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A BRAILLE BASED SHORT MESSAGE SERVICE COMMUNICATION DEVICE FOR BLIND - DEAF PEOPLE

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ABSRTACT:

Braille system is a way of writing things. Braille is a tactile writing system used by a blind and the visually impaired. It is a traditionally written with embossed paper. Braille users can read computer screens using refreshable Braille displays. They can write Braille with the original slate and stylus or type it on a Braille writer. Braille was developed in response to Napolean demand for a means for soldiers to communicate silently at night without a light source.

The physically impaired people have limited access for these technologies. So as a step to bridge the gap between the blind-deaf people and the technological advancement in the telecommunication field. We decide to design a Short Message Service (SMS) system for them. For that we are using Braille language as the basis of the project. In this project we are developing a new methodology using a Braille system in order to read a message for a blinddeaf people. Here we are using a GSM modem to receive a message the contents/letters of the message can be read by blind people easily just by feeling the vibration of the vibrator motor and the same contents/letters will be displayed on the LCD so that even deaf people can easily read it. Buzzer is working as a message alerter. The fingers by people who are blind or who have low vision.

1. INTRODUCTION:

An Embedded system is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few predefined tasks, usually with very specific requirements. Since the system is

dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product.

Personal digital assistants (PDAs) or handheld computers are generally considered embedded devices because of the nature of their hardware design, even though they are more expandable in software terms. With the introduction of the OQO Model 2 with the Windows XP operating system and ports such as a USB port both features usually belong to "general purpose computers".

Physically, embedded systems ranges from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a largechassis or enclosure.

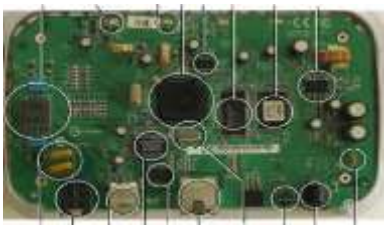


Fig 1.1: EXAMPLE FOR EMBEDDED SYSTEM

- Avionics, such as inertial guidance systems, flight control hardware/software and other integrated systems in aircraft and missiles
- Cellular telephones and telephone switches
- Engine controllers and antilock brake controllers for automobiles
- Home automation products, such as thermostats, air conditioners, sprinklers, and security monitoring systems
- Handheld calculators
- Handheld computers
- Household appliances, including microwave ovens, washing machines, television sets, DVD players and recorders
- Medical equipment

- Personal digital assistant
- Videogame consoles
- Computer peripherals such as routers and printers.
- Industrial controllers for remote machine operation.

2. EXISTED SYSTEM:

2.1BRAILLE NOTE TAKER

Electronic Braille note-taking devices are small and portable devices that may be used by a student to take notes in class using either Braille (featuring six large keys that correspond to the 6 dots in the Braille cell), standard (QWERTY) keyboard, or both. Although each device offers different features, many can be used by Braille learners to read books, write class assignments, find directions, record lectures, and listens to podcasts. Information can be readily transcribed in order to provide the student with a means to communicate with peers, teachers and others who do not read Braille.

The note-taking devices generally are the size of a book and are easily carried and used by the student. The Braille Note and the Pac Mate are probably the two most common portable note takers used by students. APH currently offers the Braille Plus 18 (the Refreshabraille 18 was discontinued December 2014) through quota funds.

2.1.1 FEATURES

- Notes written on the note takers may then be transferred to a computer for storage or printed in either braille or print formats.
- Many note-taking devices have word processors, appointment calendars, calculators or clocks, and can do almost everything a computer can do.
- Some note-taking devices have a speech program with braille input.

- Many portable note-taking devices feature a refreshable braille display built into them. These are small pins that raise and lower to allow the user to read in braille what is being accessed in the device.
- Many newer models are Bluetooth accessible which allows them to be used with iPads, iPhones and other Bluetooth devices as well as wi-fi access.

2.1.2 NOTE TAKING INSTRUCTIONS

There are a variety of electronic note-taking devices available to students with visual impairments. With advances in technology, there are multiple ways students can take notes. Some students may elect to use their iPhone or iPad to take notes of lessons. The notes can be placed in Dropbox for later retrieval. If using a braille note-taking device, it is important to teach parts and functions as well as how to access the options menu of an Electronic Note-Taking Device. Once the student has learned how to use the device, it is important to continue to monitor the student to note the student's skills and provide any troubleshooting support. The student will need instruction in the following skills.

