Braille Printer

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Abstract: Generally, user interface is improved by considering only normal people, however this improvement affects reversely on blind people. Currently available systems are either used by normal person or blind person therefore there is a need of such system which will provide a common interface to blind as well as normal person. Now here we can use Braille Printer to provide such common interface. Braille is an important language used by the visually impaired to read and write. It is vital for communication and educational purposes. Braille Printer takes an input as a speech through microphone which is then converted to text using speech recognition and the recognized text is embossed in its respective Braille code. Here speech is the way of common interface through which blind person as well as normal person can interact with our system.

Keywords — Braille, Braille Code, Speech Recognition.

I. INTRODUCTION

Computer is the way through which human can interact with the digital world. Computer access is provided through graphical user interface, textual notifications. However this access is useful only for normal user. To provide such access to visual impaired people, speech is the way through which they can interact with the system.

Braille Printer is a system useful for visually impaired people. It is developed to provide the common interface to the blind person as well as normal person. Normally user interface is improved by considering only normal people, however this improvement affects reversely on blind people. Thus, there is a need of such system which will provide common interface to blind as well as normal person. Our system takes an input as a speech through microphone which is embossed in Braille using speech recognition. Here speech is the way of common interface through which blind person as well as normal person can interact with our system.

The embossed Braille printouts are very important in intellectual progress of blind and weak sighted people. These printouts are very important in education, developing their perception. It allows recording the information in a way, which is understandable for every blind person.

II. LITERATURE SURVEY

We have referred this paper and the new separate words search and recognition approach is proposed in this article. It is based on successive application of acoustic models. This evaluates the probability of the corresponding phoneme observation along the signal. The received noisy phoneme sequence is used to spot the most probable recognised word. The comparison with the baseline algorithm "Token Passing" has used which provides simplicity and effectiveness for the system. This system requires pre-processing evaluation which is computationally challenging. [1]

The system given here is automatic speech recognition (ASR), which converts speech from a recorded audio signal to text. A speech signal has a certain probability. Therefore, assuming a word x was spoken; they compute a probability for matching these words with the speech signal. This probability is calculated from the some properties of speech sub-units (phonemes in the acoustic model), linguistic knowledge about words. It requires additional information about pronunciation which requires more storage [3].

Among the developed systems for blind people, some systems use a standard braille keyboard or speech for giving input to a computer, with speech or braille being used for output. In those systems, there is a requirement to convert the braille codes into standard codes. This system has finite number of states which can hold the current context. These states have capabilities for both left and right context matching. However there are some limitations of this system such as some of the old system abbreviations, isolated letters without letter's sign (For example, the braille equivalent of "Mr M. Jones") are not converted correctly. [4]

The system given here is a missing data recognition system. To improve the speech recognition, there are different methods which distinguish reliable and unreliable data. The performance of automatic speech recognizers degrades rapidly in the presence of noise and other distortions.

Speech recognizers requires clean speech and face a problem of mismatch when speech other sound sources (noise). They proposed a system to mitigate the effect of this mismatch on recognition; noisy speech is pre-processed by speech enhancement algorithms. However there are certain numbers of errors present due to additive noise. [7]

By referring these various papers and various techniques we came to conclusion that there are number of algorithms for speech recognition, braille conversion however feasibility of such systems is less.

And hence there must be a system where speech is given as an input and braille code will be embossed, and this system is more feasible as it can be used by blind as well as normal person.

