TEXT TO BRAILLE CONVERTING COMMUNICATION DEVICE FOR VISUALLY CHALLENGED PEOPLE

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering Degree in

Electrical and Electronics Engineering

by

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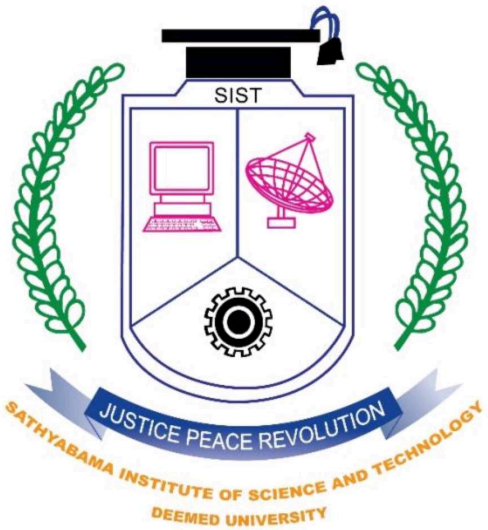

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **S. AMUDHA** (Reg. No. 39140002), **S. BHARATHI** (Reg. No. 39140009) and **P. PAVITHRA** (Reg. No. 39140036) who carried out the project entitled **"TEXT TO BRAILLE CONVERTING COMMUNICATION DEVICE FOR VISUALLY CHALLENGED PEOPLE"** under our supervision from November 2022 to April 2023.

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ABSTRACT

The major goal of this project is to give visually impaired people a comprehensive solution to their communication issues. The majority of blind individuals in the world live primarily in India. Technologies are constantly evolving, especially in the critical area of communication via mobile phones. In the previous proposals, the Visually abled can only read the message on a tactile surface. However, the system's quality is poor, as blind persons are unable to clearly distinguish the text. Blind people still use Braille technology to date, but only for reading. In this project, visually impaired people can read the message and respond to them using Braille system in a mobile application is implemented. This communication system will bridge the gap and make them feel like normal abled people. The user can easily convey their needs through this reply message. By pressing the required reply message button in the Keypad, the user can send the reply message. The device is incredibly simple to use, making it accessible to those who are visually impaired. For mobile service communication, the message will be delivered to the user over GSM.

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LIST OF SYMBOLS AND ABBREVIATIONS

Vs	-	Supply Voltage
Zo	-	Output impedance
GSM	-	Global System for Mobile Communication
LCD	-	Liquid – Crystal display
PIC	-	Programmable Interface Controller
DC	-	Direct Current
I/O	-	Input/output
Volt	-	Voltage
AC	-	Alternating current
SBUF	-	Serial Buffer
Db9	-	D-sub type of connector
E_i	-	Initial Energy
V_f	-	Final Voltage
E_f	-	Final Energy
V_i	-	Input Voltage
ARM	-	Advanced RISC Machine
GPRS	-	General Packet Radio Service
SMT	-	Surface-mount technology
CPU	-	Central Processing Unit
L	-	Inductance
C	-	Capacitance
RS232	-	Serial communication device
EM	-	Electro Magnet

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Braille is the main system of conveying information by tactile sensation, and it was designed for visually challenged people. In Today's world, communication plays a major key role in the life of every individual, where communication is necessary for understanding other individual's thoughts and feelings. Deaf-blindness is a term that is used when the person suffers from both visual and hearing impairment. The condition is otherwise termed dual sensory loss or dual sensory impairment. The visually impaired people have limited access to the outside world, despite the various developments in the field of communication. Blind people usually communicate by sign language, Tacoma, tactile fingerspelling, braille, etc. For the mentioned communication techniques, both the speaker and the listener have to be thorough and understand the language before they use it for communication. Recently researchers have come up with communication devices that would enable any normal person to communicate with the Deaf-Blind person, without any knowledge of the sign languages. The most common means of communication preferred by the blind person is Braille. Embossed paper is traditionally used for writing Braille characters. Braille was developed by a Frenchman named Louis Braille in 1824, who was also blind. The Braille characters are represented in rectangular block cells with 3x2 array of raised dots which appear like tiny bumps. The number and arrangement of these dots is used to distinguish one character from another. There are three levels of encoding in English Braille. Grade 1 encoding uses a letter by letter transcription for basic literacy; Grade 2 encoding has added abbreviations and contractions; Grade 3 encoding includes various non-standardized personal stenography. There are more than 200 million visually challenged people in the world, and this number is on the rise. Braille is easily accessible in everyday life, but mainly provides information for guidance in public facilities and cannot provide personalized information for individuals. Meanwhile, as technology advances rapidly, it has become possible to access desired information anytime and anywhere through portable personal devices such as smartphones, but

it mainly provides information through a visual display.

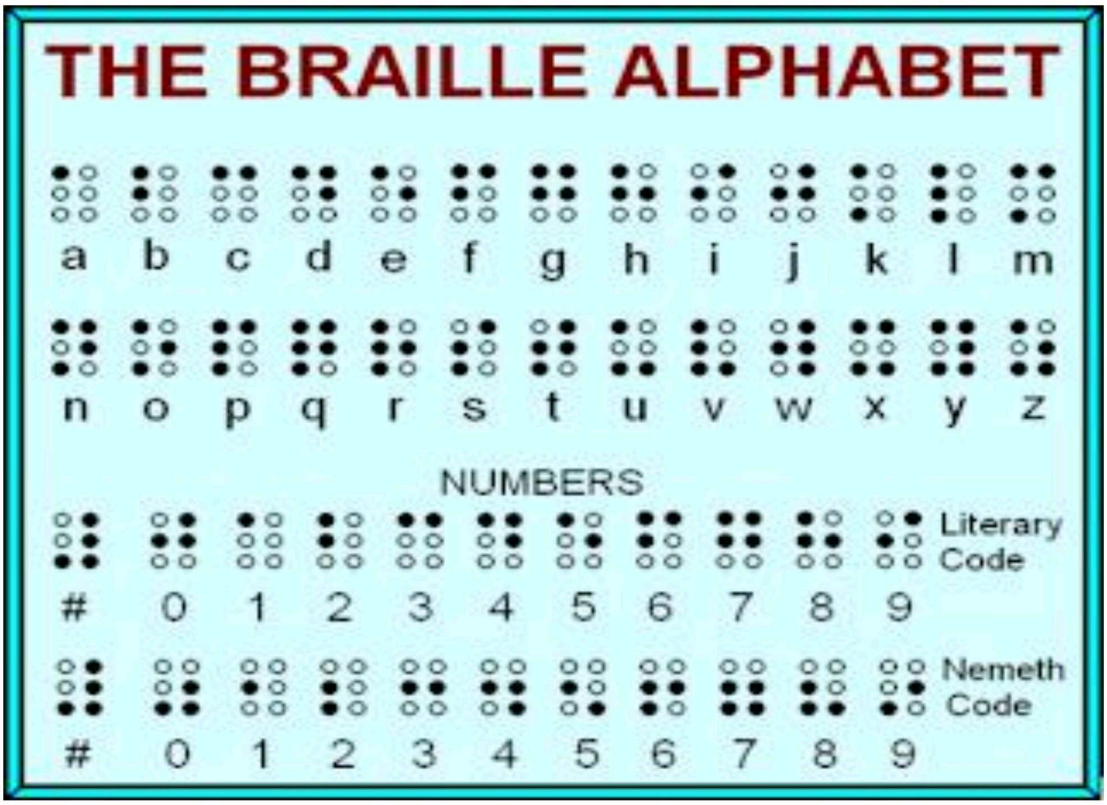


Figure 1.1: The Braille Alphabets

Therefore, the development of the braille device is essential to reduce the gap in information acquisition between visually challenged people and non-disabled people. A refreshed braille display solves the intrinsic problems of braille that it cannot reproduce different information and is bulky. Various principles have been applied to the refreshing mechanism but the most universal principle is piezo-actuator-based braille display modules. These actuators automatically raise and lower braille pins, but are limited to displaying braille information. A braille cell is composed of 6 to 8 pins and represents a single character, and the pin-to-pin and cell-to-cell spacing are different, which means that there is a limit to the expression of information other than text information. In this regard, research on tactile display has been conducted to provide two-dimensional (2D) information through an even pin-to-pin spacing of array type display This will help visually challenged people in education, mobility, and life convenience, and non-disabled people will also be able to use it in environments with the limited visitor to satisfy the small pin-to-pin spacing for all pins, the actuator must be much smaller, and at the same time, they must be able to produce a protruding force that can be felt through our fingers. Tactile

displays are also being researched based on various operating principles, and we propose an actuator based on an electromagnetic (EM) principle. An EM actuator is composed of a voice coil and permanent magnet and utilizes their attractive/repulsive force. It is mainly applied to the vibration motor of portable devices due to its low operating voltage and ease of miniaturization. Since refreshing braille has a relatively simple mechanism, requiring only linear motion (up and down), applying EM actuators to the braille display seems appropriate. However, application to a tactile display requires several challenges. First of all, an EM actuator moves the magnet through the magnetic force, which means the magnetic interference with the surroundings, must be considered. For the finger to detect the curvature while moving on the display, the braille pin must maintain a certain amount of protruding force, especially if intended to remain as a fixed statement for some duration. On the other hand, the generated magnetic field must be weak so as not to affect the surrounding pins during driving. This will have a trade-off relationship and must be resolved through the design of its magnetic structure. Second, the issue of heat generation should be considered. The tactile display consumes energy not only when driving the pins, but also when maintaining the positions of the pins. Finally, energy consumption should be considered. Since the tactile display is composed of a large array of pins, the energy consumption per each must be low. In particular, to be applied to portable devices, the energy consumption rate needs to meet the power and capacity limits of its battery.

1.2 MOTIVATION FOR SELECTION OF PROBLEM

At present, in the 21st century there is a huge way of technology development day by day. It may be either a launch of updated smartphones or a laptop, fast speed networks, data transfer, online payments and more. These technologies are created for the people and also for the growth of organizations, where people find it easier in there every access of life. When we take a pause and think, that these technologies are used by all the people around the world, it is a big question mark(?). What about the people who are with disabilities such as dumb, visually and aurally challenged. There are more than 200 million visually challenged people in the world, and this number is on the rise. Communication plays a vital role in expressing one's feeling to another. People with vision and hearing impairment, find it difficult to communicate with One another. There are

certain unique languages available for the deaf-blind people which includes tactile signing, Braille, moon etc. Among these methods, the most commonly preferred means of communication is Braille. Braille is a system developed to assist the visually and hearing-impaired person by creating arrangements of dots which form letters, numbers and punctuation marks. This thesis proposes a communication device model which converts any alphanumeric English text to its corresponding Braille format that can be read and replied by a visually challenged person. An abled person can send a message to a visually challenged person from his mobile phone. Once the message is received by the device, it starts converting the letters in the message to Braille format. The Braille characters are displayed one by one using a Braille display consisting of six vibration motors depicting the six dots in a Braille cell representation. It is just the same where they read books on tactile surface in Braille language. The visually challenged person can feel the characters by placing their palm on the Braille display unit. Here we have also included reply message facility. By this, the visually challenged persons access their private messages such as bank account credited and debited message, account details on their own, without any helping person with them. By accessing this setup on their own, it increases their self-confidence and they would not feel low on their disability. This setup is of low cost, portable and easy access.

1.3 OVERVIEW

Communication has been an integral part of human evolution, from as early as 2600 BC when the first-ever texture was recorded that comprised of the complex structure of characters to the 17th century when the world's first-ever newspaper was adopted. It is certainly the language that makes the communication unique but the modes of communication have always been uniform, cutting across geographical boundaries or cultures. Being a national or regional language of a specific nation, there has been unique and unusual ways of communicating the same language through different characterization. Morse code has been one such example – initially developed and used as a means of communication for the first commercial telegraph but later popularly known to be used in World. Such so is Braille a tactile literacy system of communication for the visually impaired or legally blind used in education and workplaces. This

Text to Braille converting communication device setup consist of a GSM module, where the user's (visually challenged person) SIM card is placed in it and it has a PIC Microcontroller attached with LCD display, via this, the message is activated in the Braille pad through this the blind person can place their palm and identify the message received and also the received message will be displayed in the LCD as well. A Braille pad which consists of six pins on a 3x2 matrix display. When there is a message received from the abled person to the user, in the Braille pad the pins will raise and rotate according to the text received to the Braille language. For replying back, this paper introduces a keypad, where a five set of standard reply message are kept in it, according to the basic needs of the user. This reply message is a very useful thing, where the user feels it easier that they can handle things on their own, with privacy. The entire setup will work when the power supply is turned ON. When the user turned ON the power supply for this setup, the sent messages to the user will start activated at that time the user has to place their palm and identify the equivalent Braille text. According to the received message, the user can press the required reply keypad button. This device is the best way of accessing message applications as normal people. Communication plays a vital role in expressing one's feeling to another and this setup is very best usage.