- Turn the device on/off
- Locate the braille keypad
- Locate the return/enter key
- Locate the previous key
- Locate back key
- Locate forward key
- Locate next key
- Locate backspace/space bar keys
- Locate braille display
- Locate cursor routing keys
- Locate ports: serial, parallel, and power
- Connect the device to the printer, embosser, and power supply using appropriate cables
- Enter the options menu
- Move forward and back in a menu

- Check date, time, and battery status
- Use escape menus
- Use the exit menu
- Change the speech settings

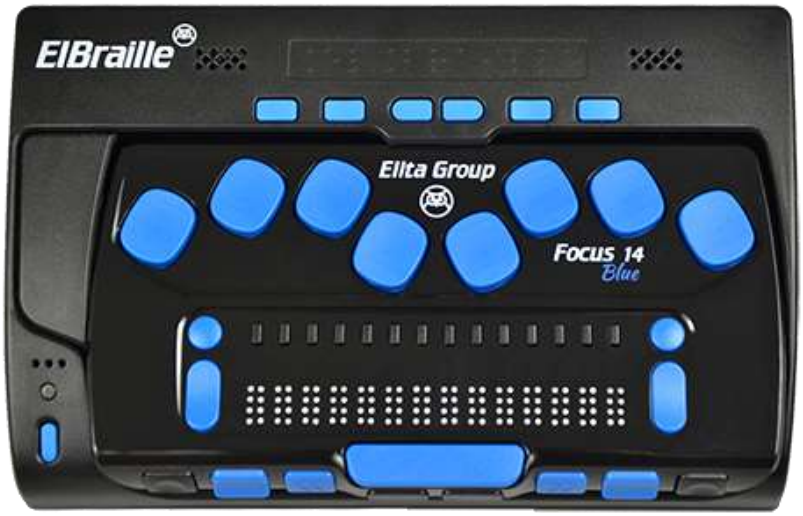


Fig 2.1: NOTE TAKER

Electronic braille notetakers are small, portable and battery operated devices with braille keyboard for entering information. They use a speech synthesizer or braille display for output.

The Braille notetaker can be used by blind or visually impaired people who read braille.It allows the user to write, review and edit data, keep a virtual address book, and store many pages of Braille or print. User options include, a talking clock, calendar, telephone directory, scientific calculator, and stopwatch. It can be used as the speech synthesizer for computer and provide acces to mainsteam programs such as e-mail, and the Internet. A regular ink-printer will produce typewritten output when the built-in Braille-to-print translation feature is available.

2.2 BRAILLE SMART GLOVES

Smart gloves are mainly designed to help blind and deaf-blind people communicate with other people. A Smart-Glove which translates the braille alphabet into text and vice versa.

The Smart-Glove has a set of pushbutton switches. Blind user can write messages through pressing pushbuttons located on the Smart-Glove. Hence different Pushbutton patterns correspond to different braille codes. These braille codes are sent by Bluetooth to the mobile, where they are converted to display the corresponding alphabets, words and sentences.

If user receives a message from the mobile, then the character corresponds to a braille code which is matched to the six vibration motors on the braille hand SmartGlove. Hence, the vibration motors corresponding to the braille code of the particular character vibrates and the character is read efficiently by the reader.

Smart Glove Enables the Deaf to Talk with People Who Don't Know Sign Language.It is used for translating hand gestures into verbal speeches allowing to create a communicative bridge between the deaf, people with speech disabilities and those who do not understand sign language.

Fig 2.2: SMART GLOVES

Smart glove has been designed to give voice to voiceless as this cause has been championed throughout history, as it’s safe to say that none of those efforts involved

packing a bunch of sensors into a glove. The main objective is to help deaf anddumb people by removing communication barrier so they are not restricted in a small social circle and are also able to convey their feelings and emotions.

2.3 DRAWBACKS OF EXISTING SYSTEMS

The main drawback of the note taker is some people cannot afford it as it is a bit costly. Also locating of keys & understanding of functionality is little bit complex.

A huge drawback of smart glove is the closeness of dataset of different alphabet and word with each other which could have been overcome by increasing the data set. Regardless of the issues mentioned, the designed glove could assist inbridging communication gap between deaf and dumb people and normal population to certain level.

