used for each motor to control the movement efficiently since Arduino has issues controlling the motors by itself.

In [2] Prachi Khilari aims to recapitulate and match up to different speech recognition systems as well as approaches for the speech to text conversion. The paper also explains in depth about the types of speech, types of speaker models and the different types of vocabulary thereby developing a speech to text conversion system.

In [3] Rajesh Mehra & SurajMalik represent the overall design and implementation of DSP based speech recognition and text conversion system. In this paper, voice recognition is carried out using MATLAB. The voice command is stored in the data base with the help of the function keys. The real time input speech received is then processed in the speech recognition system where the required feature of the speech words are extracted, filtered out and matched with the existing sample stored in the database. Then the required MATLAB processes are done to convert the received data and into text form. The system developed can be used to control AC and DC appliances through speech. Confirmative voice with specific voice pitch and frequency is desired by the speech recognizer used in this system to produce better recognition results.

In [4] Manoj Kumar & Riyaz Ahmed explain about the design of robotic arm control using MATLAB. In proposed system the robot will make movement with a gripper position to hold a pen then perform the required operations. Abstract focuses on programming that use to move the robotic arm. To make the movement for robotic arm, 2 servo motors are used at joints. Arduino Uno is programmed as per the required instructions and interfaced with system to control the servo motor.

In [5] K.S Jadhav & Shilpa Madhav proposed to design a writing robotic arm showing by speech recognition was successfully designed and working of it was checked successful output. This work included the conversion of this text data into a mechanical action by using a microcontroller. The aim of this project is to help the physically handicapped persons to write. The patients who are physically handicapped, those who could not write by their hands, the project will definitely help these patients to write with the help of robotic arm by speech recognition. The paper shows the design and implementation of the writing robotic arm by speech recognition.

3. Proposed Work

The proposed system aims to develop a writing robot by recognizing the speech signal from the user. The mechanical Assembly constructed mainly for the disabled people who can't perform writing on their own. In this system, the mobile application built is used to recognize the speech signal from the user. The action is then performed by the writing machine. The proposed system is capable of performing writing operation by recognizing our voice mainly consists of two parts. 1. Speech to text 2. Text to an action. Figure 1 is the block diagram of the voice based writing machine is basically divided into three basic parts where the first part is software/the speech recognition application built. Second part is hardware/controller part and third is the mechanical assembly.

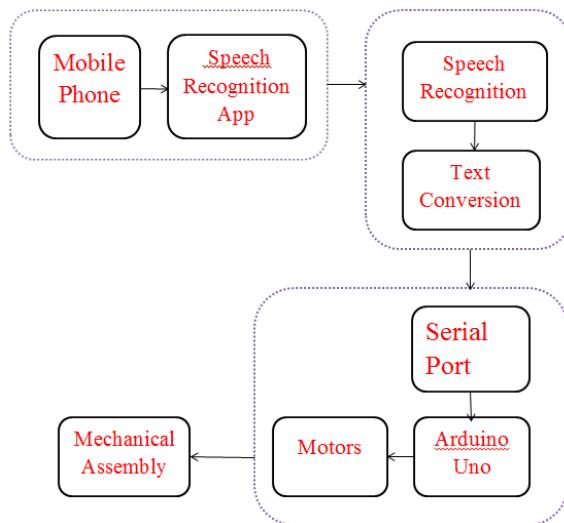


Figure 1: Block Diagram of Proposed Work

The hardware/ electronic driver part consists of the processor unit. The processor is chosen such that the real time operation of writing and speaking has to be performed simultaneously. The arduino is consisting of the code having a function each for pen up, pen down, and a function to print letters beginning from A to Z. The software part consists of the speech recognition application along with the text conversion block. The voice signal that is taken as audio input through microphone and is then converted to text version. The spoken alphabet is matched with previously stored library and the control word is then passed to the controller block via Bluetooth module and arduino to actuate the motor assembly. The application developed is the speech recognition application that requires the user to first connect to the Bluetooth module by pairing it. Once the application is connected to the HC-05 module, the application is ready to take the input from the user. The speak button once pressed waits for the user's input. The speak button (input) links to the google voice recognition system and shows the spoken word as text. This text is the driving force for the stepper motors controlled by arduino. The mechanical assembly consists of 2 stepper motors and a servo motor with pen holder. The human writing gestures generally moves into different directions. The three motors with the rack and pinion gear arrangements achieve the desired movements. The Arduino code is written for the

movement of each alphabet. The two stepper motors are used for vertical and horizontal movement. Whereas the servo motor is to move the pen up and down. The lower axis contains the writing pad that moves forward and backward. The upper axis contains the pen attached that moves the pen left and right on the pad. The main requirement is to work all three motors simultaneously and actuate the pen to write expected word by moving in three axes.

