



E-BRAILLE-A SELF LEARNING BRAILLE DEVICE

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Abstract—Braille is a required system of learning for visually challenged people. It is the method which helps them to read and write. The literacy rate in case of visually challenged people in many countries is very low. Various factors like lack of government initiatives, limitations of tutors, lack of personal attention etc. are the possible reasons for this state. Our project aims at developing a self-learning Braille kit which can help people with visual impairments. The solution aids at developing an easy to learn kit that will behave as a teacher and teaches the visually challenged people for learning the Braille learning system. The Braille system uses a Braille keypad and microphone to take input and speech as output. The input can be given through microphone and equivalent result can be produced on an electromechanical Braille cell. It consists of three different modes i.e. Learning Mode, Search Mode and Quiz Mode. By creating the designed system for visually challenged peoples, Braille literacy can be increased. The solution is so designed that it reduces cost and increased the speed of operation of the system.

Index Terms –Braille keypad, Cost efficient, Teacher independent, and Hand- held.

Motivation- Independent is the word that gives a value to any person by generating self -esteem in them. It is essential for physically challenged to be self-reliable .To help this people, it is our responsibility to provide them special care without affecting their dignity. So the first step in this concern is to give them the quality of education. In this era of technology, one must utilize the technical knowledge to increase the quality of education to help physically challenged people in the society in order to avoid inferiority complex which is the major curse to our society. Being engineering student we have thought it would be better to do the project which have social approach particularly which points the problem of physically challenged people. Among physically challenged people visually impaired are the most vulnerable, because they cannot differentiate the color and see the dimensions of any object. So we have decided to provide them with the learning kit and fully equipped device which can reduce their labor and increase excitement to learn basic alphabets in Braille to fully equipped use for visually impaired.

I. INTRODUCTION

Braille literacy for visually challenged people should have same role as normal educational methods for people with vision. The rate of population of visually challenged people is

very poor. According, to the records of 'WHO' for visual challenged updated August 2014, 285 million people in the world are visually challenged with 90% living in developing countries. In most of the country like, India most of the teachers for teaching braille are visually challenged themselves. Due to this, literacy rate for visually challenged people is as poor as 3% to 5% in developing countries. The alternate method for learning braille is bulky and requires assistance. Though this method is there, then also for learning Braille visually challenged students takes help of wooden plate and marbles; which is quite difficult to handle and also requires personal attention. These were the primary reasons for developing the solution which is independent, autonomous and user friendly .To fulfill all requirements of visually challenged people, the system Braille is so designed effectively. The main aim of this project is to reduce the rate of literacy amongst visually challenged people. The proposed solution is built on a standalone mode which runs like a micro-computer and requires minimum technological constraints.

II.BRAILLE SCRIPT

Braille is a writing system which enables the blind and partially sighted people to read and write through tactile sense. It was invented by LOUIS BRAILLE (1809-1852) who was blind and thus invented a writing system named as braille for blind people. It consist of pattern of raised dots arranged in cells of up to six dots in a 3x2 matrix as shown in fig. Each cell represents a letter, but it can also be extended and implemented to numeral or punctuation mark and also some frequently used words and letter combinations also have their own single cell patterns.

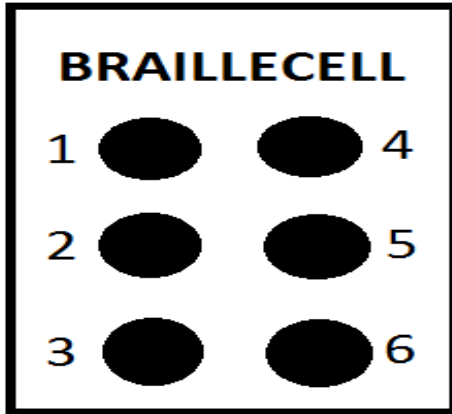


Figure 1: Braille cell with standard dot position (3*2)

English Braille has got three levels of encoding and are explained below [1]:

Grade 1: It consist of 26 standard letters of alphabet and punctuations. It is only used by those people who are new to read the braille script.

Grade 2: It consist of 26 letters of the alphabet punctuations and contractions.

Grade 3; It is used mainly in personal letter, diaries and notes and also in literature to some extent.