III. EXISTING SYSTEM

A. Printer

Braille is one way in which the visually impaired can communicate with the world. Printer output can be obtained concurrently with Braille output. Fant developed a method to allow brailing on a standard line printer. He used a strip of specially prepared cellophane tape. So it is not necessary to remove the ribbon or adjust the impact force. [6]

B. Braille Displays

In addition to the use of Braille printers, refreshable Braille displays are segregate devices that connect to a computer. Each Braille cell consists of six solenoids. The Braille codes are formed by sets of pins being raised and lowered electro-mechanically. As the input is typed, the user can review it on the 1 line display. It can display 20, 40, or 80 characters of text. [6]

C. Braille Keyboards

The keyboard consists of six standard keys that allow the user to produce a standard 6-dot Braille symbol. Braille note takers are small battery-powered devices that allow the user to enter the information on a Braille keyboard and then review the information through the use of synthetic speech or through a Braille display. These keyboards can be used as input devices that interface with personal computers. [6]

D. Disadvantages of Existing Systems

Printers are slower and noisier than ink printers as they are driven by solenoids that emboss Braille dots on a page as an output. Depending on the cost, the printers produce 10 or more characters per second. In braille display, each refreshable cell displays one character and costs approximately seventy dollars to develop. The expensiveness of Braille displays forces many to develop the skill using synthetic speech. As the Braille keyboard is only used by blind persons. Hence it is less feasible. [6]

E. Need of System

Computer access is necessary for blind users who can utilize computers as speech-enabled training programs, Braille training programs, Braille translators, interfaces with other equipment, and dynamic Braille displays.

The major barrier for computer use for the visually impaired is the display of screen. The raised use of graphics on computers have resulted in a less accessibility to the computers and to the information presented through them to blind people.

Compensation for the display can be in an tactile mode, auditory mode or a combination. For people with low vision, there is a need to enlarge the text and graphics to various degrees: 27% of individuals identified as legally blind use primarily visual means to access text while 10% use primarily auditory means. The remainder uses a combination of techniques. Thus a variety of means needs to be available to create access to computers for the visually impaired. [6]

IV. PROPOSED SYSTEM

To overcome the disadvantages of existing systems, we are going to develop the system Braille Printer. This system is useful for visually impaired people. It is developed to provide the common interface to the blind person as well as normal person.

Initially user has to give the input (speech) through micro-phone. This input speech is processed in the system. For processing the speech, speech recognition is used. Using this concept, system chops the input speech and gives it as an input to the step algorithm.

Step algorithm converts chopped input into its equivalent binary code. This binary code is used to select the appropriate data line of the port for embossing. These data lines are connected to six bobbins of the printer. According to binary code, corresponding data line is activated. Then circuit is get completed and corresponding dot is get embossed on the paper. The embossed Braille printouts are very important in intellectual progress of blind and weak sighted people. These printouts are very important in education, developing their perception.

V. SYSTEM ARCHITECTURE

Fig. 1 shows the block diagram of Braille printer. The input given to the system is in the form of speech through microphone. This speech is given to the computer for speech recognition. Recognized speech is given to the interface card which contains transistors and relays. Then the generated bits with respect to the input speech are given to the printer to emboss the Braille code.

The block diagram of Braille Printer consists of:

- System performing speech recognition
- Transistor
- Relay
- Printer

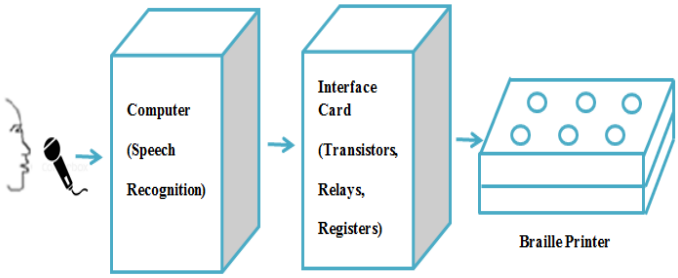


Fig. 1 Block diagram of Braille Printer

A. *Speech Recognition*

Speech Recognition is the process of converting spoken input to text. Speech recognition is sometimes referred to as speech-to-text conversion. Speech recognition allows us to provide input to an application with our voice. The speech recognition process is performed by a software component known as the speech recognition engine. Speech recognition fundamentally functions as pipeline that converts PCM (Pulse Code Modulation) digital audio from sound card into recognized speech.