CHAPTER 2
LITERATURE SURVEY

2.1 MAJOR FINDINGS FROM LITERATURE SURVEY

Prachi Rajarapollu et al., (2015) the proposed system is specially designed for the visually challenged community to connect, communicate and socialize without vision. Nowadays physically challenged people have no access to advanced communication Technologies. To inform blind people of the advanced telecommunication system, this paper is focused on designing a Short Message Service (SMS) system for them; it Interfaces the Braille pad with the GSM microcontroller. This method is using visually Challenged people to easily understand characters of text. The micro vibrators can easily understand and receive SMS visually challenged people can easily understand Text after sending SMS to normal people. These two processes only control Microcontroller operation.

Arun Francis G et al., (2020) discussed a real-time System Recognition Face (FRS) was introduced for low-vision people and aiding the blind. The work Process includes face detection and face recognition to identify the person who is standing in front of them. First, the captured image is taken by a camera Pi – 8 Megapixel. Oriented Gradient Histogram (Ho G) features are extracted with a Database that already has the extracted Ho G feature. For a face image, 4680 Ho G Features are extracted. If the input image is matched, it pronounces the person's name to the blind person by an audio signal through text to voice converter. Suppose the Image is not matched, it asks whether to store it in the database. In this proposed Method, Balabolka software is used for text-voice conversation. The work is implemented using a Raspberry pi3 processor and MATLAB 2017b. The experiment is implemented for100 faces with 10 different positions.

Naveen Kumar, Jada malli, et al., (2017) Learning the Braille script is not an easy task for visually challenged students. Visually challenged students have to Memorize/remember various patterns of keys of the Braille matrix assigned for different Letters/words/symbols in Braille script to read and write effectively.

The electronic Braille kit is for helping them out with the more difficult stages of learning Braille to expand their knowledge and assistance in orientation and mobility. Braille Keypad, which can be used to help users learn Braille by tactile signals, and also hearing it read out to them. The keypad allows visually impaired users to enter Braille characters into the system easily for different uses and works. The integration of physical activity and hearing can facilitate easy learning of Braille Script (all languages). It consists of a keypad same to Braille Cell which is based on the Braille matrix (3*2 matrixes) with two extra control keys. The user first listens to the instructions and gets the training from the kit, then enters the combination of keys in compliance with the internationally accepted Braille matrix/script, the device in turn pronounces the corresponding output of letters/words/symbols/contractions (flexible for all languages). This project is an attempt to utilize technology to educate visually challenged students.

Sruthi Ramachandran et al., (2021) Communication plays a vital role in expressing one's feelings to another. People with vision and hearing impairment find it difficult to communicate with one another. There are certain unique languages available for deaf-blind people including tactile signing, Braille, moon, etc. Among these methods, the most commonly preferred means of communication is Braille. Braille is a system developed to assist the visually and hearing-challenged person by creating arrangements of dots that form letters, numbers, and punctuation marks. This paper proposes a communication device model which converts any alphanumeric English text to its corresponding Braille format that can be read by a Deaf-Blind person. An able person can send a message to a Deaf-Blind person from his mobile phone. Once the message is received by the device, it starts converting the letters in the message to Braille format. The Braille characters are displayed one by one using a Braille display consisting of six vibration motors depicting the six dots in a Braille cell representation. The Deaf-Blind person can feel the characters by placing their palm on the Braille display unit. This paper also includes a vibration band model for the Deaf-Blind person, which acts as an indicator for an incoming message.

F. Ramirez-Garibay, et al., (2014) proposed a model which uses a USB

keyboard to enter the message which is in turn processed by a Raspberry Pi controller. A 16-cell refreshable Braille display is used to display the text given by the user in the form of Braille language so that the disabled person can sense the message. A speaker is also attached to this system so that the person who is only blind can know the message by hearing it. A vibration motor is used as an alert system for deaf-blind people to indicate that a message has been received.

R. Shylaja, et al., (2018) in the proposed model, used a Bluetooth module (HC-05) which is interfaced with an Arduino Mega microcontroller. Whenever a message is sent via Bluetooth, present in the mobile phone to the communication device, the processor will convert the message to braille and will send the braille pattern to the vibration motor which is arranged in the braille cell format. The corresponding motors will be raised up according to the received text. A 16×2 LCD display is also used to display the message and a piezo buzzer acts as an indicator whenever a message is received.

Sibila. R, et al., (2018) designed a software system for the conversion of English words, numbers, and special characters into braille format. The inputs which are opened in a folder are read and their corresponding braille format representation is assigned by MATLAB simulator by comparing the input characters with a lookup table that contains the braille pattern for all 26 English alphabets, 10 digits, and some special characters. The device stores the output text as a file, which can be printed as Braille dots.

Y. Saraswathi, et al., (2017) in their paper designed a device that contains a GSM module that is interfaced with an Arduino UNO microcontroller. When the message is received in the GSM module from the mobile phone corresponding braille characters will be assigned by the controller and the vibration motors which are arranged in a 3×2 matrix will raise up accordingly.

P. G. Anuradha, et al., (2016) proposed an efficient communication device for deaf-blind a person which contains a QWERTY keyboard to enter text. The keyboard is interfaced with a raspberry pi processor. Six servo motors are used which act as a braille display unit and perform the raising of the braille dots. In

this manner the disabled person can sense the message by touching the dots.

R. Sarkar, et al., (2012) the paper discusses the approach of converting the text to the braille format through a computer application. Six stepper motors are arranged in braille cell format and it is connected to the computer system. An application program loaded in the computer takes the English text as input and performs different language processing, parsing, interpreting, and controlling operations to meet the desired output
of the system.

Swati Malik P. J. et al., (2016) propose a device of E-Braille reader where the WI-FI module (ESP8266) is used for receiving e-books and to communicate with other android devices. The received material or text is sent to the STM32f407 ARM cortex microcontroller for processing and conversion. Servo motors are used for displaying the Braille characters. Audio playback has also been used as an output device to hear the text for the person who is visually challenged.

Kaustubh Bawdekar, et al.,(2016) discuss a model that functions by collecting the raw text with the help of a camera. The camera sends the collected data to the microcontroller (Raspberry Pi), which in turn converts it into Braille text. This mode uses a lookup table for the conversion of Standard English text to Braille text. Here the solenoids act as a Braille display from which a visually challenged person can sense the braille characters.

2.2 INFERENCE FROM LITERATURE SURVEY

The Text to Braille converting communication device helps to connect, communicate and socialize with people who have lost their vision. Nowadays physically challenged people have no access to advanced communication Technologies. To inform blind people of the advanced telecommunication system, these papers approach on designing a Short Message Service (SMS) system for them; it Interfaces the Braille pad with the GSM microcontroller. With the help of vibrating motors, the visual impairment person can identify the text message which is converted to braille language. The next form of

communication for deaf-blind is a real-time System Recognition Face (FRS). The work process includes face detection and face recognition to identify the person who is standing in front of them. Learning the Braille script is not an easy task for visually challenged students. Visually challenged students have to Memorize/remember various patterns of keys of the Braille matrix assigned for different Letters/words/symbols in Braille script to read and write effectively. The electronic Braille kit is for helping them out with the more difficult stages of learning Braille to expand their knowledge and assistance in orientation and mobility. Braille Keypad, which can be used to help users learn Braille by tactile signals, and also hearing it read out to them.

The keypad allows visually impaired users to enter Braille characters into the system easily for different uses and works. The integration of physical activity and hearing can facilitate easy learning of Braille Script (all languages). It consists of a keypad same to Braille Cell which is based on the Braille matrix (3*2 matrixes) with two extra control keys. This paper explains how to utilize technology to educate visually challenged students. Another paper survey talks about the various communications including tactile signing, Braille, moon, etc., among these methods, the most commonly preferred means of communication is Braille. Braille is a system developed to assist the visually and hearing-challenged person by creating arrangements of dots that form letters, numbers, and punctuation marks. This includes a vibration band model for the Deaf-Blind person, which acts as an indicator for an incoming message. One other paper discusses on a model which uses a USB keyboard to enter the message which is, in turn processed by a Raspberry Pi controller. The inputs which are opened in a folder are read and their corresponding braille format representation is assigned by MATLAB simulator by comparing the input characters with a lookup table that contains the braille pattern for all 26 English alphabets, 10 digits, and some special characters. The device stores the output text as a file, which can be printed as Braille dots. Some paper discusses that the Braille pad runs with the help of servo motors and some runs with relay motors. A device of E-Braille reader where the WI-FI module (ESP8266) is used for receiving e-books and to communicate with other android devices. The received material or text is sent to the STM32f407 ARM cortex microcontroller for processing and conversion. Servo motors are used for displaying the Braille characters. Audio playback has

also been used as an output device to hear the text for the person who is visually challenged.

The conclusions drawn from the literature review are listed above. Every study discusses a distinct method of communication device for those who are blind or visually impaired. By conducting these surveys, we discovered several shortcomings in the earlier works. In this work, we attempt to build a new technique by introducing a reply message device. This suggestion is briefly discussed below.

2.3 PROBLEM STATEMENT

In Today's world, communication plays a major key role in the life of every individual, where communication is necessary for understanding other individuals' thoughts and feelings. In that case, for visually challenged people Braille language is one form of communication for identifying the text. In the previous proposals, the authors have discussed a mobile communication system, by which visually impaired people can identify the text message that they received in their mobile phone.

One of the discussions is the glove setup, where the users find discomfort in wearing the glove because wearing it for a long time, sweat is created and the time of each text existence is very small, the user find it difficult in identifying the words in braille language so, this setup gives low accuracy. The other paper discusses the same mobile application system, which consists of a braille pad through which the user identifies the text message converted to braille language with the help of Braille pad, here this system is of low cost and gives good accuracy and flexible to the user, but the user can only receive the message, there is no option created for a reply message by the user (visually challenged people). The reply message proposal was not discussed in any of the papers in literature survey. In the proposed system the visually challenged people can receive message in Braille form as well as they can reply some standard message to the sender person. The proposed system is of low cost, good accuracy and more reliable.

2.4 EXISTING TEXT TO BRAILLE CONVERTING SYSTEM

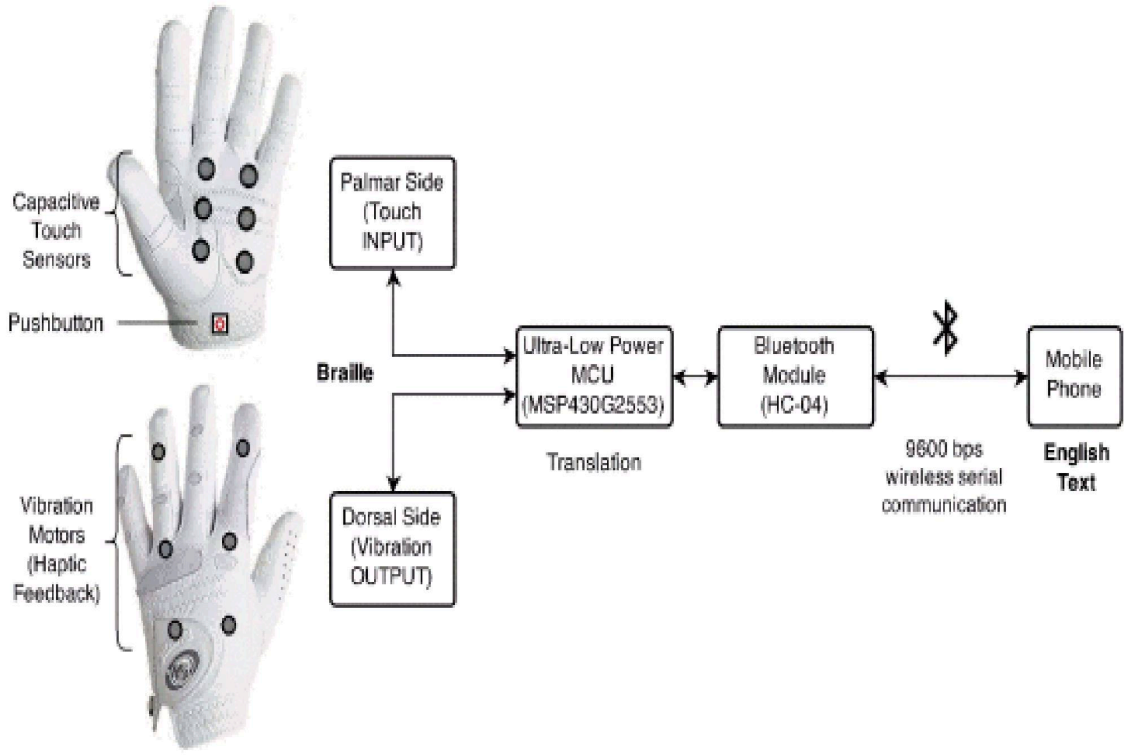


Fig 2.1 Existing Text to Braille Block diagram

The Existing system is a glove setup that consists of a palmar side (input) and a dorsal side (output). A touch sensor was placed in a 3×2 matrix in both tides. The push button (switch) is also placed on the palmer side and the vibration motors are placed on the dorsal side. This setup works under a Bluetooth connection. The receiver (impaired person) will receive the text message by the vibration of each alphabet in braille language. A random survey revealed that wearing the glove can occasionally cause annoyance and discomfort. To convert text to braille, input is taken from the keyboard of a laptop, one letter at a time. The user types the letter in the serial monitor window of Arduino. After receiving the letter, Arduino processes it according to the source code. The diagram shows the block diagram for this work. In order to simulate braille letters there will be 6 servo motors connected to the Arduino and the swing arms of these motors are connected to 6 metal rods. When the servo motors rotate by a small angle the connected rods correspondingly move backwards or forward depending upon the direction of rotation. This back-and-forth motion of the rods will result in a depression or elevation on the surface of the

device. All braille letters can be produced using 6 rods organized in 3 rows and 2 columns. The source code of the device is a simple if -else construct, all alphabets will be saved and their braille equivalents will be the overall output of the system, this will be in terms of servo rotations by a small positive angle of elevation and a small negative angle for depression that will raise the metal road. It Result in the kind of impressions that someone who understands braille can use to read that someone needs to convey. It is extremely hard for some individuals to acquire fundamental and vital data required for their living. They are at danger of being socially avoided because of this. A text-to-braille converter hence is an attempt at bridging the communication.