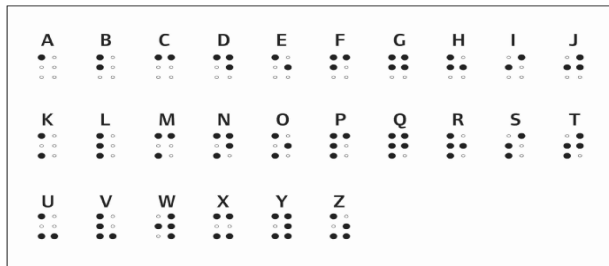


Figure 2: Braille combinations for letters of English Alphabet in International Braille script

III.PROBLEM STATEMENT

Our aim is to develop the system which can be used in Blind schools and Institutions to train students without the help of tutor. By implementing the designed system for visually challenged individuals, Braille literacy can be increased. The solution is so designed that it optimizes cost and speed of Operation of the device.

IV.LITERATURE SURVEY

Following are the points explaining the gravity of visual impairment and blindness in India:

- 1) 15 million people are blind.
- 2) 11.75 million Blind live in the rural and backward areas.

- 3) One out of every three blind people in the world lives in India.
- 4) 9.4 million Have cataract related blindness.
- 5) 6 million people become blind and low vision every year.
- 6) 3.2 million Children are blind under the age of 16 years, only 5% of them receive any education.

V. OUTCOME

5.1 Hand-held and Portable

A device/kit similar to mobile which is rechargeable and can be carried all around.

5.2 Reusable

The kit is useful for initial learners and primary school students. Visually impaired person can use this kit to learn the basic letters. Very similar to how normal student studies the basic alphabets initially. Kit can be considered as the friend for life.

VI. DESIGN AND METHODOLOGY

The design of the system is done keeping the requirement of the end user in mind. We analyze the problem and divided the working of the device into three important modes-learning mode, search mode and quiz mode.

Mode-1: Learning mode

In this mode, system will generate Braille pattern on Braille cell sequentially for all alphanumeric characters. Audio samples for corresponding alphanumeric character will be played sequentially. For this purpose, Matlab code has been written to play single audio sample at a time and to access GPIO pins of Arduino to drive corresponding solenoids simultaneously.

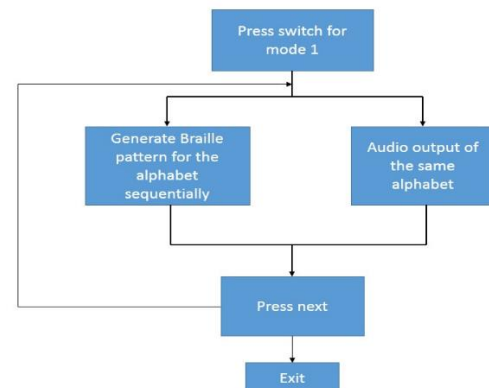


Figure 3: Flow chart for mode one

Mode-2: Search mode

This mode is designed to know about braille pattern of any alphanumeric character. In this mode, user can ask for braille pattern of any alphanumeric character using microphone. The audio sample is captured and recorded via microphone in Matlab. The recorded audio signal is given to the speech processing algorithm for speech recognition. As per the recognized character, system will generate Braille pattern by sending the control signal to Arduino via serial port for corresponding pattern. It will access GPIO pins of Arduino to drive the solenoids of Braille cell.

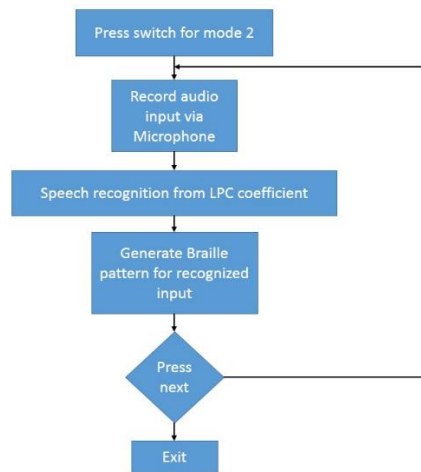


Figure 4: Flow chart for mode two

Mode-3: Quiz mode

This mode is designed to test user's knowledge about Braille system. The system would ask random question to user related to braille pattern. This mode is divided into two sub-modes. We have created database of some questions along with the respective answer to test user proficiency in Braille system. The database is divided into two parts for the sub-modes. The system can ask questions from both the sub-modes randomly.

