Braille Oriented Message System B-Chat

Karthika P*, Divya D S**

(M Tech Student, Department of VLSI & ES, ER&DCI Institute of Technology, Trivandrum
** (Assistant Professor, Department of VLSI & ES, ER&DCI Institute of Technology, Trivandrum*
Corresponding Auther : Karthika P

ABSTRACT
From time immemorial onwards, communication had an important role in our daily life. The technology have completely revolutionized so that long distance communication is within our fingertips. But these advancements in the field of communication shut door against visually challenged. They need alternative communication expertise which is very expensive and often inconvenient to use. This project is especially designed for the visually impaired to communicate with others so that they can communicate and socialize without vision. The approach focuses on Braille Oriented Message system which converts SMS in text to Braille language and also Braille to characters using GSM module, Microcontroller, switch arrays and vibrators which enable the visually impaired people to send and receive SMS without any difficulty. This new communication system is cheap, portable, fast and accurate.
Keywords – Braille code, Deaf- blind, Vibrators, Visually Impaired, Switch array

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I.   INTRODUCTION

Communication has a vital role in our daily life. Decades back ideas where exchanged by using pictures, symbols and sounds. Then language was originated. But there was issue with long distance communication. It took almost weeks to send a message in the form of letters from one location to other. As a solution for the delay caused by long distance communication telephone was invented. Development in the field of communication is at a high rate in which telephones where replaced by mobile phones, voice calls by text messages and video calls. But a part of society is unaware of these advancements especially visually impaired. These difficulties were predicted by Louis Braille decades back. So he invented Braille system which was accepted worldwide that is used by blind people for reading and writing purpose.

Louis Braille is considered as the father of Braille system who lost his eyesight in early childhood in an accident. He self-invented Braille system by getting inspired from wooden dice. Braille system consists of six dots which are arranged in rectangular pattern. In the system, each alphabets or letters is recognized by passing fingertips over the dots all at once. The proposed system is designed by using Braille language as the communication interface for visually challenged. Thus the project B-chat is a new communication channel that act as a bridge to the communication gap between visually impaired and communication advancements.

The paper is organized as follows: section II presents an introduction to the Braille system, section III includes a review of related works, section III involves overall system requirement, section IV involves system architecture, section V includes results of hardware implementation and section VI involves conclusion and future scope.

II.   BRAILLE SYSTEM

Braille is a haptic device which is used by people who are visually impaired. Braille characters are arranged in rectangular patterns called cells and have tiny raised dots. The dots are arranged in a pattern which is used to recognize a character. It is read by passing the fingertips over the raised dots all at once. These patterns can be used in various languages and the as mapping varies from language to language. In English Braille, there are three levels of encoding.

Grade1 include letters by letter transcription shown in Fig 1. Grade2 include 26 alphabets, punctuations and contractions. Grade3 include words which are shortened to two or three letters.

III.   LITERATURE SURVEY

Today Braille became one of the most important ways for the visually impaired to learn and share information. Many Braille products are available in
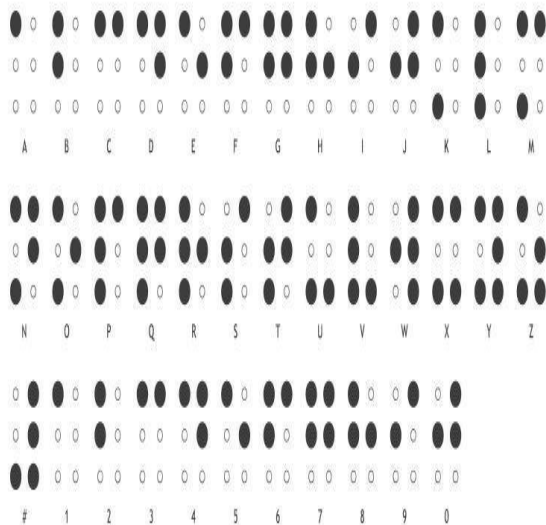
Fig 1: Braille representation of letters and numbers

the market today. Among these products, Braille note takers, slates, paper etc are widely used. Embossed paper is used for writing braille. In the educational context, a note taker is an essential device used by visually challenged students to carry out assignments and take notes. But it is not an economical way of communication now days. It limits the maximum number of words per page and pages per book. This is a hindrance to update and explore their knowledge.

