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RESEARCH ARTICLE OPEN ACCESS

The Braille Communicative Band for Blind Deaf and Dumb People

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ABSTRACT
In this fast developing world which is tending more towards the use of digital communication the visually, audibly and vocally impaired people find it really difficult to cope up with the pace of it. Considering these people, we have developed a communicative band which will help them to interact with other people. This band includes push buttons and vibration motors for communication. It allows the person to type characters representing the Braille combination using push buttons which is placed on the ventral side of the band which also allows the person to read the incoming message using the vibration motors which we have placed on the dorsal side of the band. This band also has voice recognition using API.

Keywords – Braille communication, communicative band, Digital communication, Push buttons, vibrating motors.

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I. INTRODUCTION

According to world health organization, concerning 285 million individuals wherever visually impaired individuals, 466 million individuals have hearing impairment and one million individual's square measure voiceless. Concerning 9 thousand million individual within the world the world square measure deaf and dumb. They need their own manual-visual languages popularly referred to as language. The blind individuals have ability to reading one hundred fifty words per minute. Deaf, blind and mute individuals usually referred to as deaf, blind and mute individual referred to as deaf blind use tactile language 0.2% is deaf-blind within the worldwide fully blind population is calculate to be forty to forty five million and nearly one hundred thirty five million square measure calculate to own low vision. Whereas handicap and sightless due to infections have significantly reduced with the speedy progress of health care services, there's a notable increase in blind and visually impaired over sixty five years older due to long expectancy.

Unfortunately, the blind population is anticipated to double by 2020. Sight is the main human sense which posses the main influence on perception of all sensations, together with alternative senses like hearing. Therefore, the lack of sight is the greatest challenge the blind face in performing their daily tasks such as navigation, information access, interpersonal interactions and safety. Hence, the blind are jobless and deprived of the privilege of education under normal circumstances.

Approximately 75% of the blind are jobless while only 10% of the blind children receive special Braille education. In the context of the modern society a blind person and his/her family faces many socio-demographic problems. Consequently, the requirement for the helpful technologies that change the blind to measure freelance, productive and higher lives emerged as finance on nursing homes, blind welfare, healthcare and blind care specialist were

looked as if it would be pricey and unsustainable solutions.

1.1 BRAILLE SYSTEM

Braille may be a system developed by Louis Braille in the19th century to allow the blind to browse and write. Louis Braille was impressed by this method and in turn then visited produce a changed code to form easier to use. Louis took many a lot of years to make a system that was appropriate to include all the letters of the French language. Eventually the Braille system has become widespread with the support of a bunch United Nations agency was to become the Royal National Institute for the Blind. Braille code may be a piece of writing using a series of raised dots to be browse with the fingers by individuals blind or whose seeing is not spare for reading written material. The standards describe regarding the characteristics of the Braille code and conjointly the most options square measure in short summarizes.

Braille code operates the sixty- four code characters within the middle of thirty two and ninety five inclusive. All capital letters in code communicate to their equivalent values in unconstructed English Braille. These characters have rectangular blocks called cells that have tiny bumps called raised dots. The number and arrangement of these dots distinguish one character from another. Since the various Braille alphabets originated as transcription codes for printed writing, the mappings (sets of character designations) vary from language to language, and even within one; in English Braille there are three levels of encoding: Grade 1 – a letter-by-letter transcription used for basic literacy; Grade 2 – an addition of abbreviations and contractions; and Grade 3 – various non-standardized personal stenography.

II. DESCRIPTION OF SYSTEM

We are developed the Braille band to communicative band for blind deaf and dumb people. The proposed system is able to send and received the message that is transmitting part and receiving part. This system is mainly includes Arduino micro R3, Bluetooth module, push buttons and vibrating motors.