Compared to devices developed earlier which require use of smart phones, which is quiet expensive, so we are proposing a new a device, which does not even require use of phone. It only requires a sim card to receive SMS. Our device is highly affordable. Some earlier devices convert SMS text to audio output. But to listen to audio output the blind person requires to be in a quiet place which is not always possible.

3. PROPOSED SYSTEM:

3.1 INTRODUCTION

Mobile cell phones are the milestone in telecommunication technology. Despite of all these advancement in the telecommunication field, the physically impaired people have limited access for these technologies. So as a step to bridge the gap between the blind-deaf people and the technological advancement in the telecommunication field. We decide to design a Short Message Service (SMS) system for them. For that we are using Braille language as the basis of the project.

Braille is a tactile writing system used by the blind and visually impaired. Braille characters are small rectangular blocks called as cells that contain tiny palpable bumps called raised dots. The number and arrangement of these dots distinguish from one character to another. We are designing a modular device using which blind-deaf people can send and receive message without any support of others. The basic grid of a Braille alphabet character consists of six cells, positioned like the figure six on a die, in two parallel vertical lines of three dots each using which 64 different signs can be created. In our modular design we are representing cells in the form of vibrator motors.

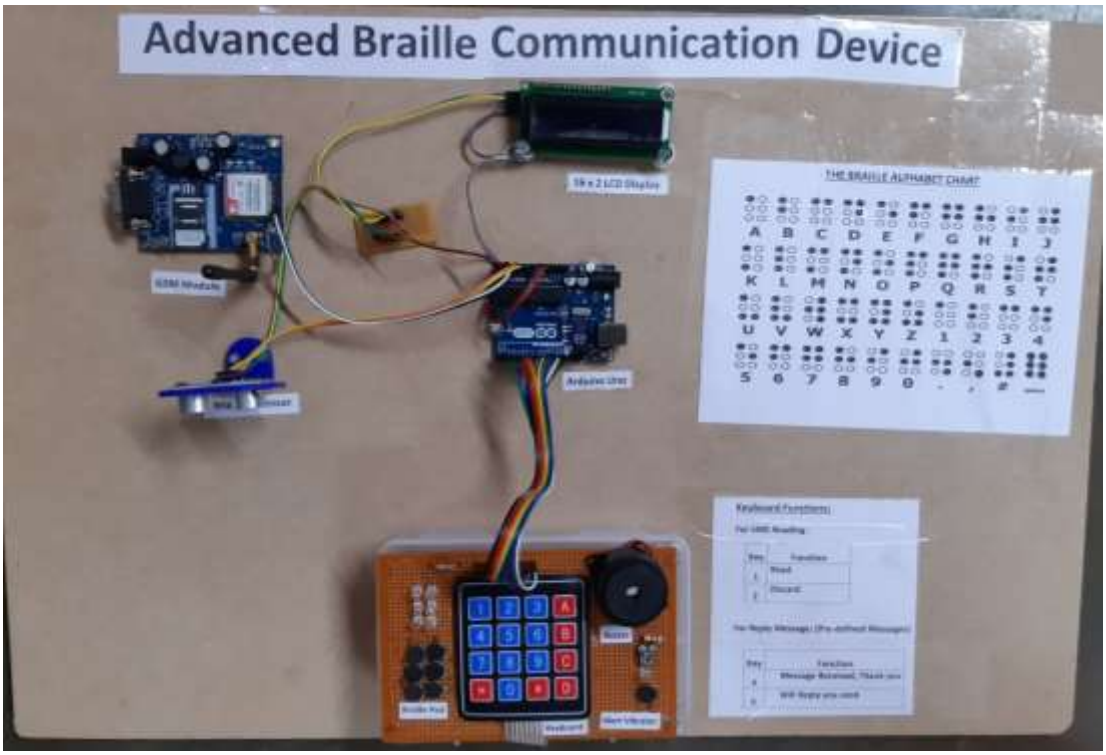


FIG 3.1:PROPOSED SYSTEM

3.2 BLOCK DIAGRAM

Our proposedsystem consists of following blocks.