Many research projects have been conducted focusing on independent communication for the blind, the deaf and the deaf-blind communities. Development of Automatic System for Text to Braille Conversion is a milestone in this field which is used to convert computer written text to the Braille language. The system uses a microcontroller connected to a special device that can be read by blind persons. The project aims to convert text to the Braille code which is read at an output device which was also built. The software converts letters (including capitals), numbers, punctuation marks and other special characters [1]. In the system, braille pad is used which consists of two plates. Paper is inserted between these plates. The upper plate consists of rectangular a window which is used for uniformity and lower plate consists of six holes which are arranged in braille pattern. Six styluses are attached above the plates. When a key is pressed, it actuates the relay and stylus will imprint the braille pattern for the pressed character. Wearable systems such as mechanical hands for automated fingerspelling and communication glove systems have been developed using various alphabets. The Lorm glove uses the Lorm alphabet, a form of communication for deaf and blind. It translates the hand-touch Lorm alphabet to text and vice versa using a fabric sensors embedded on the glove [2].

DB-HAND is a similar wearable device with Malossi alphabet interface for the deaf-blind community. This glove is equipped with sensors and actuators enabling two way communications with pressing of tactile sensors enabling the inputs to the device [3]. In another braille based mobile communication and translation glove, uses capacitive touch sensors and actuators to enable two way communication by translating text to braille patterns and vice versa [4]. Wearabraille is a keyboard for the deaf and blind which uses finger mount accelerometers to identify the tapping action of fingers in a similar fashion to typing in a traditional keyboard. However, the main drawback of glove systems is that they limit the use of hands for other activities it gets interrupted if hands are being used for another activity. Braille band [5] and body braille are similar haptic devices [6], but it is used only for one way communication. It can be used only for receiving the messages. Text-to-speech is another mode of assisting the blind. However, it possesses usability issues such as privacy issues, disturbs hearing which is the main sense of blind people etc. Even if a pair of headsets is used it permanently disconnects the visually impaired person from the surrounding environment increasing the chance of meeting with accidents. Moreover, Braille terminals and displays carry an exorbitant cost, hence unaffordable.

IV.   SYSTEM REQUIREMENT

The proposed B-chat Braille oriented Message System would receive and send messages and interpret the received messages in the form of Braille Script. The system requires switch array, Arduino Mega microcontroller, Vibrators, LCD display, GSM module and Buzzer.

1. Microcontroller: Arduino Mega microcontroller is used as the central part of the B-chat. C language program saved in the memory of the controller ensures proper system functionality .The microcontroller has 16 analog inputs, 54 digital input/output pins, 4 UARTS as well as a 16 MHz crystal oscillator. Arduino IDE is the software used to develop the code.

2. Braille keypad: Three Pairs of push buttons are used as braille keypad. The concept of Braille keypad arises from the wooden dice. It is used to enter the text message in the form of characters, alphabets etc. only for the blind peoples having the specific standard pattern for each character or alphabet. Group of six raised dots or bumpy dots represent the particular letter. Push buttons are arranged in 3x2 matrixes by which we can display 64 different characters. All the six dots are arranged in the form of rectangular array design. Each character has standard symbolic pattern respective to its Braille keypad. Normal Keypad can be used for

the purpose. But it is inconvenient for the visually impaired and also increase in number of keys makes the device more bulky.

3. GSM module: The GSM Modem used in the project is using SIM 800 quadrant and TTL serial interface. It is used to SMS make and received call, The GSM operations by simple communicating language AT commands through a serial interface from microcontrollers and computer and applies 12 voltages in GSM operation.

4. Vibrators: Vibrators in the B-chat are used to sense and understand each character for visually impaired. The corresponding characters are converted to vibrations based on Braille script language pattern. Solenoids or motors [7] can also be used. But they are inconvenient to use. So microvibrators are preferred. The main features of vibrator is the magnet coreless DC motor are permanent, which means it will always have its magnetic properties (unlike an electromagnet, which only behaves like a magnet when an electric current runs through it); another main feature is the size of the motor itself is small, and thus light weight. Moreover, the noise and the power consumption that the motor produce while using are low.