2.5 DISADVANTAGES OF THE EXISTING SYSTEM

The Existing system is a glove setup which consists of a palmar side (input) and a dorsal side (output). A touch sensor, placed in a 3×2 matrix in both the sides. Push button (switch) is also placed in the palmer side and the vibration motors are placed on the dorsal side. This setup works under Bluetooth connection. The receiver (impaired person) will receive the text message by the vibration of each alphabet in braille language. On the survey, we noticed that there occurs a certain irritation and uncomfortableness of wearing the glove. So, this glove setup becomes a failure under usage of practice, as the impairment people mostly felt discomfort in carrying the glove setup in their hand, this basically covers entire palm till their wrist area. Occurrence of sweat and sudden jerk due to the vibration, by that only they will identify the text message which is converted to braille language. One another disadvantage in this paper is that, those visual impairment people can only receive the message and they can identify it by this setup but they have no chance to make a reply message. Previously in the normal and the current situation, the visual impairment person is care by a helping person to read text message and to see their condition every time. For reading text alone, which this setup explains is not preferred much by them. This setup requires high-voltage supply and its cost is also high. It has low flexibility and low accuracy.

CHAPTER 3

AIM AND SCOPE OF THE PROJECT

3.1 INTRODUCTION

The main aim and scope of this proposed system is to establish the means of communication for specially-abled people. Nowadays physically challenged people have no access to advanced communication Technologies. To inform blind people of the advanced telecommunication system, this project is focused on designing a Short Message Service (SMS) system. It Interfaces the Braille pad with the GSM microcontroller. It has a special keyboard (braille Pad), that converts the text message into required Braille language. Using this Braille system both reading and replying the messages are possible for visually challenged people. Using this Braille technology, blind people can access the message application with their mobiles as normal people.

3.2 OBJECTIVE

The objectives of the proposed work

- To establish a means of communication for specially-abled people.
- It has a special keyboard (braille Pad), that converts the message into voice or text
- Using this Braille system both reading and replying the messages are possible for visually challenged people.
- Using Braille technology, blind people can access the message application on mobiles as normal people.

3.3 SCOPE OF THE PROJECT

- This proposed work is mainly employed for visually challenged people who can read mobile messages and also reply the messages to the sender.

- The proposed system is low cost, has good accuracy, and is more reliable.

3.4 METHODOLOGY

- The Text to Braille conversion procedure starts when a message has been received by the GSM module in the converted kit from any abled person's mobile phone.

- The message sent to the microcontroller, where the text to Braille conversion part takes place.

- The PIC microcontroller has been programmed to convert the incoming alphanumeric text message to its equivalent Braille text.

- Each character in the received message is assigned with its corresponding Braille pattern.

3.5 PROPOSED SYSTEM DESCRIPTION

In this system using Braille technology the blind people can access the message application in mobiles as a normal people. At the same time keypad using one by one message will be sent based on the keypad options, the user can easily send the information's through Message as a reply. The proposed text to braille conversion system consists of a power supply where the entire setup work when it is turned ON. GSM module acts as a medium of data transfer. Here the user's sim card is placed in the GSM module and the setup consists of a PIC Microcontroller attached with LCD display, through the LCD the output will be displayed. It also contains of a serial data transfer where a serial buffer, data frame and a level shifter are present in it. With the help of relay motors, the Braille pad activates. The message displayed in the LCD will activate in the Braille pad according to the Braille language. After the text message

read by the user for replying back they can use the keypad device, where five standard reply messages are coded into it.

3.5.1 Block Diagram of Proposed System

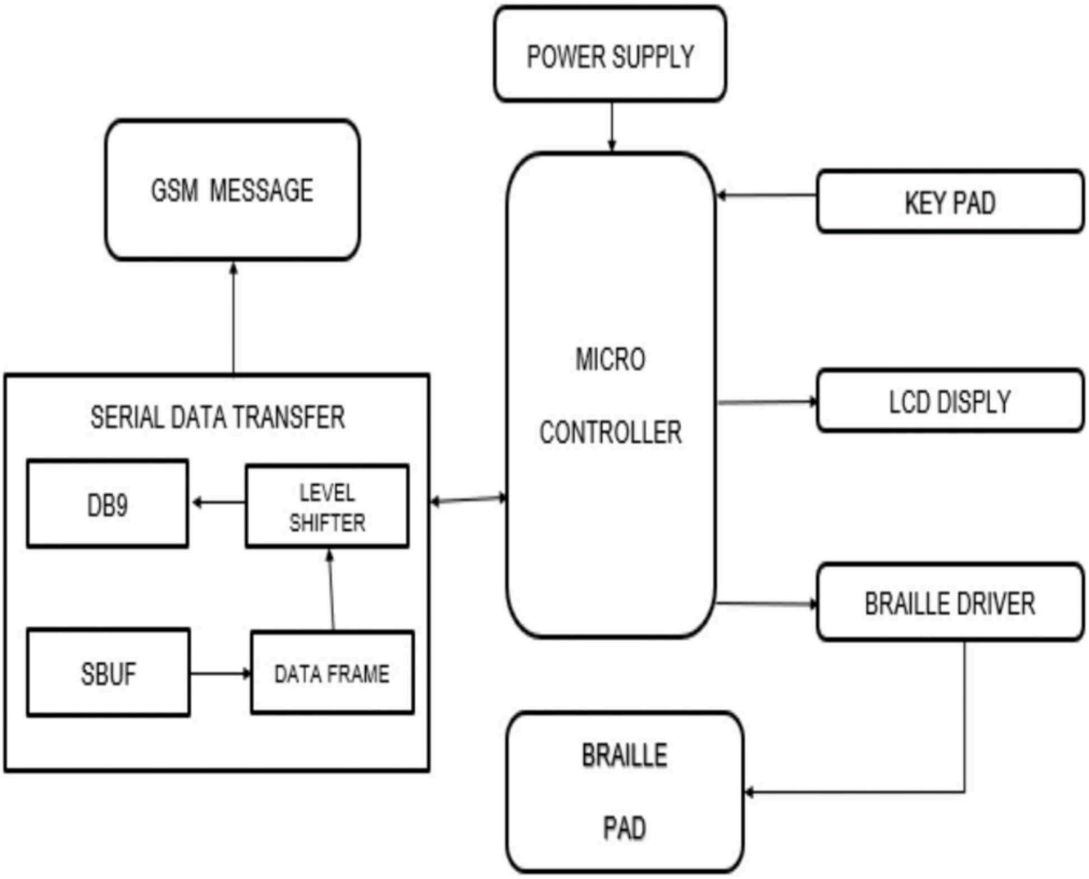


Figure 3.1: Proposed Text to Braille conversion Block Diagram

3.6 EXPLANATION OF THE PROPOSED SYSTEM

This module explains how to use a software program on a computer to transform text to braille. A microprocessor is connected to six stepper drivers arranged in braille block arrangement. The computer's application software accepts English text as input and executes various language processing, parsing, translating, and management processes to produce the system's desired output. A gadget was created for the

proposed system that communicates with an Arduino UNO microprocessor via a GSM modem.

The processor selects the proper braille characters from the mobile phone for the GSM module to display when a message is received, and the vibrating actuators in a 3x2 matrix rotate accordingly. The Proposed System helps blind people to communicate the message via SMS to a remote contact. The Braille alphabets are arranged in a 3x2 matrix, with six raised dots. The six-dot system helps to recognize alphabets or letters by passing fingertips to sense all the dots at once. When the power supply is turned on the user can start receiving messages via GSM module.

The text messages are presented sequentially in the LCD screen using the PIC microcontroller, and they are simultaneously received in the Braille pad by spinning each pin in accordance with the Braille text at predetermined intervals of time.

But here, using this Braille system both reading and replying to the messages is possible by the visually challenged people. This system helps blind people, who can access the message application on mobiles as normal people. At the same time, the keypad is used to send reply one-by-one based on keypad option. Each button represents a standard reply message which is predefined. By this reply message, the people who take care of the disabled person(user), can stay far and also know the current situation of them.

3.7 ADVANTAGE OF PROPOSED SYSTEM

- Fast Refresh Rate.
- Low Cost.
- Portable.
- Small Size.
- Easy Access.

3.8 APPLICATION OF PROPOSED SYSTEM

- Blind People System.
- Easy Message Alert System.

3.9 STANDARDS

The IEEE standard adapted for this project is IEEE 1596-1992.

IEEE 1596-1992: Standard for Scalable Coherent Interface (SCI) – This standard defines a high-speed serial communication interface that allows for efficient data transfer between computer system. It could be useful for connecting different components of a system designed for visual impairments.

3.9.1 Terminology

The process of converting digital text into Braille using a specific Braille code, such as UEB (Unified English Braille) or Grade 2 Braille. A system using a series of raised dots that can be read by touch and is used by blind and visually impaired people to read and write. The sensation of touch or vibration that provides feedback to the user when interacting with a device. The device that displays braille characters using an array of raised dots that can be raised or lowered electronically. The OCR (Optical Character Recognition) technology that enables machines to recognize printed text and convert it into digital text. The Haptic technology that provides tactile feedback to the user, such as through vibrations or motion, indicating that a message has been sent or received. The Assistive technologies such as devices or software designed to assist people with disabilities to perform tasks that would otherwise be difficult or impossible. The design of products, devices, services, or environments that are accessible to people with visual disabilities.

3.10 CONSTRAINTS AND TRADE-OFFS

3.10.1 Constraints

As in the current phase of the project work the following constraints where encountered:

1. Accessibility:

The device must be accessible to visually impaired people, which means it should be designed with tactile features and audio prompts.

2. Durability:

The device should be designed to withstand daily use and possible impacts and drops.

3. Battery life:

The device should have a long battery life to ensure that it remains operational for as long as possible.

4. Portability:

The device should be portable and easy to carry around, allowing users to access the system wherever they go.

5. Privacy:

The device should be designed to protect the user's privacy and security, as it may contain sensitive information.

3.10.2 Trade-Offs

The possible trade-offs of the project work are encountered:

1. Customization vs. Standardization:

Customizing the device to meet individual user's needs may result in a higher level of satisfaction, but it could also be more expensive to produce. A standardized design may be more cost-effective, but could result in a less tailored experience for each user.

2. Braille size vs. device size:

The size of the Braille symbols could affect the size of the device. Smaller Braille symbols could make the device more compact and portable, but could also be more challenging for users to read. Larger Braille symbols could be easier to read but could result in a larger and less portable device.

3. Voice output vs. Braille output:

The device could offer both voice output and Braille output, or only one of the two. Voice output could be faster, but Braille output could provide a tactile experience that some users may prefer.

4. Cost vs. functionality:

Adding more features to the device could increase its functionality, but it could also result in a higher cost. A simpler design may be more affordable, but could offer fewer features and functions.

5. User testing vs. Development time:

User testing is essential to ensure that the device is user-friendly and meets the needs of the target audience. However, user testing can be time-consuming and could increase the development time.

CHAPTER 4

HARDWARE DESCRIPTION

4.1 INTRODUCTION

The Text to Braille converter communication device hardware setup consist of AT89s52 microcontroller, LCD display, keypad, serial data transfer, braille driver, braille pad, relay motors (6), and GSM message unit. The entire setup will work when the power supply is turned ON. The working of this setup is briefly explained in the explanation proposed system in the previous chapter.