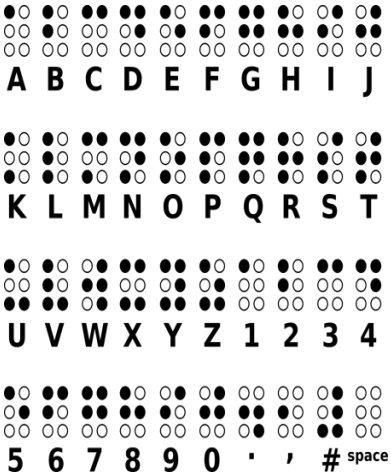


Figure 1. Braille Alphabets

Braille cells aren't the sole factor to look in Braille text. There could also be decorated illustrations and graphs, with the lines either solid or manufactured from series of dots, arrows, bullets that are larger than Braille dots, etc. A full Braille cell includes six raised dots organized in 2 columns, every column having 3 dots. The dot positions are known by numbers from one to 6. There are sixty four doable combos, together with no dots in any respect for a word area. However, within the face of changes in education policy and screen reader software package, Braille usage has declined in recent decades, despite the vary fact that technologies like Braille displays have conjointly created Braille additional accessible and sensible. Braille characters square measure a lot of larger than their written equivalents, and therefore the normal eleven by 11.5"(28 cm * thirty cm) page has space for less than twenty five lines of forty three characters. To cut back area and increase reading speed, most Braille alphabets and orthographies use ligatures, abbreviations, and contraction. Nearly all English Braille books square measure transcribed during this shrunk Braille that adds an extra layer of complexness to English orthography: the library of congress's guide for Braille transcribing runs to over three hundred pages and Braille transcribing should pass certification tests. The system of contraction in English Braille begins with a group of twenty three words that square measure shrunk to single characters.

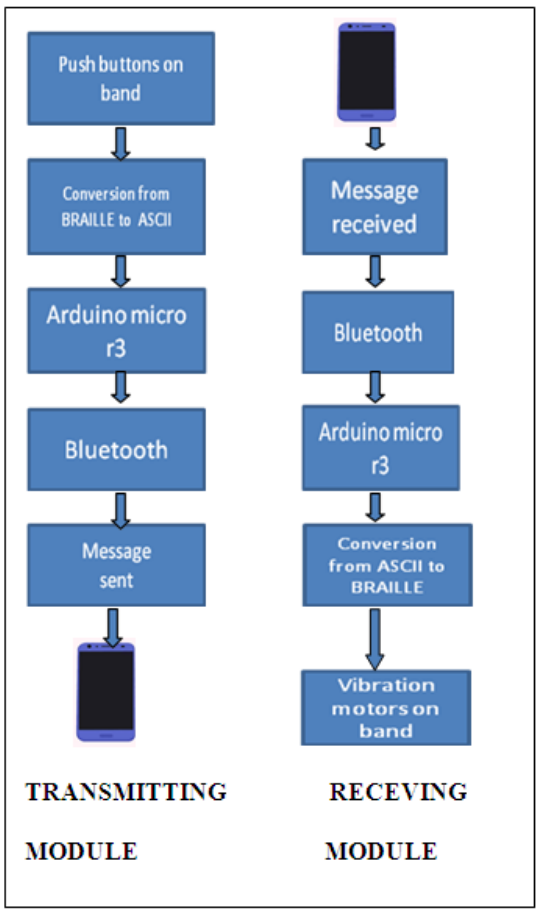


Figure 2. Block Diagram of system

2.1 Arduino Micro

The Arduino micro is also a microcontroller board supported the ATmega32u4. It's twenty digital input/output pins(of that seven is also used as PWM outputs and twelve as analog inputs), a sixteen Mc per second crystal oscillator, a little USB association, associate in nursing ICSP header and a better and a button. It contains everything needed to support the little controller; simply connect it to a portable computer with a small USB cable induces started. The little is analogues to the Arduino designer during this ATmega32U4 has intrinsic USB communication. Eliminating the need for a secondary processor this allows the little to look to a connected portable computer as a mouse and keyboard, to boot to a virtual (CDC) serial / (COM port. It to boot has totally different implications for the behavior of the board; unit detailed on the getting started page.