5. Buzzer: A buzzer or beeper is used in B-chat to indicate the arrival of message.

6. LCD Display: B-chat uses LCD display to indicate the stages like arrival of message, display the characters while conversion is taking place and so on. It is used to debug the system.

V.   SYSTEM ARCHITECTURE

As a step to bridge the gap between the visually challenged people and the technological advancement in the telecommunication field, B-chat is introduced so that they can have the access to the SMS system and through which they can take important notes. As shown in Fig 2, B-chat has a braille keypad, Arduino Mega microcontroller, Vibrators, LCD display, GSM module and Buzzer. When message arrives, it is indicated through buzzer. Microcontroller reads the SMS through the AT commands and then converts the letters of the SMS into the Braille language. With the help of 6 vibrators, braille script is recognised by the visually impaired person and can read the SMS. For sending a SMS, the microcontroller converts the pushbutton enabled Braille script to the English alphabets. Using GSM the message is send to the person concerned.
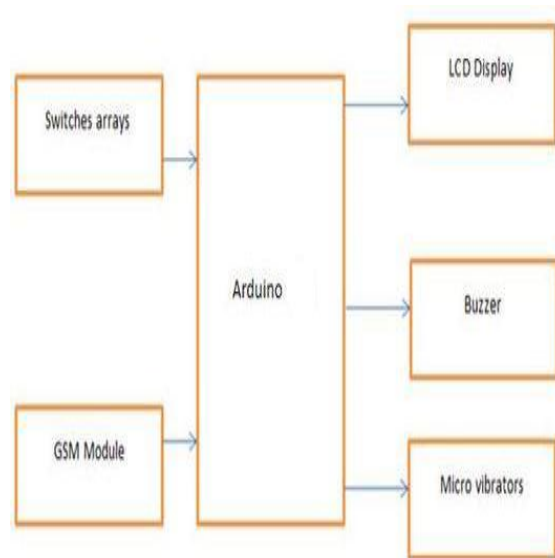

Fig 2: B-chat Architecture

VI.   RESULTS OF HARDWARE IMPLEMENTATION

The proposed system provides a low cost feasible solution to communication problems of the visually impaired. The system makes use of affordable components such as switch array, GSM module as well as vibrators. B-chat has been successfully designed, assembled and tested for its performance as shown in Fig 3.

Reading SMS

1. When a message is received, a buzzer indicates the arrival of the message.

2. When the user is ready to read the message, he presses the combination of pushbutton which is assigned for reading the message.

3. Microcontroller first converts sender's number into vibrations and then the message is converted.

4. Each character is displayed in LCD for crosschecking purpose.

Writing SMS

1. In order to send the message, B-chat should be in the Send mode (which is set by a braille pattern).

2. After pressing the send pattern, user of the B-chat should type the contact number of the person to whom the message should be sent. Contact number should be typed only after pressing the number pattern.

3. After that SMS can be typed with the help of pushbuttons.

4. Microcontroller converts the Braille script back to characters and each converted character will be displayed in the LCD display.

5. When a Send pattern is again pressed, message will be sent to the desired person.

Care should be taken to ensure that the extra patterns like number pattern, send pattern and

read pattern should be different from the already assigned braille script for the alphabets and numbers.

Fig 3: Implemented model

VII. CONCLUSION

Even now Braille technology is used by the visually challenged only for reading and writing purposes. B-chat is a device which solves the communication problems. By using B-chat, the disabled person can read the received messages and can reply or send messages by interfacing braille system with B-chat. The proposed system describes bilingual or bidirectional translation for communication. The system uses Braille technology and the disable people can access the message application as a normal people.

Future work include

1. GPS module to help disabled people where ever they want to go by providing instructions to follow path.

2. By incorporating more patterns, B-chat can be used for various language translations.

3. Vocabulary can be improved using flux sensors.

4. The Project can be extended to send and receive electronic texts.

5. Provisions for the control of reading and writing speed can be provided in future scope

6. The system can be incorporated with the provisions for storing the read messages, so that it can be used for reference.

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