4.2 HARDWARE CIRCUIT DIAGRAM

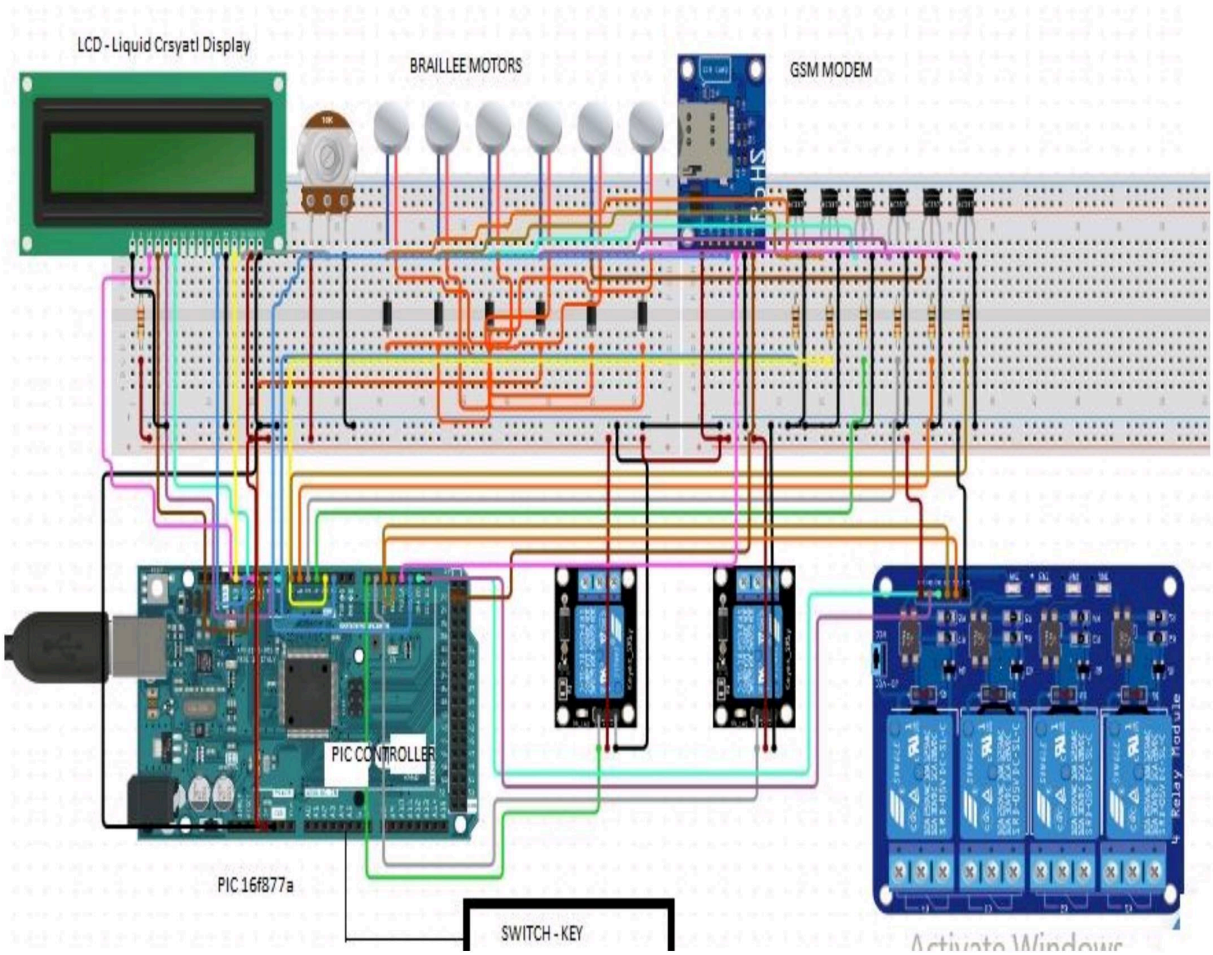


Figure 4.1: Hardware circuit Diagram

4.3 FLOW CHART OF TEXT TO BRAILLE CONVERTER

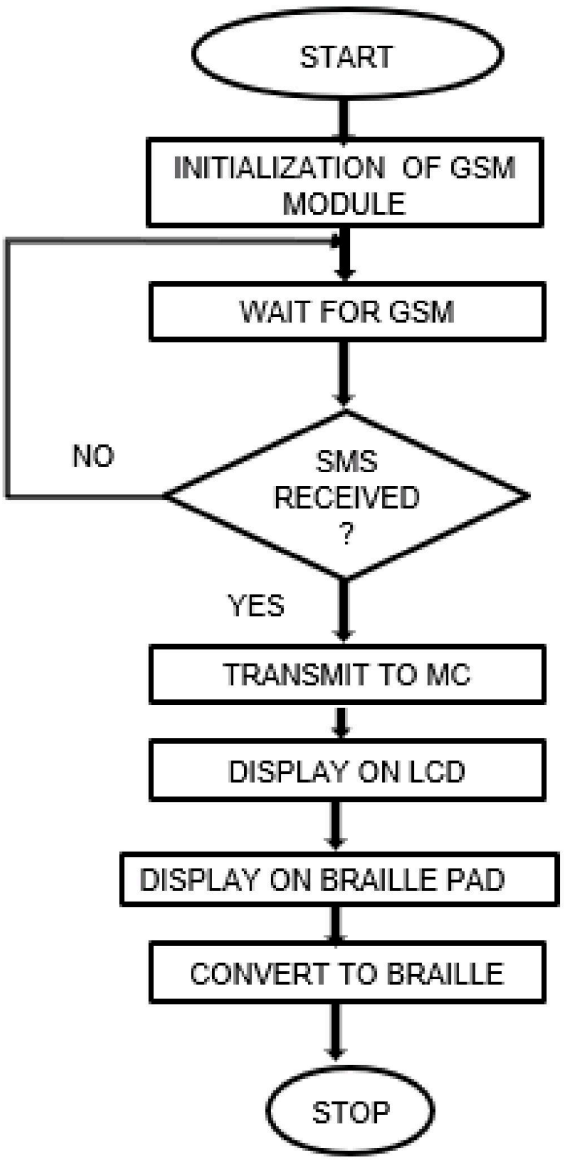


Figure 4.2: Flow chart for Text to Braille conversion process

The start indicates the Power ON of the hardware setup. Before initializing of GSM, one has to insert the sim card (into the GSM) of the particular Braille person. When the sim is placed perfectly means the entire setup is good to go, message transfer can be made. After this point, GSM can be used to receive the message at any time. In the event that a message is received from someone on the braille user's contact list,

it is first communicated to the microcontroller before being shown on the LCD. Simultaneously one also gets the indication of a message from the Braille pad, with vibrations of each screw. With the help of the Braille pad, visually challenged people can identify each and every text of the message from the sender. Here the normal English text message is converted to Braille language text so that it becomes easy for them to identify the message line by line. There is a certain gap given for each alphabet for identifying (reading) the message.

4.4 HARDWARE IMPLEMENTATION

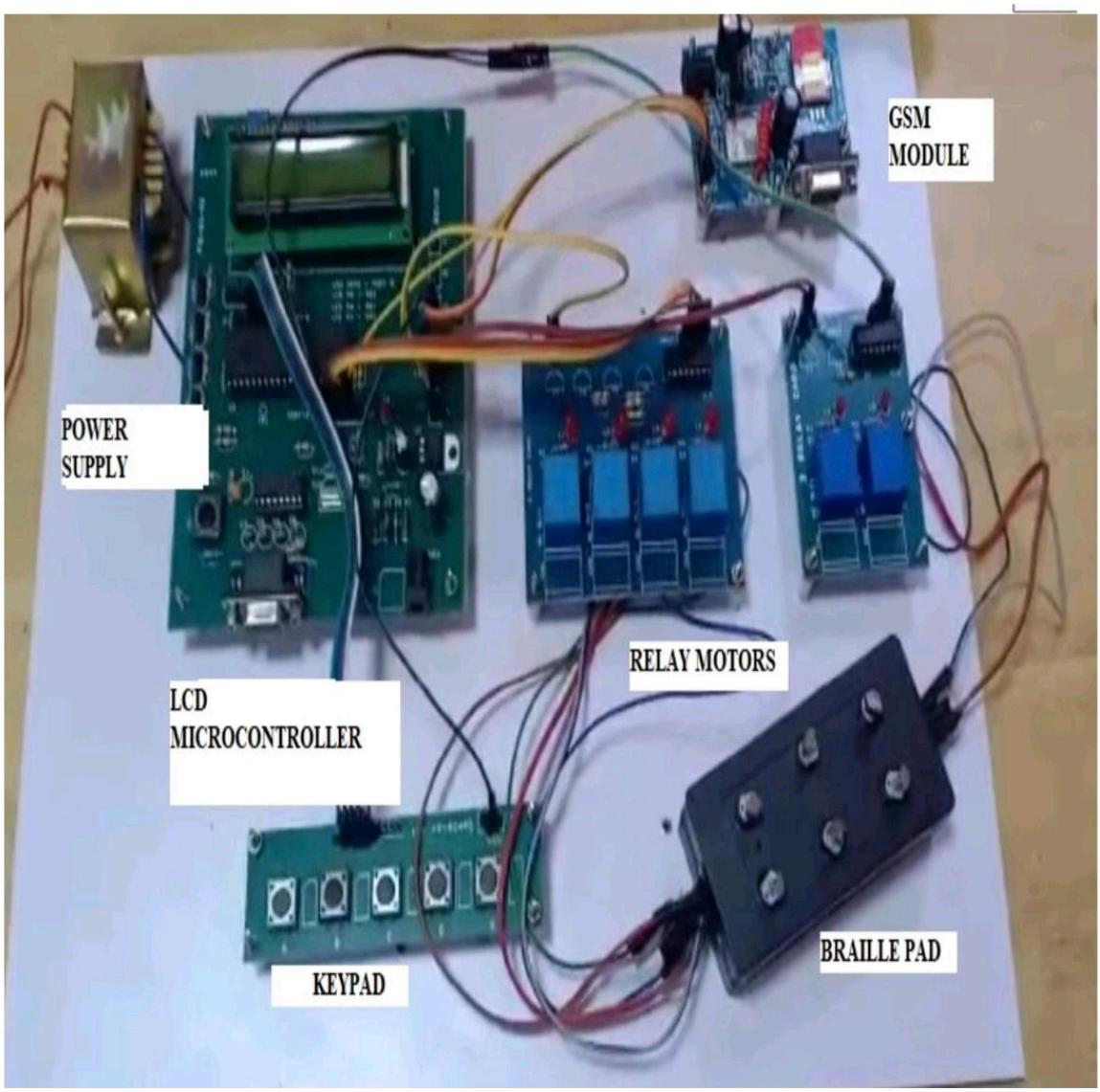


Figure 4.3: Hardware kit for Text to Braille converter

4.4.1 Power Supply Unit

Power supply unit consists of following units:

- Step down transformer
- Rectifier unit
- Input filter
- Regulator unit
- Output filter

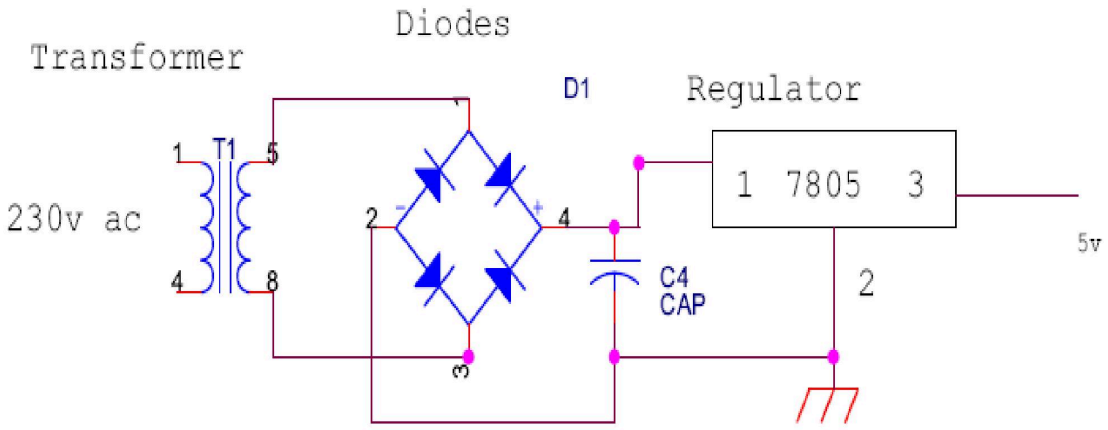


Figure 4.4: Power supply circuit diagram

- **STEPDOWN TRANSFORMER:**

The Stepdown Transformer is used to step down the main supply voltage from 230V AC to lower value. This 230 AC voltage cannot be used directly, thus it is stepped down. The Transformer consists of primary and secondary coils. To reduce or step down the voltage, the transformer is designed to contain few number of turns in its secondary core. The output from the secondary coil is also AC waveform.