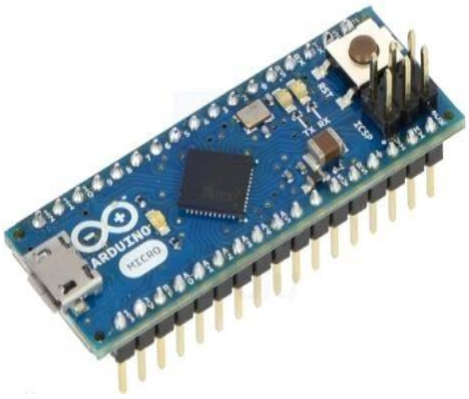


Figure 3. Ardiuno Micro R3

2.1 Bluetooth HC-05 Module

HC-05 Bluetooth Module is a simple to use Bluetooth SPP (Serial port protocol) module, designed for clear wireless serial affiliation setup. Its communication is via serial communication that makes simple thanks to interface with controller or laptop. It uses the two .45GHz wavebands. The transfer rate of the info will vary up to 1Mbps and is in varying of ten meters. The HC-05 nodule are often operated inside 4-6V of power offer. It supports baud of 9600, 19200, 38400, 57600, etc. the HC-05 has 2 in operation modes, one is that the information mode during which it will send and receive information from alternative Bluetooth devices and also the alternative is that the AT Command mode wherever the default devices settings are often modified. It will operate the device in either of those 2 modes by mistreatment the key pin as explained within the pin describing. It's terribly simple to combine the HC-05 module with microcontroller as a result of it operates mistreatment the interface protocol (SPP). Merely power the module with +5V and connect the Rx pin of the module to the TX of MCU and TX pin of module to Rx of MCU.

Figure 4. Bluetooth Module

2.2 Power source (Rechargeable battery)

A rechargeable battery, galvanic battery or secondary cell, could be a style of electrical battery

which might be charged , discharged into a load, and recharged repeatedly, as hostile a disposable or primary battery that is provide totally charged and discharged when use. It's composed of 1 or additional chemical science cells. Reversible batteries area unit made in many various shapes and sizes, starting from buttons cells to power unit systems connected to stabilize associate electrical distribution. Recharging time is a crucial parameter to the user of a product battery-powered by reversible batteries. Although the charging power offer provides enough power to control the devices is hooked up to associate external power offer throughout the charging time. Reversible batteries generally initio value over disposable batteries, however have a far lower total value of possession and environment impact, as they will be recharged inexpensively repeadly before they have communication. Some reversible battery sorts area unit accessible within the same sizes and voltages as disposable sorts, and may be used interchangeably. Here, we tend to use 5V power reversible battery as inform of power bank.

2.3 VIBRATING MOTORS

The main part within the Braille band could be a vibrating motor. There are two types of varieties of motors i.e. coin (or flat) and cylinder (or bar).

Cylinder sort motors square measure easy brush motors with a conventional axial style. The centrically movement of the burden connected to the rotor provides vibrating throughout operation. However coin form of vibrator motors square measure best slot in the tip of the finger positions within the Braille band. Thus Braille band is built with coin sort motor. In coin sort motor the number of vibration is directly proportional to the voltage applied to the motor. Coin motors square measure factory-made in high volumes and square measure fairly cheap. Associate in nursing electrical current applied to the coil within the direction of the arrow generates upward force on the left aspect of the coil and downward forces on the proper aspect, inflicting the coil to revolve dextrorotary. The vibration motors that square measure to be mounted on every of the 5 fingers of the hand band additionally because the palm square measure just like the motors employed in pagers or cell phones that square measure simple to mount and have adhesive backing. These motors square measure ERM (Eccentric Rotating Mass) motors, i.e. a DC motor with associate in nursing offset (non-symmetric) mass connected to the shaft. Because the ERM rotates, the force of the offsets mass is uneven, leading to a web force that causes displacement of the motor. With a high range of revolutions are often controlled with the voltage offer.