B. *Transistor*

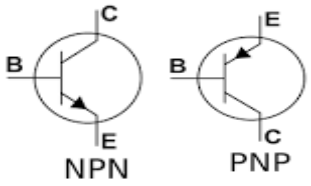


Fig. 2 Electronic Symbol of Transistor

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is consists of semiconductor material with at least three terminals for connection to an external circuit. A current or a voltage applied to one pair of the transistor's terminals and it changes the current through another pair of terminals. Because the controlled [output] power can be higher than the controlling [input] power thus a transistor can amplify a signal.

A. *Relay*

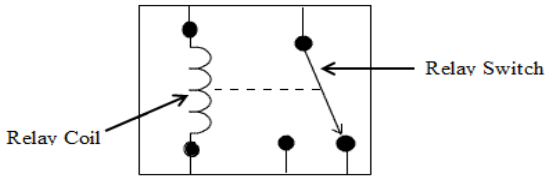


Fig. 3 Electronic Symbol of Relay

An electrically operated switch is called as Relay. To mechanically operate a switch many relays use an electromagnet, however other operating principles are also used, as the solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal or where several circuits must be controlled by one signal.

C. *Printer*

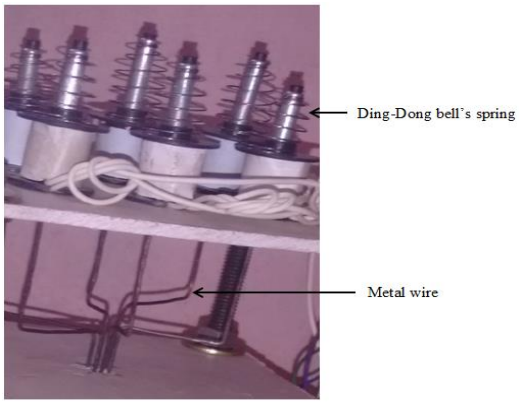
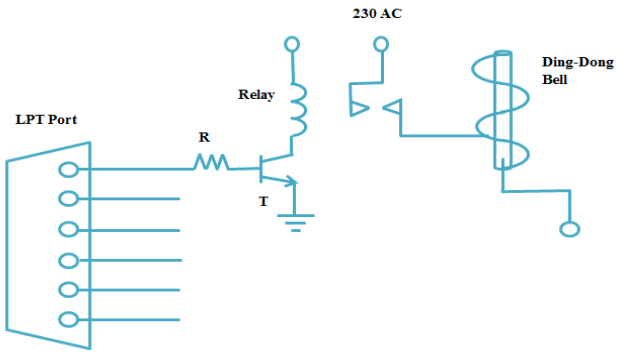


Fig. 4 Printer

A printer consists of 6 dots equivalent to the Braille language dots. Internally these six dots are made up of door bell's (Ding-Dong bells) solenoid mechanism. Metal wires are connected to each ding-dong bell. After recognizing the speech, its equivalent binary code is given as input to printer. According to binary code, dots are get embossed on paper using metal wires.



Where R= Register, T= Transistor

Fig. 5 Internal View of Embossing

Initially user has to give the input (speech) through micro-phone. This input speech is processed in the system. For processing the speech, speech recognition is used. Using this concept, system chops the input speech and gives it as an input to the step algorithm.

Step algorithm converts chopped input into its equivalent binary code. This binary code is used to select the appropriate data line of the port for embossing. These data lines are connected to six bobbins of the printer. According to binary code, corresponding data line is activated. Then circuit is get completed and corresponding dot is get embossed on the paper.

VI. ALGORITHMS

As proposed system accepts an input as a speech, so we require a microphone. An input taken through this microphone is processed further as given in following algorithm.

A. Algorithm of speech processing

Initially user has to give the input (speech) through micro-phone. This input speech is processed in the system. For processing the speech, speech recognition is used. Using this concept, system chops the input speech and gives it as an input to the step algorithm.

Steps in algorithm

1. Accept the input (speech) through microphone.
2. For (i=1 to speech_length) {

   Chop the given input.