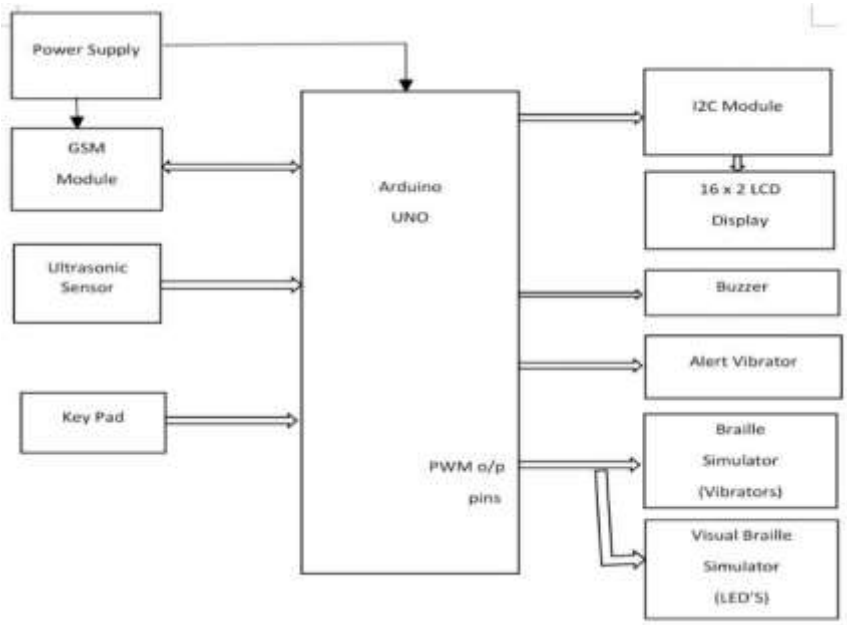


FIG 3.2:BLOCK DIAGRAM

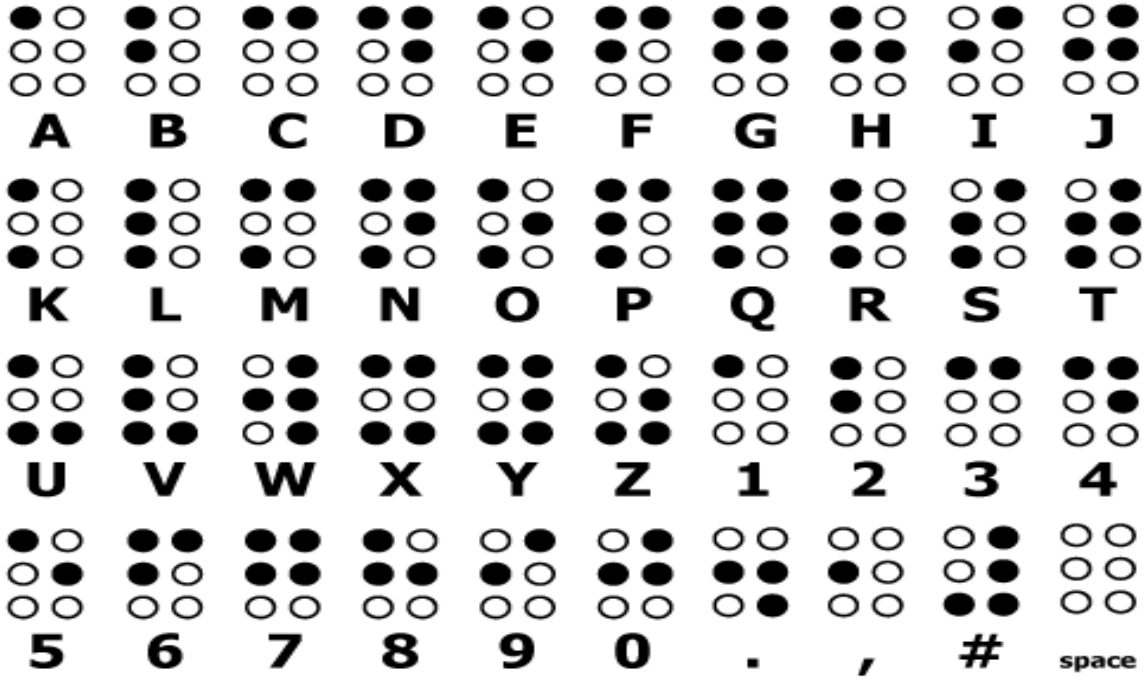


FIG 3.3: BRAILLE ALPHABET CHART

3.3 ALGORITHM

Step 1: Initialization of GSM Module.