Figure 5. Vibrating Motors

2.4 PUSH BUTTONS

A push button or just button is a easy switch mechanism to manage some side of a machine or a method. Buttons square measure usually created out of exhausting material, typically plastic or metal.

The surface is sometimes flat or formed to accommodate the human finger or hand, therefore on be simply depressed or pushed. Buttons square measure most frequently biased switches, though several un-biased buttons (due to their physical nature) still need a spring to come to their un-pushed state. We'd like six pushbuttons switches representing the six dots in Braille system, to put in writing a Braille message.

Figure 6. Push Buttons

III. SOFTWARE IMPLEMENATION

A. Software Tools

- Android Studio: used to build the Android application.
- Arduino IDE: used to program Arduino.

B. Used programming Languages

- C++ language is used to code the Arduino and JAVA for application development.

3.1 Arduino IDE

The Arduino Integrated Development atmosphere (IDE) may be a cross-platform application that's written in functions from C and

C++. It's wont to write and transfer programs to Arduino compatible boards, but also with the assistance of third –party cores, different vender development boards. The Arduino IDE employs the program argued to convert the practicable code into a document in position notation secret writing that's loaded into a document in positional notation secret writing that's loaded into the Arduino board by a loader program within the board's code. By default, argued is employed because the uploading tool to flash the user code onto official Arduino boards. Arduino IDE is open supply computer code Arduino IDE is open supply computer code that's in the main used for

Writing and collection the code into the Arduino Module. It's official Arduino computer code, creating code compilation too simple that even a typical person with no previous technical information will get their feet wet with the educational method. It simply accessible for operative systems like mackintosh, windows, and UNIX system and runs on the Java Platform that the knowledge within the type of code. The most code, additionally referred to as a sketch, created on the IDE platform can ultimately generate a Hex file that is then transferred and uploaded within the controller on the board. The IDE atmosphere in the main contains two basic parts: editor and complier wherever former is employed for writing the desired code and later is employed for collection and uploading the code into the given Arduino Module. The ASCII text file for the IDE is discharged below the wildebeest General Public License, version 2. The Arduino IDE supports the languages C and C++ victimization Special rules of code library from the Wiring project that provides several common input and output procedures. User written code solely needs two basic function, for beginning the sketch and also the main program loop, that square measure compiled associated joined with a program stub main() into an practicable cyclic programmed with the wildebeest tool chain, additional enclosed with the IDE distribution.

3.2 Braille app

Braille technology is helpful technology that permits blind or visually impaired folks to try and do common tasks like writing, browsing the web, writing i9n Braille and printing in text, participating in chat, downloading files, music, mistreatment electronic message, burning music, and reading documents. It additionally permits blind or visually impaired students to finish all assignments at school because the remainder of hawkeyed classmates and permits them take courses on line. It permits professionals to try and do their jobs and academics to lecture mistreatment hardware and software package applications. The advances of Braille technology area unit significant as result of blind folks will access a lot of texts, books and libraries and it additionally facilities the printing of Braille texts. Humanoid software package development is that the method by that applications area unit created for devices running the humanoid software package. Google states that "Android apps will be written mistreatment kotlin, Java, and C++ languages" mistreatment the humanoid software package

Development kit (SDK), whereas mistreatment different languages are additionally attainable. The official humanoid app distribution mechanism to finish users is Google Play; it additionally permits staged gradual app unfairness, still as distribution of pre-release app versions to testers. Here, we use this application for communication with them and other people also.