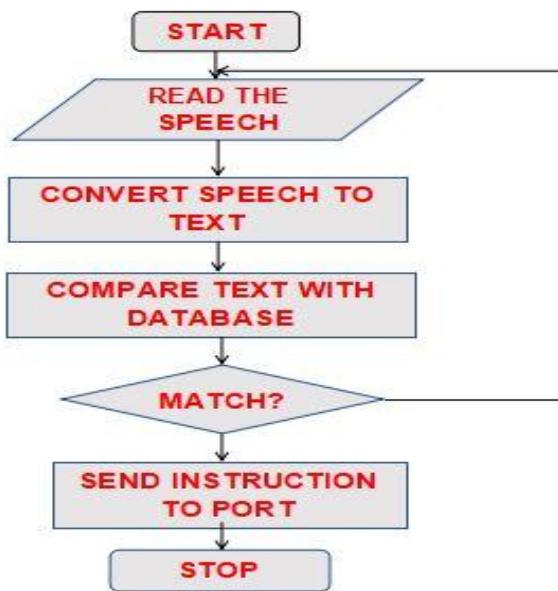


Figure 2: Flowchart for voice recognition

The Voice input from the user is taken from the user's mobile phone through the application developed for the same purpose. The application receives the input and compares with the database for a similar sound. It is then matched and the corresponding text is chosen and it is then converted into the digital form which is to be transmitted by the Bluetooth of the device. Through the Bluetooth module of HC-05 the text is transmitted to the arduino uno. The text in the digital format appears serially at the receive pins of the arduino and is then used for the further process. Once the text is received at the serial port of Arduino, the code checks for the Alphabet and the motor control movement is decided based on the matching of the text incoming with the 26 letters of the English Alphabet.

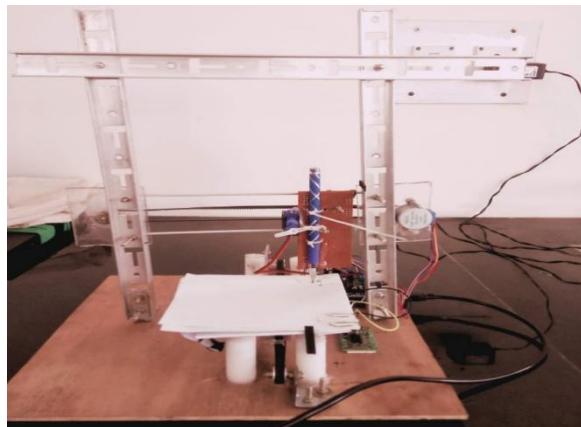


Figure 3: Hardware Setup

If suppose the input is letter ‘H’ the pen tip is moved to position zero in all the two axes. From initial position y-axis motor moves 4cm forward, again comes back by 2cm, then x-axis motor moves 2.5cm forward, again y-axis motor moves 2cm forward and comes back 4cm. Similarly, the movement is controlled for the remaining alphabets.

4. Results

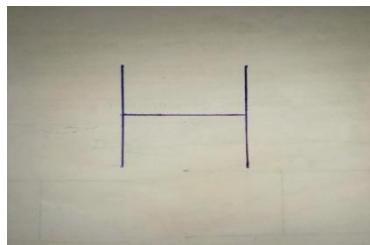


Figure 3: Outcome of letter ‘H’

The proposed system was to design and develop a writing robotic arm showing by speech recognition was successfully designed and working of it was checked successful output. This work included the conversion of this text data into amechanical action by using a microcontroller.The main aim of this system is to help the physically handicapped persons to write. The patients who are physically handicapped, those who could not write by their hands, our project will definitely help these patients to write with the help of robotic arm by speech recognition.

5. Conclusion and Future Scope

In this proposed system, we have used a robotic assembly to write the document from what the user speaks. This process is done by speech to text conversion and text to the written document.

In future, the proposed system can be extended to write all letters and numerals also. The system can be implemented to work for additional functions such as pick and place and other activities that will help the disabled in their day to day activities. Human assistance for changing set of paper can also be automated. A separate hardware module can be built that performs the operation of speech to text conversion.

6. Acknowledgement

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