   /* Using the concept of sound hypothesis, input speech is chopped in small units for recognition. */
   }
3. For (i=1 to speech_length) {

   Compare input with library file.
   Return result of comparison.
   /* Chopped input is compared with library file which is already stored in our system. Comparing is done to determine spoken word. */
   }
4. By comparing, appropriate word is recognized.

B. Algorithm of printing

The output of speech processing algorithm is recognised word. This word is converted into binary form. This binary code is given as input to this algorithm. According to binary code, equivalent dots are embossed using metal wire.

Steps in algorithm

1. Accept the input i.e. binary code. (Braille has six dots, hence six bit binary code is considered.)
2. According to binary code, data lines of port are selected.
   i. If (bit is high), Then equivalent data line is selected.
   ii. After selecting the data line, circuit get completed.
   iii. Using selected data line, corresponding dot is embossed using metal wire.

These embossed dots on paper are considered as an output of proposed system.

VII. RESULTS AND ANALYSIS

Braille Printer is the system which is used for embossing the Braille code by accepting speech as an input. As we speak through micro-phone, it get recognized using sound hypothesis and get converted to binary code. This 6 bit binary code is equivalent to the braille code of recognized word. According to binary code, dots are getting embossed using metal wire.

For example, binary code for alphabet ‘A’ is 100000, then output will be as shown in fig. 6.

A. Analysis

There are various existing systems which are referred during developing the proposed system. However, these existing systems have some disadvantages which are overcome in proposed system.

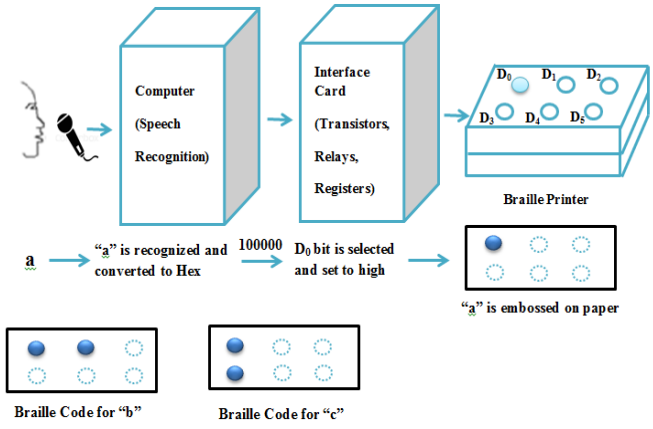


Fig. 6 Examples of Embossed braille codes

Table. 1: Analysis of existing and proposed system

Parameters	Existing system	Proposed system
Feasibility	Less feasible as it can be only used by blind people because these system uses braille keyboards and braille displays which are only used by blind people as they have knowledge about braille.	More feasible as it can be used by blind people as well as normal people because it takes speech as input and it can be given by blind as well as normal people.
Cost	More expensive as the Braille Displays consist of refreshable cells. These cells require approximately 60-70 dollars to refresh.	Less expensive as it required the low cost components to develop.
Input	Input must be given in textual form through keyboard which can be either used by normal person by using normal keyboard or by blind person by using Braille Keyboard.	Input is given in speech form through microphone which can be easily given by normal person or blind person.
Output	It converters the given text into Braille Code and only displays braille form of that input.	It converts the given speech to text and then that text into its respective braille form and then embosses that Braille Code on paper.

VIII. CONCLUSION

Proposed system describes course and results of work on development of new hardware aiding blind people and use new technologies in well-known hardware. An increasing number of computer based systems are becoming available to assist people with disabilities.

Proposed system is useful for blind and visually impaired persons. This system permits blind person to enter information using speech, there is requirement of convert speech into Braille codes. These converted Braille codes are then embossed on paper in text format.

These printouts are very important in intellectual progress of blind and weak sighted people. These printouts are very important in education, developing their perception. It allows recording the information in a way, which is understandable for every blind person.

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