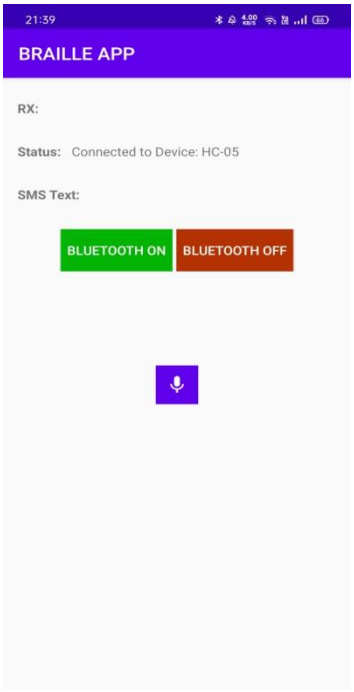


Figure 7. Braille APP

IV. PROPOSED WORK

4.1 TRANSMITTING MODULE

The block diagram is that of the transmitting module which is discussed in detail in the coming section. The main components used in the transmitting module are as follows:

- Six push buttons
- Arduino Micro R3
- Bluetooth module
- Android application (Braille app)
- Connecting wires

For the band to function as a transmitter, the dorsal side of the band is fixed with push buttons.

The numbering of the push buttons will be same as that of the motors (as shown in fig). The blind person will move that particular fingers together which will correspond to black dots of a letter. The push buttons will convert that movement to an electrical signal which will be sent as input to the Arduino Micro R3. The Arduino Micro R3 will convert the Braille input to English with the help of conversion code. The Arduino Micro R3 will also be connected to a Bluetooth will send the text message to the required contact. To make our methodology viable for not only receiving the message but also for transmitting the message, a transmitting module is also developed. The block diagram of the transmitting module is represented. The message generated is sent to the person at the receiving end using a Bluetooth Module already connected with the Arduino Micro R3. The person receives this message on his cell phone or tablet. Henceforth, message is transmitted successfully.

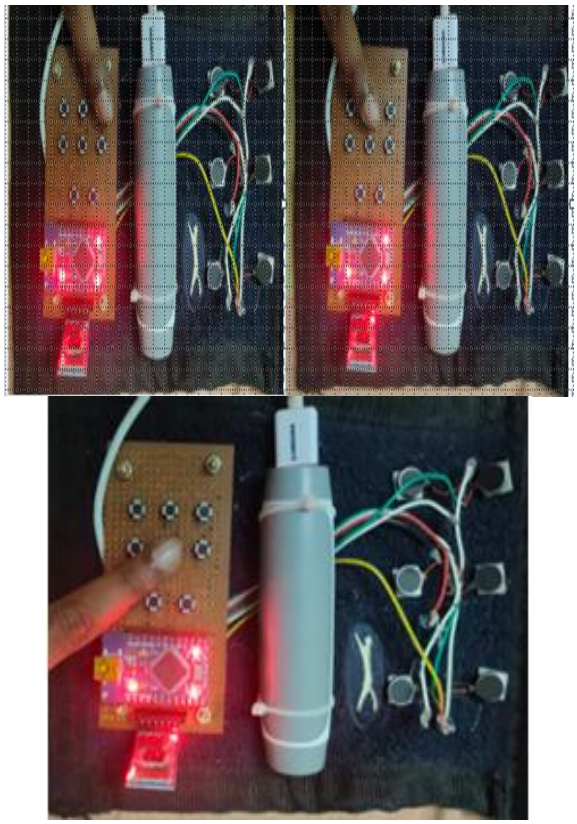


Figure 8. Transmitting part

These three images show the process of selecting the input data in accordance with the Braille code. For example, the word "HI" is used here. At first, the Braille input code of "H" letter is to be given by pressing push buttons with respect to Braille code (i.e. 1, 2, and 5).

4.2 RECEVING MODULE

The main components of the receiving module:

- Six vibration motors
- Arduino Micro R3
- Bluetooth
- Android application(Braille app)
- Connecting wires

For the band to function as a receiver, is fixed with a small sized coin vibration motors. These motors will receive the input from the Arduino Micro R3. Only those motors will vibrate simultaneously which will correspond to the black dots of the particular letter. And this will be possible with the help of a conversion code that will convert the English text message to Braille.

When the Arduino Micro R3 based systems are connected with the Bluetooth, it enables the user to control the system by sending or receiving messages. The advantage of using a Bluetooth module with a system or device is that the user can control the system wirelessly no matter how far it is kept compared to any other wireless communication, provided that both the user and the device should be in a cellular coverage area.