Thus, the conversion from AC to DC is essential. This conversion is achieved by using the Rectifier Circuit/Unit. Step-down transformers can step down incoming voltage, which enables user to have the correct voltage input for the user electrical needs. For example, if this equipment has been specified for input voltage of 12 volts,

and the main power supply is 230 volts, we will need a stepdown transformer, which decreases the incoming electrical voltage to be compatible with 12-volt equipment.

- **RECTIFIER UNIT:**

The Rectifier circuit is used to convert the AC voltage into its corresponding DC voltage. The most important and simple device used in Rectifier circuit is the diode. The simple function of the diode is to conduct when forward biased and not to conduct in reverse bias. Now we are using three types of rectifiers. They are

1. Half-wave rectifier
2. Full-wave rectifier
3. Bridge rectifier

- **INPUT FILTER:**

Capacitors are used as filter. The ripples from the DC voltage are removed and pure DC voltage is obtained. And these capacitors are used to reduce the harmonics of the input voltage. The primary action performed by the capacitor is charging and discharging. It charges in positive half cycle of the AC voltage and it will discharge in negative half cycle. It allows only AC voltage and does not allow the DC voltage. This filter is fixed before the regulator. The output is free from ripples.

There are two types of filters. They are

1. Low pass filter
2. High pass filter

- **REGULATOR UNIT:**

Regulator regulates the output voltage to be always constant. The output voltage is maintained irrespective of the fluctuations in the input AC voltage. As and then the AC voltage changes, the DC voltage also changes. To avoid this Regulators are used.

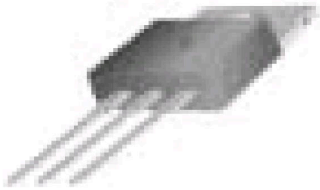


Figure 4.5: 7805 Regulator

When the internal resistance of the power supply is greater than 30 ohms, the output gets affected. This can be successfully reduced here. The regulators are mainly classified for low voltage and for high voltage. Further they can also be classified as:

i) Positive regulator

1---> input pin

2---> ground pin

3---> output pin

It regulates the positive voltage.

ii) Negative regulator

1---> ground pin

2---> input pin

3---> output pin

It regulates the negative voltage.

- **OUTPUT FILTER:**

The Filter circuit is often fixed after the Regulator circuit. The capacitor is most often used as a filter. The principle of the capacitor is to charge and discharge. It charges during the positive half cycle of the AC voltage and discharges during the negative half cycle. it allows only AC voltage and does not allow the DC voltage. This filter is fixed after the Regulator circuit to filter any of the possibly found ripples in the output received finally. Here we used a 0.1µF capacitor. The output at this stage is 5V and is given to the Microcontroller. The output voltage overshoots when the load is removed or a short clear. When the load is removing from a switching mode power supply with an LC low-pass output filter, the only thing the control loop can do is stop the switching action so no more energy is taken from the source. The energy that is stored in the output filter inductor is dumped into the output capacitor causing a voltage overshoot.

The magnitude of the overshoot is the vector sum of two orthogonal voltages, the output voltage before the load is removed and the current through the inductor times the characteristic impedance of the output filter, $Z_o = (L/C) \wedge 1/2$. This can be derived from the conservation of energy considerations.

The initial energy, E_i, is:

$$E_i = 1/2*(L*I_i\wedge 2 + C*V_i\wedge 2)$$

The final energy, E_f, is:

$$E_f = 1/2*(L*I_f\wedge 2 = C*V_f\wedge 2)$$

The two energies are equal when the load is removed, since the load is no longer taking energy from the system. Equating the two energies, substituting zero current for the final inductor current, then the solution for the final voltage V_f is:

$$V_f = (V_i\wedge 2 + (I_i*Z_o) \wedge 2) \wedge 1/2$$

This is the orthogonal vector sum of the output voltage and the load current times the characteristic impedance and is illustrated in Figure 4.6.

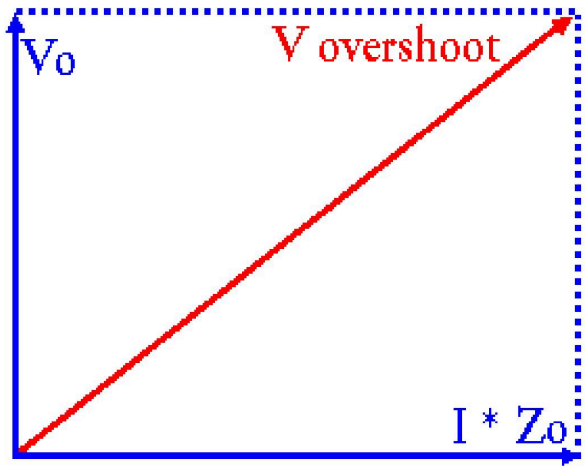


Figure 4.6: Overshoot Voltage as Vector Sum

The problem becomes worse if the current in the inductor is established by a short circuit on the output and the short circuit clears. In this case, the initial voltage is zero (short circuit) and the overshoot is $I*Z_o$, where I can be very large, resulting in a ruinous overshoot

4.4.2 GSM Module

A device that makes use of GSM mobile telephone technology to offer a cellular data link to a network is known as a GSM modem or GSM module. Mobile phones, that is linked to its network typically contains GSM CPUs. For connecting mobile device to its own network, SIM cards are used. The GSM modem works like a mobile phone and has its own unique mobile number. It takes any GSM network as a SIM card. The benefit of using this modem is that its RS232 port allows for interaction and the creation of incorporated applications. While the SIM800CS is a quad-band GSM/GPRS module that uses GSM850MHz bands and offers the capability for voice and data, the SIM800C is a complete Dual-band GSM/GPRS solution in an SMT module with an industry-standard interface.

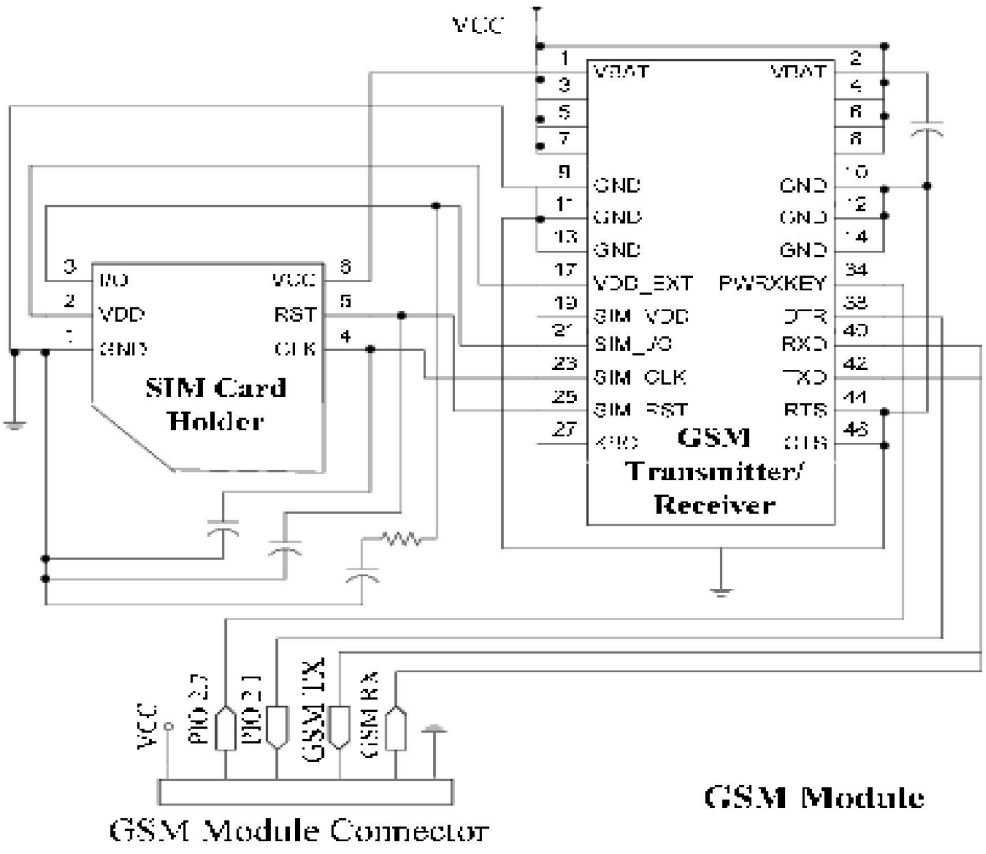


Figure 4.7: GSM Module Hardware circuit Diagram

4.4.3 LCD Microcontroller

The intelligent alphanumeric dot matrix monitor (16 x 2) can show 224 distinct letters and symbols.

This LCD monitor is designed to work via E-blocks. There is only a 9-way D-type connector and a 2-line, 16-character alphanumeric LCD display. The majority of E-Block input/output interfaces can now be used with this device. Serial info is required by the LCD display and is covered in the user manual that follows. The display needs a 5V power supply. If the supply is given more than 5V, it will damage the entire device, desired output will not appear. The E-blocks Multi coder or a 5V set regulated power supply are the best sources of 5V.

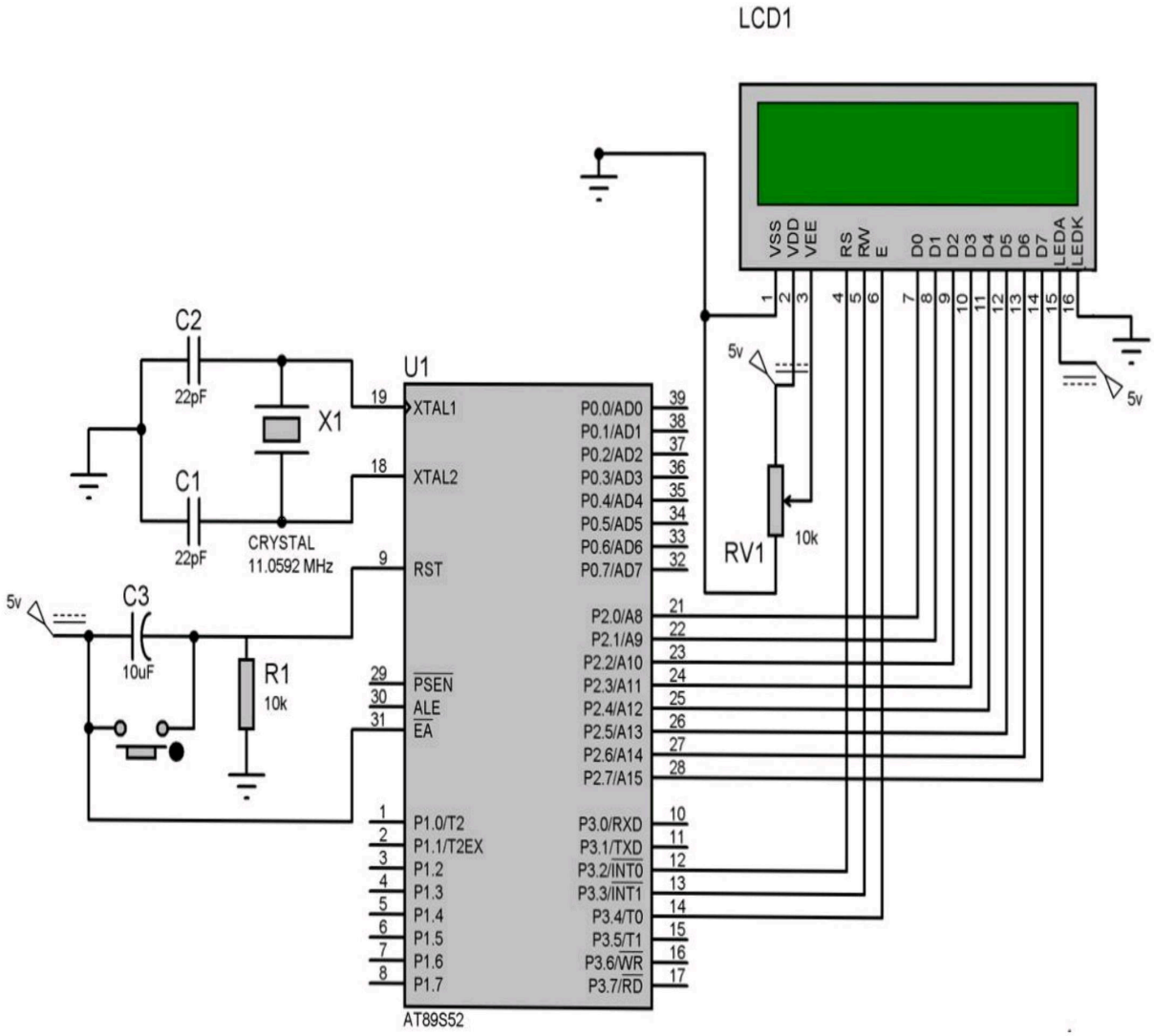


Figure 4.8: LCD Microcontroller Hardware circuit Diagram

4.4.4 Keypad

A keypad is a collection of keys organized in a block or pad to perform a particular function. It has 5 buttons that are organized in a matrix configuration. The microcontroller's vibrations are used to swap letters on a keypad. Pull-down resistors should be positioned on the microcontroller's input ports to define the logic state when no button is pushed in order for the keypad to function correctly. It is decided which button is pushed by combining zeros and ones on the output pins. Switching does not require a different power source. The keyboard can be used to alternate between multiple inputs.