Step 2: GSM waits for SMS.

Step 3: If SMS is received, then GSM transmitsinformation to Arduino.

Step 4: After passing information from GSM to Arduino, the distance is calculated by using ultrasonic sensor.

Step 5: If the person is in range (36 Cm), thenthe buzzer and vibrator motor will be activated.

Step 6: After the completion of indication given by buzzer and vibrator then the Arduino waits for keypad input for some time.

Step 7: If the pressed key is '**1**', then it indicates that the user is ready to read that message. If the pressed key is '**2**' then the message will be discarded.

Step 8: If the user is ready to read that message then the message will be displayed alphabet by alphabet on the LCD.

Step 9: In Parallel to step 8, the vibrators will be vibrating to sense the letter by the blind person.For our identification6 LED's are arranged like Braille pad and these LED's also blinks along with vibrators.

Step 10: After the message displayed on the LCD and Braille pad, then Arduino waits for reply message from user.

Step 11: If the user presses a key '**4**' then "**MESSAGE IS RECEIVED, THANKYOU**", this message is sent to Arduino as reply from user.

Step 12: if the user presses a key '**5**' then "**WILL REPLY YOU SOON**",this message is sent to Arduino as reply from user.

Step 13: The reply message is sent to sender through GSM module.

4. HARDWARE COMPONENTS AND DESCRIPTION:

The Arduino Uno is one kind of microcontroller board based on ATmega328, and Uno is an Italian term which means one. Arduino Uno is named for marking the upcoming release of microcontroller board namely Arduino Uno Board 1.0**.** This board includes digital I/O pins-14, a power jack, analogi/ps-6, ceramic resonator-A16 MHz, a USB connection, an RST button, and an ICSP header. All these can support the microcontroller for further operation by connecting this board to the computer. The power supply of this board can be done with the help of an AC to DC adapter, a USB cable, otherwise a battery.

4.1.2 FEATURES

- The operating voltage is 5V
- The recommended input voltage will range from 7v to 12V
- The input voltage ranges from 6v to 20V
- Digital input/output pins are 14
- Analog i/p pins are 6
- DC Current for each input/output pin is 40 mA
- DC Current for 3.3V Pin is 50 mA
- Flash Memory is 32 KB
- SRAM is 2 KB
- EEPROM is 1 KB
- CLK Speed is 16 MHz

4.1.3 ARDUINO UNO PINOUT

The Arduino Uno board can be built with power pins, analog pins, ATmegs328, ICSP header, Reset button, power LED, digital pins, test led 13, TX/RX pins, USB interface, an external power supply. The Arduino UNO board description is discussed below.