The mobile phones have built-in Bluetooth module which can be used by the processor inside the phone to make a call, send or receive message or even connect with the GPRS network. When it comes to a Arduino Micro R3 based system a separate GSM module is used rather than using a cell phone as such. There are Bluetooth modules available which can do serial communication with Arduino based systems. The communication is done by sending or receiving AT commands with the Bluetooth module.

The Arduino is referred to as a open source hardware and the Arduino IDE is also an open source and anybody can contribute their libraries to the Arduino. All Arduino boards are compatible with the

Arduino IDE which can be used to program the Arduino boards. Using this programming technique, code is written down in order to receive a text message.

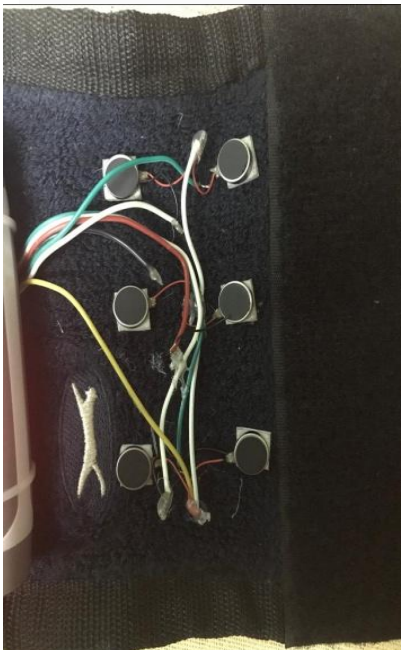
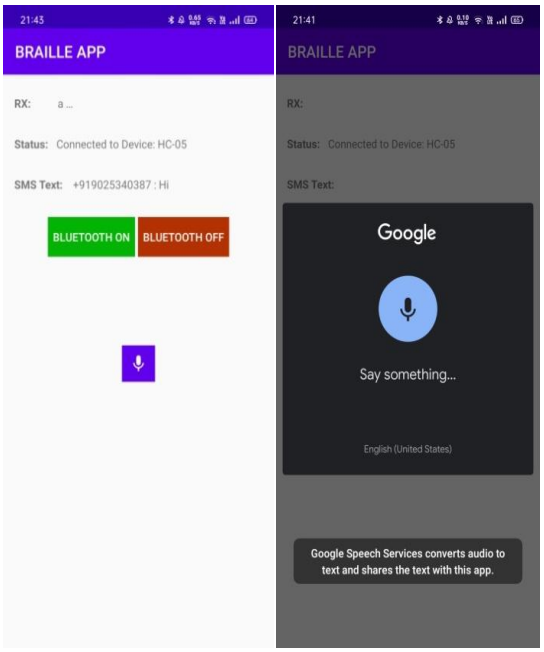


Figure 9. Receiving part by Message

These images describe the receiving process. Once the message is received from the third person, it is automatically displayed in the BRAILLE APP as the SMS Text. As a result, the vibration motors used in the receiving end starts vibrating with respect Braille language for received message.



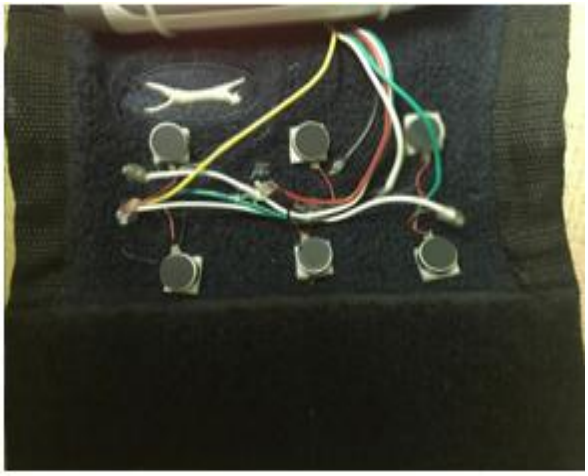


Figure 10. Receiving part by voice

4.3 MODE OF COMMUNICATION

We are implementing two types of communication for the use of disabled people.