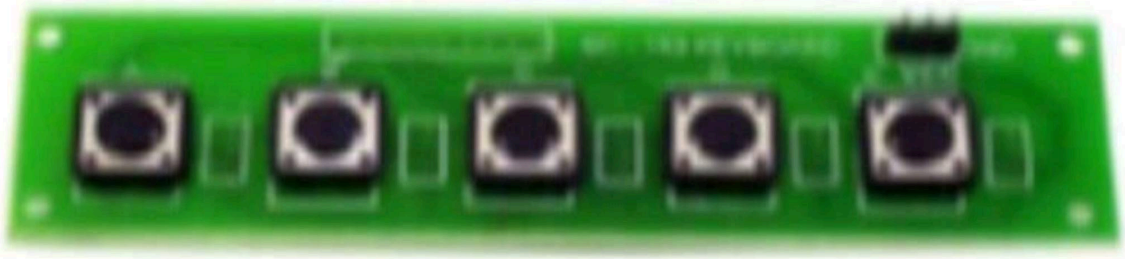


Figure 4.9: Keypad-Reply Device

4.4.5 Braille Pad

The person using the Braille Pad can read the braille language. Each and every text from the message is shown with the spinning of pin according to the Braille alphabets, where the users can touch and feel each letter and easily they can identify the text message. The vibration of spinning is very low, whereas there is no discomfort for the user to use.

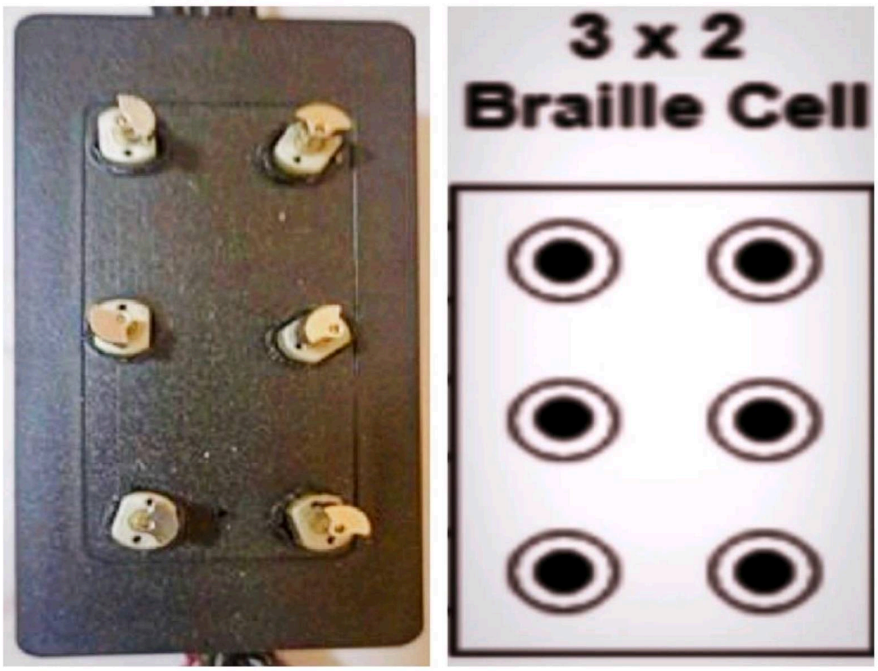


Figure 4.10: 3x2 Braille Pad arrangement

CHAPTER 5

RESULT AND DISCUSSION

5.1 OPEN SOURCE SOFTWARE RESULTS

These are the Open Source Soft wares available for converting text into braille

i. Braille Blaster

ii. The Duxbury Braille Translator

iii. Euler

iv. Braille2000

v. Change Alphabet

vi. Braille Converter

5.1.1 Braille Blaster – Open Source Software

- It is one of the free Open source software to convert text into Braille.
- It even converts Mathematical symbols to Braille.
- It also supports various languages to convert to Braille.

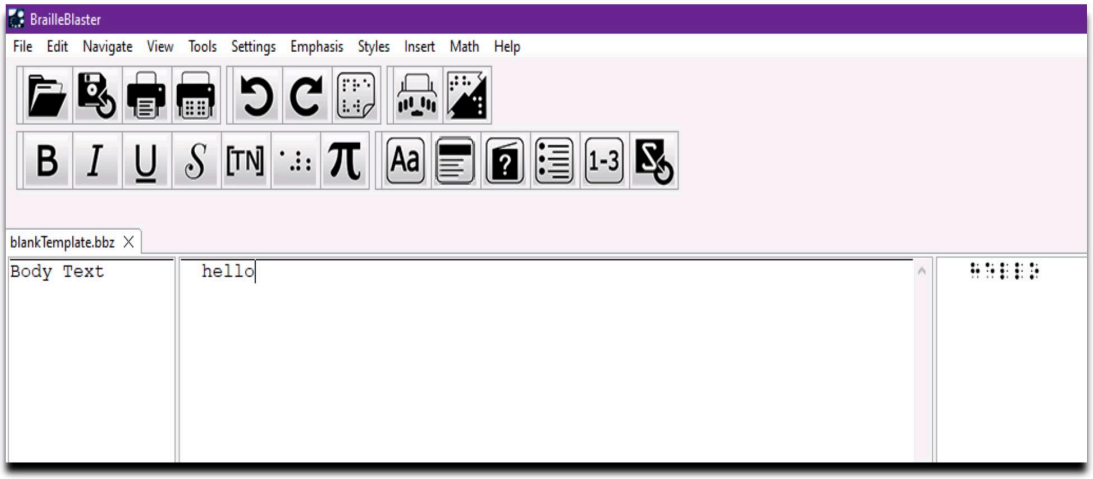


Figure 5.1: Open source software – Word conversion to Braille alphabets

5.1.2 Symbols Conversion

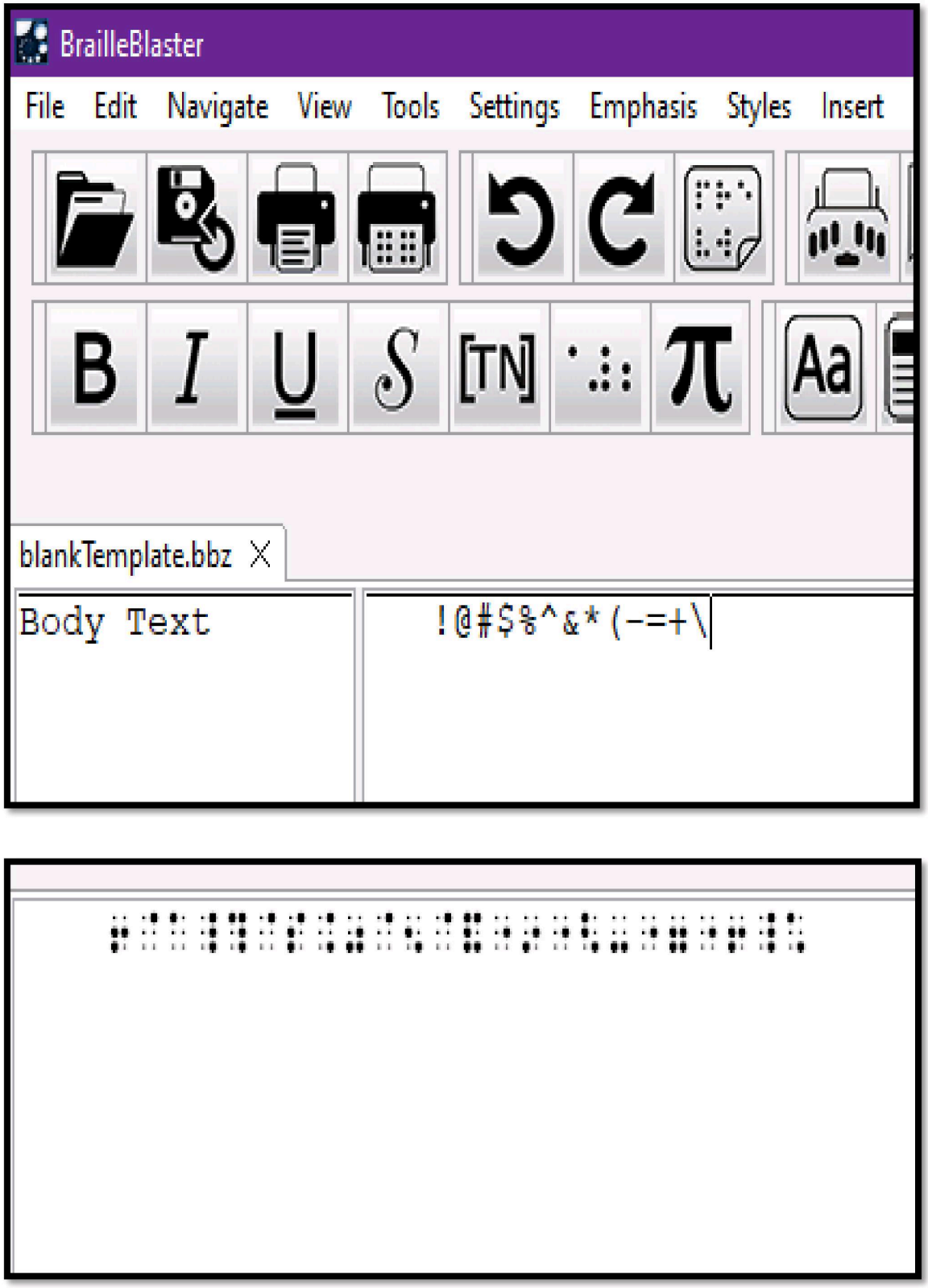


Figure 5.2: Open source Software – Special characters conversion to Braille

5.2 HARDWARE RESULTS

It has a special keyboard (Braille pad), that converts the message into required Braille text. Using this Braille system both reading and replying to the message is possible for visually challenged people. Using Braille technology, blind people can access message applications on mobiles as normal people. Braille is read by passing the fingers over characters designed as an arrangement of one to six embossed points.

Here instead we are having the Braille pad raised with six dots in a 3 x 2 matrix. These six raised dots which correspond to the letters of the Braille alphabet. The six-dot system helps to recognize alphabets or letters by passing fingertips to sense all the dots at once. When the power supply is turned on the user can start receiving messages. The text message is displayed one by one in the LCD display simultaneously, we receive those text in the Braille pad within a particular interval of time, and each text will be identified by the user with help of the rotation of each pin of the required Braille alphabet.

With the help of relay motors the working of the Braille pad occurs. Here GSM plays a major role where the user's sim card is placed and activated. With the help of GSM, the user receives the message.

Here comes the major implementation (I.e.) the replay message. The keypad has five certain reply messages that the user can send as a reply. By replying to the helping person, they can view the current need of the user over a long distance. This system helps blind people, who can access the message application on mobile as normal people.