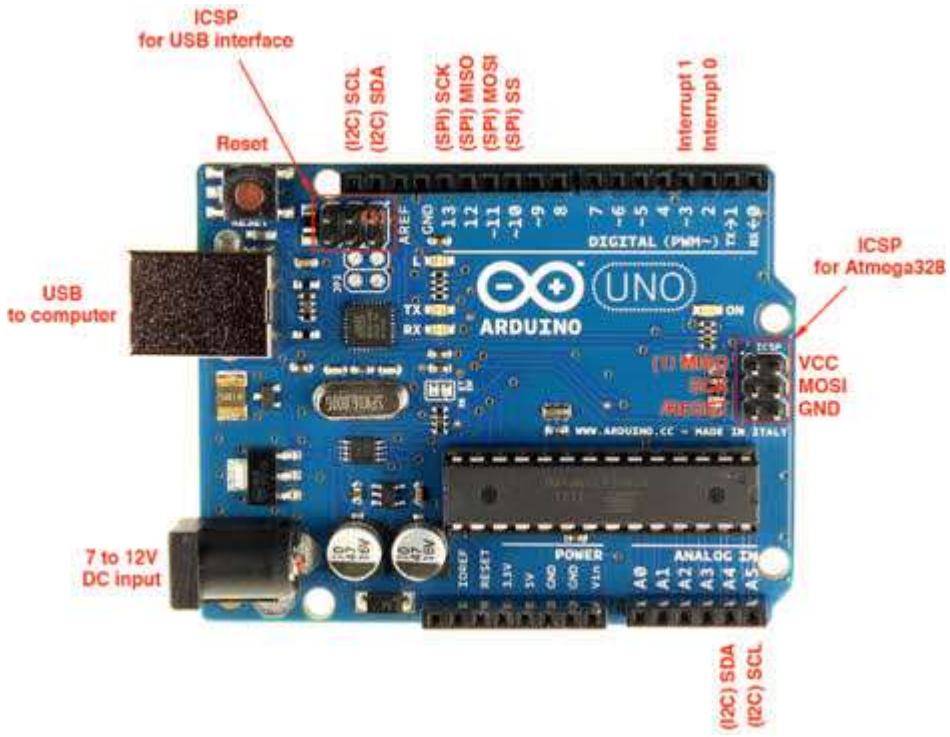


Fig 4.1: ARDUINO UNO

- **VIN:**The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V:**The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3.3V:** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND:** Ground pins.

The 14 digital input/output pins can be used as input or output pins by using pinMode(), digitalRead() and digitalWrite() functions in arduino programming. Each pin operate at 5V and can provide or receive a maximum of 40mA current, and has an internal pull-up resistor of 20-50 KOhms which are disconnected by default. Out of these 14 pins, some pins have specific functions as listed below.

- Serial Pins 0 (Rx) and 1 (Tx): Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.
- External Interrupt Pins 2 and 3: These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM Pins 3, 5, 6, 9 and 11: These pins provide an 8-bit PWM output by using analogWrite() function.
- SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK): These pins are used for SPI communication.
- In-built LED Pin 13: This pin is connected with an built-in LED, when pin 13 is HIGH – LED is on and when pin 13 is LOW, its off.
- Analog pin 4 (SDA) and pin 5 (SCA) also used for TWI communication using Wire library
- AREF: Used to provide reference voltage for analog inputs with analogReference() function.
- Reset Pin: Making this pin LOW, resets the microcontroller.

4.2 ULTRASONIC SENSOR

4.2.1 INTRODUCTION

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar.The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received. This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object. The HC-SR04 sensor works best between 2cm – 400 cm (1" - 13ft) within a 30 degree cone.

Fig 4.2:ULTRASONIC SENSOR

4.2.3 WORKING OF ULTRASONIC SENSOR

The HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below.