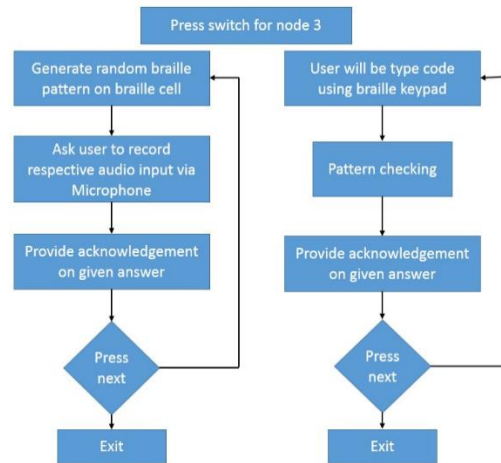


Figure 5: Flow chart for mode three

6.1 Technical challenges encountered during the system design

We had first used solenoid range of 12V but the spring of key was not moving automatically it was required to be operated manually which was inconvenient for blind people even power consumption was more so to avoid this all disadvantages we used a 5V solenoid and coming to software point of view when we spell each alphabets each and every individual have different tone, speed and voice to speak so six samples of each alphabets were recorded and a big pause was taken at the beginning and each alphabet was achieved of different time and frequency.

6.2 Block diagram description

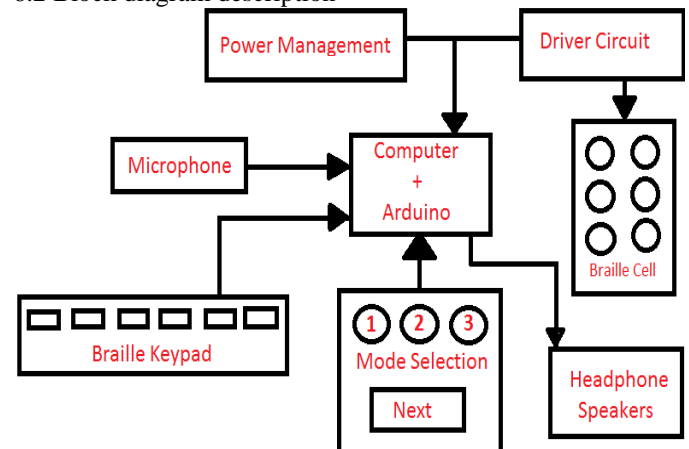


Figure 6: Design

The computer is the main processing unit which runs the matlab codes for the different modes. Speakers, microphone and Arduino board is directly connected to the computer. The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 Braille cell and the Braille typewriter is connected to the Arduino board. The board receives the digital signals from the typewriter and sends it to the computer via serial port and vice-versa. The cell contains six electromechanical actuators which together give a combination of 64 Braille codes. The cell will replicate the dot pattern created by using stale and stylus or a typical Braille typewriter. The typewriter is similar to a 'Perkins Typewriter' and operates to take input from user in the form of Braille language. This signal will pass to the computer through the GPIO pins of Arduino. The driver circuit contains three motor driver IC's viz. L293D which are used to power the actuators in the Braille cell. Three IC's make up to six available outputs of analog voltage of up to 13V to drive the cell. The input command for the driver circuit is provided by the Arduino. The power management unit works to supply power to drive the entire system. The unit contains a 15V DC step down transformer which is directly connected to the AC mains. Mode selection are push buttons provided in this section for selection of modes for the user. There are three buttons for the three predefined modes and one switch for 'next' command. This command will help the user to navigate through different Braille code samples.

VII. SOFTWARE AND HARDWARE REQUIREMENTS

Hardware and software: Arduino, microcontroller ATmega2560, Solenoids, Motor driver IC L293D, transformer step down matlab.