TABLE 5.1: TEXT TO BRAILLE CONVERSION PROCESS USING HARDWARE SETUP

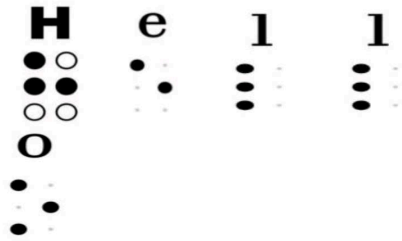
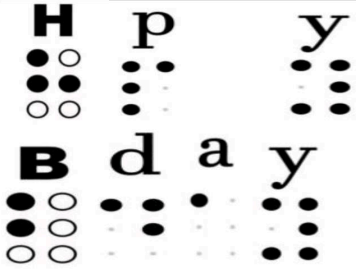
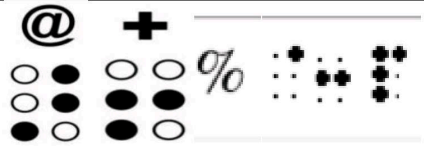
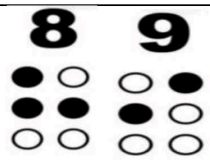
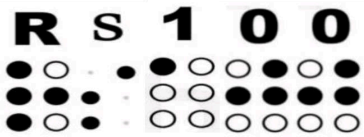
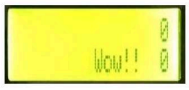
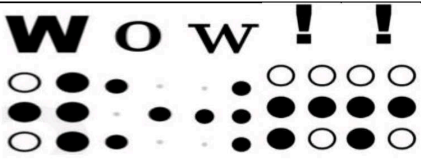
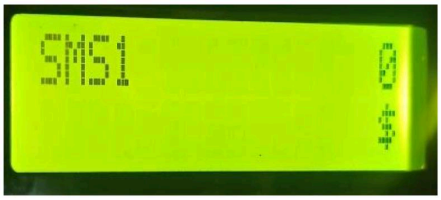
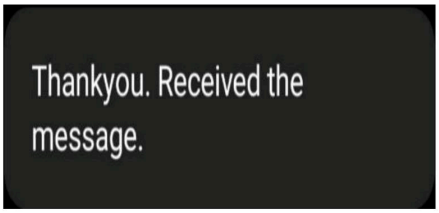
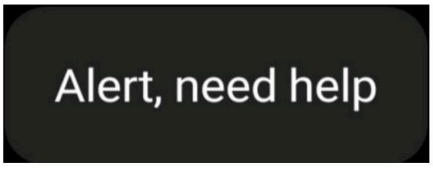
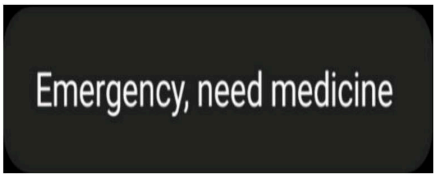
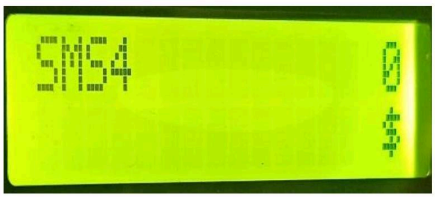
Description	Message sent from mobile to GSM module	Message displayed on LCD from the GSM module	Braille pad output in the hardware kit
Single word	*Hello!#		
Group of words	*Hpy bday#		
Special characters	*@+%#		
Numbers	*89#		
Combination of words and Numbers	*Rs 100#		
Combination of words and special characters	*Wow!!#		

TABLE 5.2: STANDARD OUTPUT REPLY MESSAGE SEND TO MOBILE PHONE

KEYPAD BUTTON	LCD DISPLAY	RETURN MESSAGE SENT TO CORRESPONDING MOBILE
A - SMS1		
B - SMS2		
C - SMS3		
D - SMS4		
E - SMS5		

CHAPTER 6

SUMMARY OF CONCLUSION

6.1 SUMMARY

Communication plays a vital role in expressing one's feelings to another. The Text to Braille conversion system is specially designed for the Visually challenged community to connect, communicate and socialize without vision. The Text to Braille Conversion System is extremely making this conversion system translator or a converter that takes alphabets from a keyboard or a keypad and then converts the letters into braille language one by one with the help of servo motors that have metallic rods that rotate at certain angles when a particular alphabet is sent into the conversion system. This product is an attempt at bridging the communication gap between those who are visually impaired and those with vision. Using this, someone can communicate with the blind people without requiring knowledge of braille scripture themselves. With the help of this project, it is possible to employ someone who is visually impaired to do basic tasks by giving instructions through the text to Braille Conversion system which can then be read by someone knows the braille language. This product uses basic electronic components, simple microcontroller technology and knowledge of C programming to solve a socially relevant problem. This Text to Braille Conversion System can be used by people and serves the possibility of increasing and improving employment as well as higher education prospects.

6.2 SCOPE FOR THE FUTURE WORK

It is certainly the language that makes communication unique, but the modes of communication have always been uniform, cutting across geographical boundaries or cultures. Being a national or regional language of a specific nation, they have unique and unusual ways of communicating the same language through different characterizations. Morse code has been one such example – initially developed and used as a means of communication for the first commercial telegraph but later popularly known to be used in World. Such so is Braille a tactile literacy system of communication for the visually impaired or legally blind used in education and

workplaces. The scope of the text to Braille converter communication device is to provide a means of communication for visually and hearing-impaired individuals. The device can be used in a variety of settings, including educational institutions, workplaces, and social environments. It can also be used for personal communication, such as sending and receiving text messages or emails. The device can be customized to meet the needs of different users, including those with varying degrees of visual and hearing impairments. For example, the Braille display can be adjusted for different sizes and fonts, and the audio output can be adjusted for volume and clarity. The device can also be used in conjunction with other assistive technologies, such as screen readers or hearing aids, to provide a more comprehensive communication solution. Additionally, the device can be integrated with other devices, such as smartphones or computers, to provide access to a wider range of text input sources. Overall, the scope of the text to Braille converter communication device is to improve the accessibility and quality of communication for visually and hearing-impaired individuals, allowing them to more fully participate in social, educational, and professional environments.

REFERENCE

1. Ab Wahab, Mohd Nadhir, Ahmad Sufril Azlan Mohamed, Abdul Syafiq Abdull Sukor, and Ong Chia Teng. "Text reader for a visually impaired person." In Journal of Physics: Conference Series, vol. 1755, no. 1, p. 012055. IOP Publishing, 2021.
2. Angdresey, Apriandy, Ivana Valentine Masala, Vivie Deyby Kumenap, Michael George Sumampouw, Kristian Alex Dame, and Ivan Daniel Reynaldo Riady. "A Communication Assistant Application for the Deaf." In 2021 Sixth International Conference on Informatics and Computing (ICIC), pp. 1-6. IEEE, 2021.
3. Anuradha, PG, and K. Devibalan. "A Low-Cost Portable Communication Device for The Deafblind." *International Journal of Industrial Electronics and Electrical Engineering, Special* 2016 (2016): 22-25.
4. Arbes, L. A. D., J. M. J. Baybay, J. E. E. Turingan, and M. J. C. Samonte. "Tagalog text-to-braille translator tactile storyboard with 3D printing." In IOP Conference Series: Materials Science and Engineering, vol. 482, no. 1, p. 012023. IOP Publishing, 2019.
5. Cruz, Joshua L. Dela, Jonaida Angela D. Ebreo, Reniel Allan John P. Inovejas, Angelica Romaine C. Medrano, and Argel A. Bandala. "Development of a text to braille interpreter for printed documents through optical image processing." In 2017IEEE 9th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM), pp. 1-6. IEEE, 2017.
6. Hemanth, A. V., K. Sai Bharadwaj, V. Prasanthi, M. E. Harikumar, and J. Rolant Gini. "Arduino and solenoid valve-based text to braille converter." In *2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT)*, pp. 478-483. IEEE, 2020.
7. Kishore, K. Krishna, G. Prudhvi, and M. Naveen. "Braille script to voice conversion." In *2017 International Conference on Computing Methodologies and Communication (ICCMC)*, pp. 1080-1082. IEEE, 2017.

8. Nivash, S., and E. N. Ganesh. "Implementation of TTS with tactile mobile based assistive device for visually impaired people." Materials Today: Proceedings (2021).
9. Ramachandran, Sruthi, D. Gururaj, K. N. Pallavi, and Niju Rajan. "Text to Braille Converting Communication Device for the Visual and Hearing-impaired Persons." In *2021 International Conference on Computer Communication and Informatics (ICCCI)*, pp. 1-5. IEEE, 2021.
10. Sarkar, Ruman, and Smita Das. "Analysis of different braille devices for implementing a cost-effective and portable braille system for the visually impaired people." *International Journal of Computer Applications* 60, no. 9 (2012).
11. Saxena, Arunima, Dharuv Verma, Jatin Pathak, and Raghavendra Kumar Singh. "A Device for Automatic Conversion of Speech to Text and Braille for Visually and HearingiImpaired Persons." In *2022 8th International Conference on Signal Processing and Communication (ICSC)*, pp. 560-564. IEEE, 2022.Shylaja, R, R. L. Prasanna, M. Madhavi, and K. U. Rani, “Text to Braille Converter,” vol. 7, no. 5, pp. 6–9, 2018.

APPENDIX

CODING FOR THE MICROCONTROLLER

```
# include<htc.h>#include "lcd16.h"
void delay2()
 {
 long i;
 for (i=0; i<50000; i++);
CLRWDT ();
 }

void delay3()
 {
 long i;
 for (i=0; i<10000; i++);
CLRWDT ();
 }
void Delay ()
{
     long i;
     for (i=0; i<5000; i++)
   {



  }
```

```
}


void txs (unsigned char val)
{
int i, c=0;
while (! TXIF)
 {

 }
OERR=0;
TXREG=val;
}

unsigned char rxs(void)
{
int c=0;
while (! RCIF)
 {
   c++;
    if(c>5000)
     break;

 }
return RCREG;
}
```

```
/* Sample code to set up the A2D module */
void init_a2d(void) {
 ADCON0=0; // select Fosc/2
 ADCON1=2; // select left justify result. A/D port configuration 0
 ADON=1; // turn on the A2D conversion module
}

/* Return an 8-bit result */
unsigned char read_a2d (unsigned char channel) {
 channel&=0x07; // truncate channel to 3 bits
 ADCON0&=0xC5; // clear current channel selects
 ADCON0|=(channel<<3); // apply the new channel select
 Delay ();
 GO=1; // initiate conversion on the selected channel
 while (GO)continue;
 return (ADRESH); // return 8 MSB of the result
}
unsigned char val1[96], val2[96], j=0;
unsigned char k, l, st, so, fl;
static void interrupt isr(void) // Here be interrupt function - the name is
{
 if (RCIF) // Was this a timer overflow?
  {
  if(k<94)
  {
  val1[k]=RCREG;
```

```
  if(val1[k]=='*')
   fl=1;
  if(val1[k]=='#')
   k=94;
  if(fl==1)
   {
   if(k<95)
   k++;
   }
  }
  else
  {
  RCIE=0;
  }
  RCIF = 0; // Clear interrupt flag, ready for next
  OERR=0;
  CREN=0;
  CREN=1;
  }

}
int ll;
unsigned char val3;

long op, o;
unsigned char rval1, rval2, rval3, rval4, oc1, oc2;
```

```
//9940412816
void sms1()
 {
      txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
   txs('S'); txs ('=');
  txs ('"');
   txs ('9'); txs ('9'); txs ('4'); txs ('0');
   txs ('4'); txs ('1'); txs ('2'); txs ('8'); txs ('1'); txs ('6');
  txs ('"');
   txs (13); txs (10);
 delay2();

txs('T');txs('h');txs('a');txs('n');txs('k');txs('y');txs('o');txs('u');txs('.');txs('R');txs(‘e’);txs(‘c’)
;txs(‘e’);txs(‘i’);txs(‘v’);txs(‘e’);txs(‘d’);txs('');txs(‘t’);txs(‘h’);txs(‘e’);txs(‘
');txs(‘m’);txs(‘e’);txs(‘s’);txs(‘s’);txs(‘a’);txs(‘g’);txs(‘e’);txs(‘.’);
   txs (13); txs (10); delay (10000);
   txs (26);
 }


void sms2()
 {
      txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
   txs('S'); txs ('=');
  txs ('"');
   txs ('9'); txs ('9'); txs ('4'); txs ('0');
   txs ('4'); txs ('1'); txs ('2'); txs ('8'); txs ('1'); txs ('6');
```

```
 txs ('"');

  txs (13); txs (10);

 delay2();

  txs(‘A’); txs(‘l’); txs(‘e’); txs(‘r’); txs(‘t’); txs (‘,’); txs’’ (‘’); txs('n’); txs('e’); txs('e’);
txs('d’); txs (‘’); txs('h’); txs('e’); txs('l’); txs('p’);

  txs (13); txs (10); delay (10000);

  txs (26);

 }


void sms3()

 {

     txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');

  txs('S'); txs ('=');

 txs ('"');

  txs ('9'); txs ('9'); txs ('4'); txs ('0');

  txs ('4'); txs ('1'); txs ('2'); txs ('8'); txs ('1'); txs ('6');


 txs ('"');

  txs (13); txs (10);

 delay2();

  txs('E');txs('m');txs('e');txs('r');txs('g’);txs('e’);txs('n’);txs('c’);txs('y’);txs(', ’);txs('
’);txs('n’);txs(‘e’);txs(‘e’);txs(‘d’);txs(‘ ’);txs('m');txs('e'); txs('d');txs('i');
txs('c');txs('i');txs('n'); txs('e');

  txs (13); txs (10); delay (10000);

  txs (26);

 }


void sms4()
```

```
{
    txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
  txs('S'); txs ('=');
 txs ("");
  txs ('9'); txs ('9'); txs ('4'); txs ('0');
  txs ('4'); txs ('1'); txs ('2'); txs ('8'); txs ('1'); txs ('6');

 txs ("");
  txs (13); txs (10);
delay2();
  txs('I'); txs (' '); txs('a'); txs('m'); txs (' '); txs('i'); txs('n'); txs (' '); txs('a'); txs (' ');
txs('m'); txs('e'); txs('e'); txs('t'); txs('i'); txs('n'); txs('g'); txs ('. '); txs (' '); txs('C');
txs('a'); txs('l'); txs('l'); txs (' '); txs('u'); txs (' '); txs('l'); txs('a'); txs('t'); txs('e'); txs('r'); txs
('. ');
  txs (13); txs (10); delay (10000);
  txs (26);
}

void sms5()
{
    txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
  txs('S'); txs ('=');
 txs ("");
  txs ('9'); txs ('9'); txs ('4'); txs ('0');
  txs ('4'); txs ('1'); txs ('2'); txs ('8'); txs ('1'); txs ('6');
 txs ("");
  txs (13); txs (10);
delay2();
```

```
    txs('R'); txs('e'); txs('c'); txs('h'); txs('a');
    txs('r'); txs('g'); txs('e');
   txs (13); txs (10); delay (10000);
   txs (26);
 }
char o1, o2, o3, o4, o5;
long op, o;
unsigned char rval1, rval2, rval3, rval4, oc1, oc2;
void main () //Main entry
{
label:
 PSA=1;
 PS0=1;
 PS1=1;
 PS2=1;

 CMCON=0x07;
 RCSTA=0x90; // receive enabling with the same speed
 TXSTA =(0x24); // High speed selection baud rate 9600
 SPBRG = 64;
 ADCON1=0x09;
 ADCON0=0xC1;
 CVRCON=0x00;
 TRISD=0x00;
 TRISE=0x00;
 Lcdinit ();
 init_a2d ();
```

```
 GIE=1;
 PEIE=1;
 TRISB=0xFF;
 nRBPU=0;
 TRISC0=0;
 TRISC1=0;
 TRISC2=0;
 TRISC3=0;
 TRISC4=0;
 TRISC5=0;
RC0=0;
RC1=0;
RC2=0;
RC3=0;
RC4=0;
RC5=0;
int x, d1=2;
   Lcdcmd(0xCF);
   lcddata ('#');
 txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
 txs('F'); txs ('='); txs ('1'); txs (13); txs (10);
delay3();
 txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
 txs('D'); txs ('='); txs ('1'); txs (','); txs ('4'); txs (13); txs (10);
   delay3(); delay3(); delay3(); delay3();
   Lcdcmd(0xCF);
   lcddata ('$');
```

```
RCIE=1;
while (1)
{
if (RB0==0)
 {
  Lcdcmd(0x80);
  lcddisp ("SMS1                ");
  sms1();
 }
if (RB1==0)
 {
  Lcdcmd(0x80);
  lcddisp ("SMS2                ");
  sms2();
 }
if (RB2==0)
 {
  Lcdcmd(0x80);
  lcddisp ("SMS3                ");
  sms3();
 }
if (RB3==0)
 {
  Lcdcmd(0x80);
  lcddisp ("SMS4                ");
  sms4();
 }
```

```
 if (RB4==0)
  {
   Lcdcmd(0x80);
   lcddisp ("SMS5                    ");
   sms5();
  }
Lcdcmd(0x8f);
lcddata(fl+0x30);
  txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
  txs('R'); txs ('='); txs ('1'); txs (13); txs (10);
 d1=2;
 delay3();
 CLR WDT ();
 if(k>=90)
   {
   RCIE=0;
   for (l=0; l<90; l++)
   {
   if(val1[l]=='*')
    {
    st=l;
    }
   if(val1[l]=='#')
    {
    so=l;
    break;
    }
```

```
  }
  if(so>0)
  {
  Lcdcmd(0xc8);
  for (l=1; l<so; l++)
   {
 lcddata(val1[l]);
delay2();
 if(val1[l]=='A')
    {
 d1=5;
 PORTC=0x01;
 delay2();
 PORTC=0;
 delay2();
    }
 if(val1[l]=='B')
    {
 d1=5;
 PORTC=0x05;
 delay2();
 PORTC=0;
 delay2();
    }
 if(val1[l]=='C')
    {
 d1=5;
```

```
PORTC=0x03;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='D')
    {
d1=5;
PORTC=0x0A;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='E')
    {
d1=5;
PORTC=0x09;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='F')
    {
d1=5;
PORTC=0x07;
delay2();
PORTC=0;
```

```
delay2();
    }
 if(val1[l]=='G')
    {
d1=5;
PORTC=0x0F;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='H')
    {
d1=5;
PORTC=0x0D;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='I')
    {
d1=5;
PORTC=0x09;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='J')
```

```
    {
d1=5;
PORTC=0x6;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='K')
    {
d1=5;
PORTC=0x0E;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='L')
    {
d1=5;
PORTC=0x15;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='M')
    {
d1=5;
PORTC=0x13;
```

```
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='N')
    {
d1=5;
PORTC=0x1B;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='O')
    {
d1=5;
PORTC=0x19;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='P')
    {
d1=5;
PORTC=0x17;
delay2();
PORTC=0;
delay2();
```