They are:

i. Face to face communication
ii. Long distance communication

4.3.1 FACE TO FACE COMMUNICATION

I. Transmitting side

When the blind person provides the message to the Arduino board with the braille configuration through the push buttons, the input braille code get converted into English alphabets using ASCII code conversion. These converted outputs are transmitted through Bluetooth module. It is paired with the disabled smart phones. The output is displayed in the BRAILLE APP in the form of text as well as in voice output so that it is helpful for nearly person

for communication.

II. Receiving side

By using Google assistant, we can able to open the BRAILLE APP. Once the app is opened. The nearby person who wants to communicate with the disabled person should make of the app. In the application, we have an mic icon. By clicking the icon, the neighbor can speak to the app for conversion of speech to text. It results the output in the app display and also through vibration with the help of vibration motors resembling the text.

4.3.2 LONG DISTANCE COMMUNICATION

I. Transmitting side

Here the blind people deliver the message which has to convey to the other end people through Braille band. It get processed in the Arduino and transferred to the BRAILLE APP through Bluetooth. Finally the message which is to be communicated with long distance people are sent by pressing all the six push buttons one by one and followed by long press of sending push button. Therefore the message will be sent to others through SMS manager by reading the contact of the disabled person's smart phone.

II. Receiving side

For the long distance communication, the person who wants to communicate with disabled person, have to send the message through SMS. Therefore this message will be read by the blind people's mobile "BRAILLE APP" through SMS manager. As the result, the received message will be converted into Braille code through code conversion in the Arduino. And then the blind people can read the received message through vibrations.

V. RESULT AND DISCUSSION

In order to communicate with blind deaf dumb people we designed a portable wrist band for blind people. Band which has 6 Braille dots as input on ventral side of the hand and 6 vibrating motors on dorsal side of the hand. To communicate Blind people must know the Braille alphabets. Normal person can Communicate with blind deaf people by their Smartphone. In order to attain this we created a new Braille application in play store for android users. In that we developed app we can type or voice message to the blind person. For eg: hello john! The message is send to the arduino. The message is translated to Braille format and sends to the blind person via Bluetooth and the motors .Then the vibrating motors vibrates according to the Braille format. Then blind people can reply with the 6 push buttons which are arranged in 3*2 matrix symbolize the Braille format. For eg; hi Phil! Blind people can enter this in push buttons as Braille format. The arduino receives and converts this message to normal letters and sends to the Braille app via Bluetooth .Where the message is came as text and as well as voice feedback. Likewise we had made a sentence consist of 7 words .It can help to communicate blind deaf people with normal people.

Figure 11. Prototype (Braille Band)

VI. CONCLUSION

The Band is able to connect to Android mobile and facilitate exchange of messages. Whereas the android application is able to send and receive text messages from and to the Band and the Band able to send and receive Braille messages from and to the application. At the end of the project we believe that the project is an effective, cheap and very useful for blind people to communicate with others, and it is very useful for deaf-blind people if they are taught Braille where they can communicate with their families and people around them.

REFERENCES

[1]. K.Basavaraga, Apoorva pujari, N.Karthika, Ravishankar Holla, "Braille code convertion using verilog," *International journal of research in engineering, science and management [IJRESM]*, vol no -3, issue -5, 2020

[2]. B Shirude,A Mohite,Kalyani aghav , Pranjali bade,"A device for communication among deaf dumb and blind, " *International journal of advanced research in computer engineering and technology [IJARCET]*-2016

[3]. Suvarna Nandyal , Shireen kansar, " A device for deaf dumb and blind by raspberry pi, " *International journal of innovation technology and exploring engineering[IJITEE]*-2019

[4]. Saraswathi Y.S, Shivangi Garg, Spurti

Kulkarni, Swetha, Kiran B , " A device for Deaf-blind using Braille , *" International Research Journal of Engineering and Technology[IRJET]*-2017