VIII. RESULTS

The result we achieved for Braille system is done with the help of a matlab code as we have six samples for each alphabet of different time slots as everyone have different audible voice, tone, speed we have taken a pause with respect to time at the start of each alphabet and for each alphabet we get an different waveform sample at different frequency

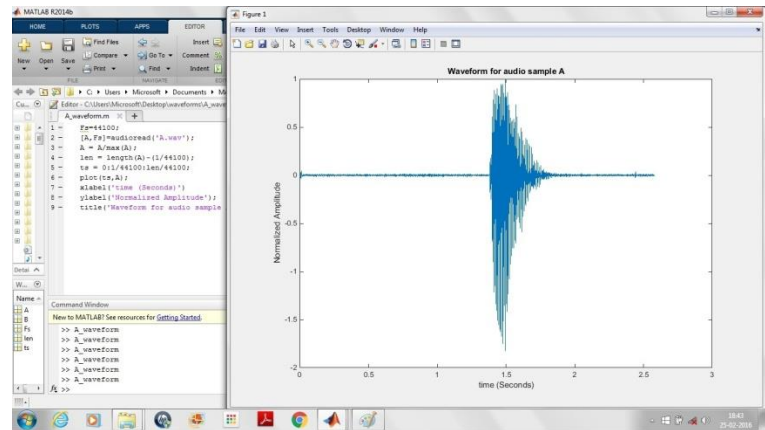


Figure 9: Output waveform of A (when we spell A)

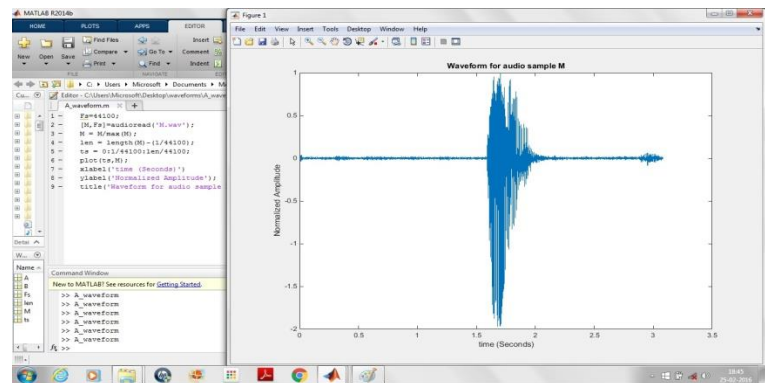


Figure 7: Output waveform of M (when we spell M)

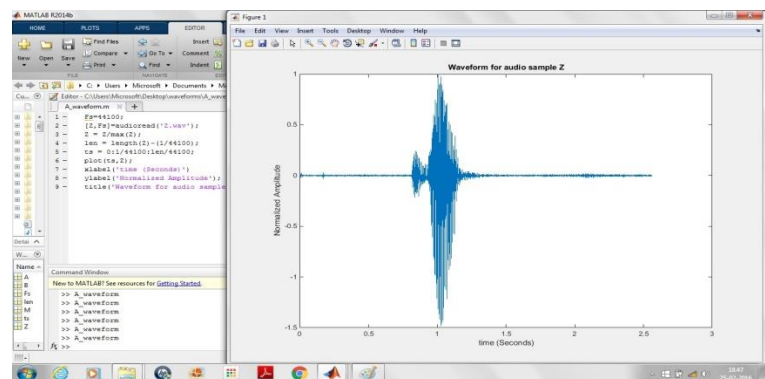


Figure 8: Output waveform of Z (when we spell Z)

IX. FUTURE SCOPE

Once our system is successfully implemented, we can make further modifications and improvement to make the propose system more robust. This improvement will be specifically with respect to making the system user independent. Further a more sophisticated micro controller, low power solenoid actuators will make this system more compact.

X.CONCLUSION

The problem of braille literacy is creating a major hurdle in enabling the visually disabled people in achieving a rightful place in the society. Use of braille system is an independent, user friendly, portable and cost effective manner. It can enhance the learning ability of visually challenged people in a comfortable and interactive way. The software processing that is performed in project is developed independently and does not rely on internet connectivity. The different modes of operation ensures user friendly approach for designed system. This device can be used effectively to make the learning of braille easy. It can prove to be a major break through in enhancing the literacy rate for visually challenged people.

XI. ACKNOWLEDGMENT

This project is a result of the constant motivation and support offered to us by our guide and our sincere efforts. We can convey our deepest gratitude to Prof. Pranita Potey project guide for her continuous co-operation steady support without which we would be able to complete our project on time.

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