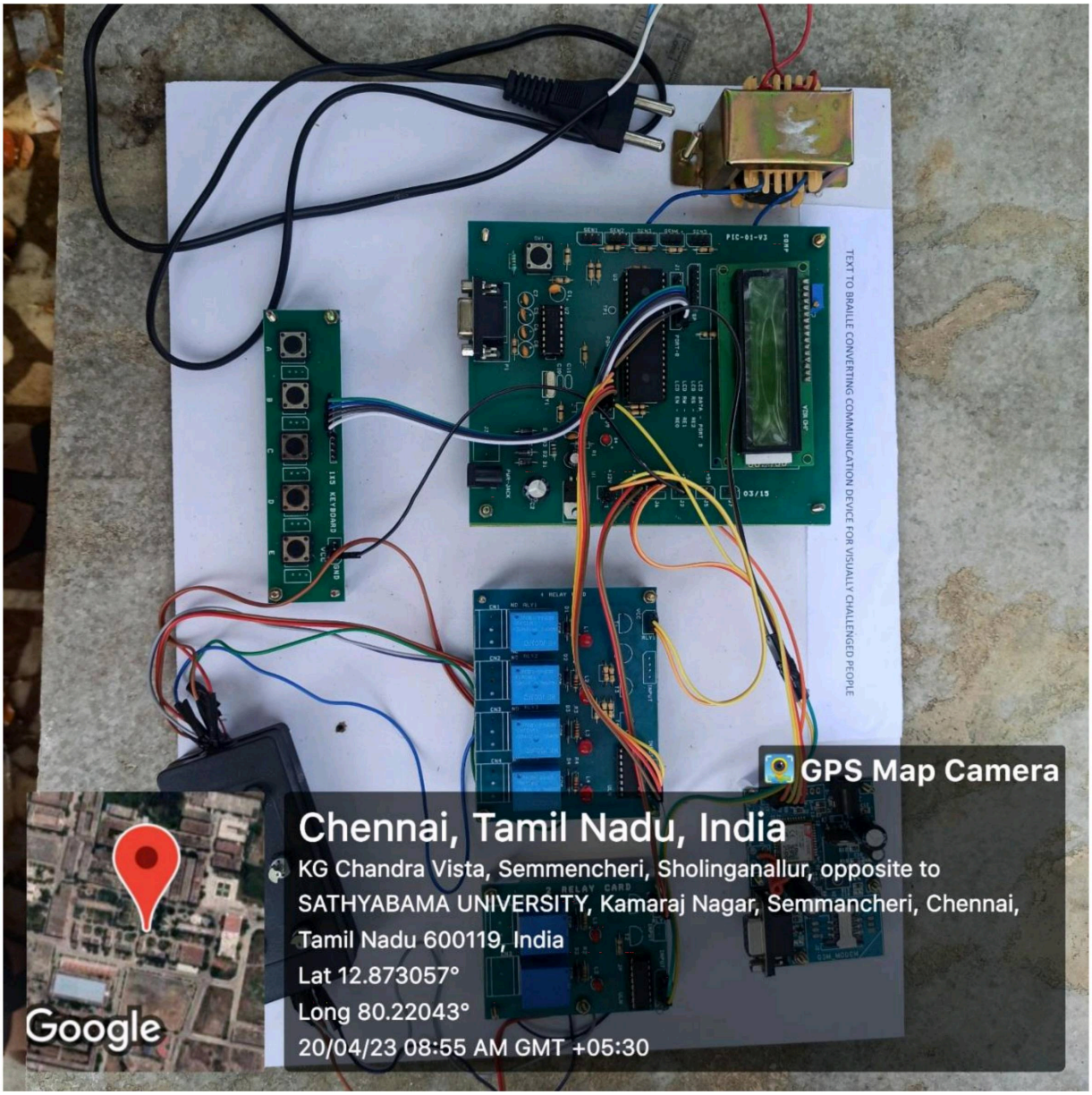
```
    }
 if(val1[l]=='Q')
    {
d1=5;
PORTC=0x1F;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='R')
    {
d1=5;
PORTC=0x1D;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='S')
    {
d1=5;
PORTC=0x16;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='T')
    {
```

```
d1=5;
PORTC=0x1E;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='U')
    {
d1=5;
PORTC=0x31;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='V')
    {
d1=5;
PORTC=0x35;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='W')
    {
d1=5;
PORTC=0x3E;
delay2();
```

```
PORTC=0;
delay2();
    }
 if(val1[l]=='X')
    {
d1=5;
PORTC=0x33;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='Y')
    {
d1=5;
PORTC=0x3B;
delay2();
PORTC=0;
delay2();
    }
 if(val1[l]=='Z')
    {
d1=5;
PORTC=0x39;
delay2();
PORTC=0;
delay2();
    }
```

```
}
   Lcdcmd(0xCF);
   lcddata(st+0x30);
   Lcdcmd(0x8F);
   lcddata(so+0x30);
   txs('A'); txs('T'); txs ('+'); txs('C'); txs('M'); txs('G');
   txs('D'); txs ('='); txs ('1'); txs (','); txs ('4'); txs (13); txs (10);
   delay2(); delay2(); delay2(); delay2();
   }
     k=0;
     fl=0;
     RCIF=0;
     OERR=0;
     RCIF=0;
     OERR=0;
     CREN=0;
     CREN=1;
     RCIE=1;
   }
 }
}
```

HARDWARE GEO TAGGED IMAGE



6th International Conference on Inventive Computation Technologies
26-28, April 2023 | ICICT 2023 | Lalitpur, Nepal
http://icicts.com/2023/ icict.conf@gmail.com

LETTER OF ACCEPTANCE

Manuscript ID : **ICICT963**

Manuscript Title: Communication Device for Converting Text to Braille language for Visually Impaired People

Author/s: M.Kavith,V. Meenakshi, M.Pushpavalli, Amudha S, Bharathi S, Pavithra P, Department of Electrical and Electronics Engineering, Sathyabama Institute of Science and Technology, Chennai, India

Dear Author/s,

Greetings from Tribhuvan University!

International Conference on Inventive Computation Technologies (ICICT 2023) would like to congratulate you on the acceptance of your research manuscript to the International Conference ICICT-2023 which will be held on **26-28, April 2023** at Tribhuvan University, Nepal. You have been selected to deliver a presentation on your research work at ICICT 2023 conference. ICICT is the International IEEE recognized conference, where all the Manuscripts included in the ICICT 2023 proceedings will be submitted for inclusion into IEEE Xplore. In this regard, ICICT welcomes the wide range of research experts, academicians and industrialists, to present and deliver potential research insights to the young research minds.

In this regard, we appreciate if you could send the final Manuscript, copyright form and other necessary documents to the conference at the earliest, to ensure a timely publication of your research Manuscript. When submitting your final Manuscript, please highlight the changes made to the research Manuscript according to the specified reviewer comments.

Yours' Sincerely

Prof. Dr. Subarna Shakya
Conference Chair - ICICT 2023

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Technical Comments

Manuscript Title: **Communication Device for Converting Text to Braille language for Visually Impaired People**

Review Comments-1:

1. Communication device for converting text to braille language for visually impaired people is the proposed title of this paper.

2. Selection of microcontroller should be justified by the author

3. How to improve the performance?

4. How serial data transfer take place?

5. In what way high accuracy is achieved?

6. Role of braille driver needed more clarity

7. Literary style of the paper should be improved.

8. Paper should be prepared as per template prescribed.

9. Figures are of poor resolution and clarity.

10. Provide source image citation for figure 1 and 2.

Review Comments-2:

There are adjustments for the authors have to be considered:

1.The authors should clearly mention the challenges in the abstract. Mention a few recent techniques and highlight what are the challenges faced by the systems and then present the proposed objective. Objectives and challenges are quite different from each other.

2. Literature analysis is presented well. However, it should be revised by discussing the feature merits and demerits of existing works.

3.Measure the performance of the proposed model with various parameters and discuss the observations in detail.

4. A comparative analysis of the proposed model and existing techniques can be included for better validation.

5. Experimental section needs detailed explanation for the results obtained.

6. Grammar errors should be taken care throughout the manuscript.

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Conference Chair - ICICT 2023