[5]. Arsh.A.Ghate,Vishal.G.Chavan, " Smart glove for blind, " *International Research Journal of Engineering and Technology (IRJET)*-2017

[6]. Josephine Stella, Krishna S Valsan, "Text to speech conversion," *International Journal of Management and Applied Science (IRAJ)*, vol no- 4, issue-01, 2018

[7]. Miti Shah,Tanvi Shah,Rihiy Tiwari,Rutvi Thakar, " Braille Glove for Deaf and Blind, " *International Advanced Research Journal in Science, Engineering and Technology[IARJSET]*-2018

[8]. Kanika jindal, adittee mattoo, bhupendra kumar, "Braille coding device employing microcontroller," *International journal of recent technology and engineering [IJRTE]*-vol-08, issue-2s11, 2019

[9]. Akshatha K.V.,Mohammad Hasan D.,H.Latha, Manjunath M.T.,Chetan B.V., " Computerized Deaf, Dumb and blind communicator, " *International Journal for Research Trends and Innovation[IJRTI]*, vol-02, issue-06, 2017

[10]. Savindu H.P.,Iroshan K.A.,Panangala C.D., Pereira W.L.D.W.P., De Silva A.C., " Blind Support Haptic Wearable Band, " *Institute of Electrical and Electronics Engineers[IEEE]*-2018

[11]. Josephine stella, Krishna valson,"Text to Braille conversaion", *International journal of management and applied science [IJMAS]*,vol-04, issue-2s11, 2010.

[12]. M.Rajasenathipathi ,M.Arthanam, and M.Sivakumar,"An electronic design of a low cost Braille hand glove", *International journal of advanced computer science and application [IJACSA]*, vol no- 01, issue-03, 2010.

[13]. Mitti Shan , Tanvi Shan, Rohit Tiwari, Rutvi Thakar,"A Real time communication Braille glove for deaf and blind", *International advanced research journal in science, engineering and technology[IARJSET]*,vol no-05, issue-03, 2018.

[14]. Raluca Maria,Aileni,"E-Health monitoring by smart pulse oximeter system integrated in SDU", *International symposium on advanced topics in electrical engineering,[ISATEE]*,2019

[15]. Megha S.Kumabhar,Kshitija.S.Ganbavale, "Braille to text conversion using slot sensorized", *International research journal of engineering and technology [IRJET]*,2020.

[16]. Amit gupta, Likitha B S and Venkatrao P,"Blind ,deaf and dumb communicator", *International journal for research in applied science and engineering technology [IJRASET]*,2018.

[17]. S.Anu, M.Dilsath, R.Lakshmi,"Interaction communication between impaired people", *International journal of advanced engineering and research development [IJAERD]*,2018.

[18]. R.Jeena,AtturKeerthana,R.Meenakshi,K.Priya, "Arduino based interaction between blind, deaf and dumb people ",*International journal of innovative research in computer and communication engineering [IJIRCCE]*,2018.

[19]. Avijit Hazra, Mohammad Moshinal Hoque,"Braille gloves: 'An intelligent hand glove to generate Bengali Braille characters for visually impaired people*", The Institute of Electrical and Electronics Engineers [IEEE]*, 2019.

[20]. Oliver Ozioko,William Taube,Marion Hersh,Ravinder Dahiya,"Smartfinger Braille : A tactile sensing and actuation based communication glove for deaf blind people," *The Institute of Electrical and Electronics Engineers[IEEE]*,2017.

[21]. Suvarna Nandyal,Shireen Kausar,"Raspberrypi based assistive communication system for deaf, dumb and blind person", *International journal of innovation technology and exploring engineering*, vol no-08, issue-10,2019.

[22]. Savindu H.P,Iroshan K.A, Panangula c.d, Perera W.L.D.W.P, De silva A.C,"Braille band: blind support Haptic wearable band for communication using Braillelanguage ",*(MIEE)*,2019.