Fig 4.3:WORKING OF ULTRASONIC SENSOR

Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

4.2.4 ULTRASONIC SENSOR INTERFACING WITH ARDUINO

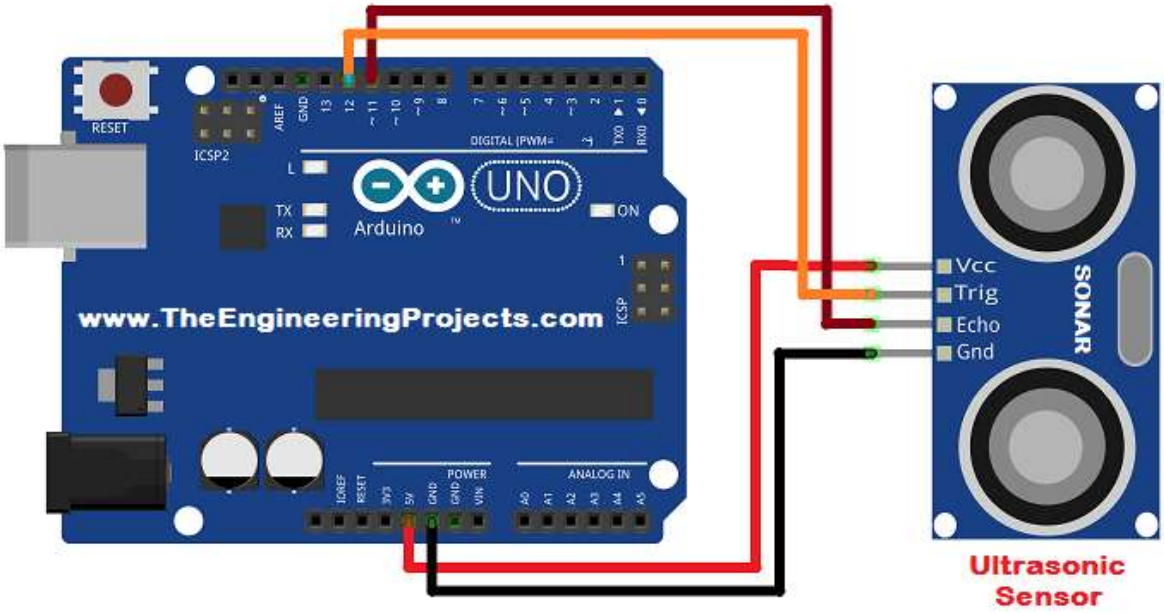


Fig4.4:INTERFACING OF ULTRASONIC SENSOR WITH ARDUINO

4.3 GSM MODULE

4.3.1 INTRODUCTION

GSM is a mobile communication modem; it stands for global system for communication.

GSM is widely used in mobile communication system in the world.GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at 850MHz,900MHz,1800MHz and 1900MHz frequency bands.GSM system is developed as a digital system using time division multi-access technique for communication purposes.A GSM digitizes and reduces the data then sends it down through the channel with two different streams of client data, each in its own particular time slot.The digital system has an ability to carry 64kbps to 120mbps of data rates.There are various cell sizes in GSM system such as macro, micro, pico and umbrella cells. Each cell varies as per implementation domain.

Fig 4.5:GSM MODULE

4.3.3 INTERFACE GSM SIM900A WITH ARDUINO

SIM900A Modem is built with dual band GSM/GPRS based SIM900A modem for SIMCOM. It works on frequencies 900/1800 MHZ.SIM900A can search these two bands automatically. The frequency band can also be set by AT commands baud rate configurable from 1200 to 115200 through AT command.The GSM/GPRS modem is having internal TCP/IP stack to enable you to connect with internal via GPRS.SIM900A is an ultra-compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single chip processor integrating AMR926EJ-S core, allowing you to benefit from small dimensions and cost-effective solutions.

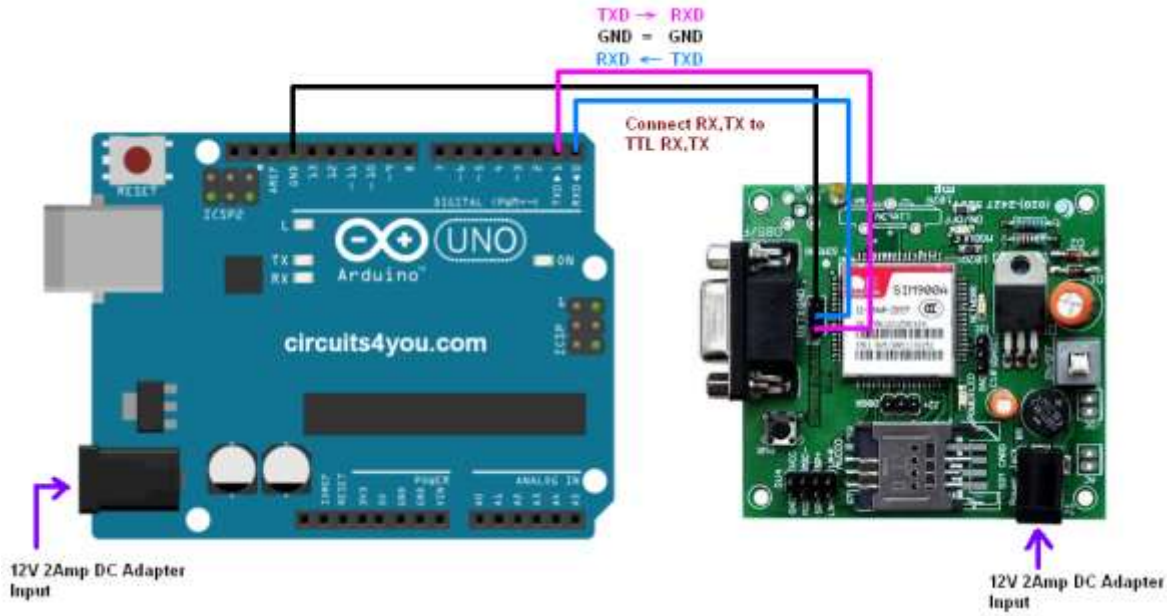
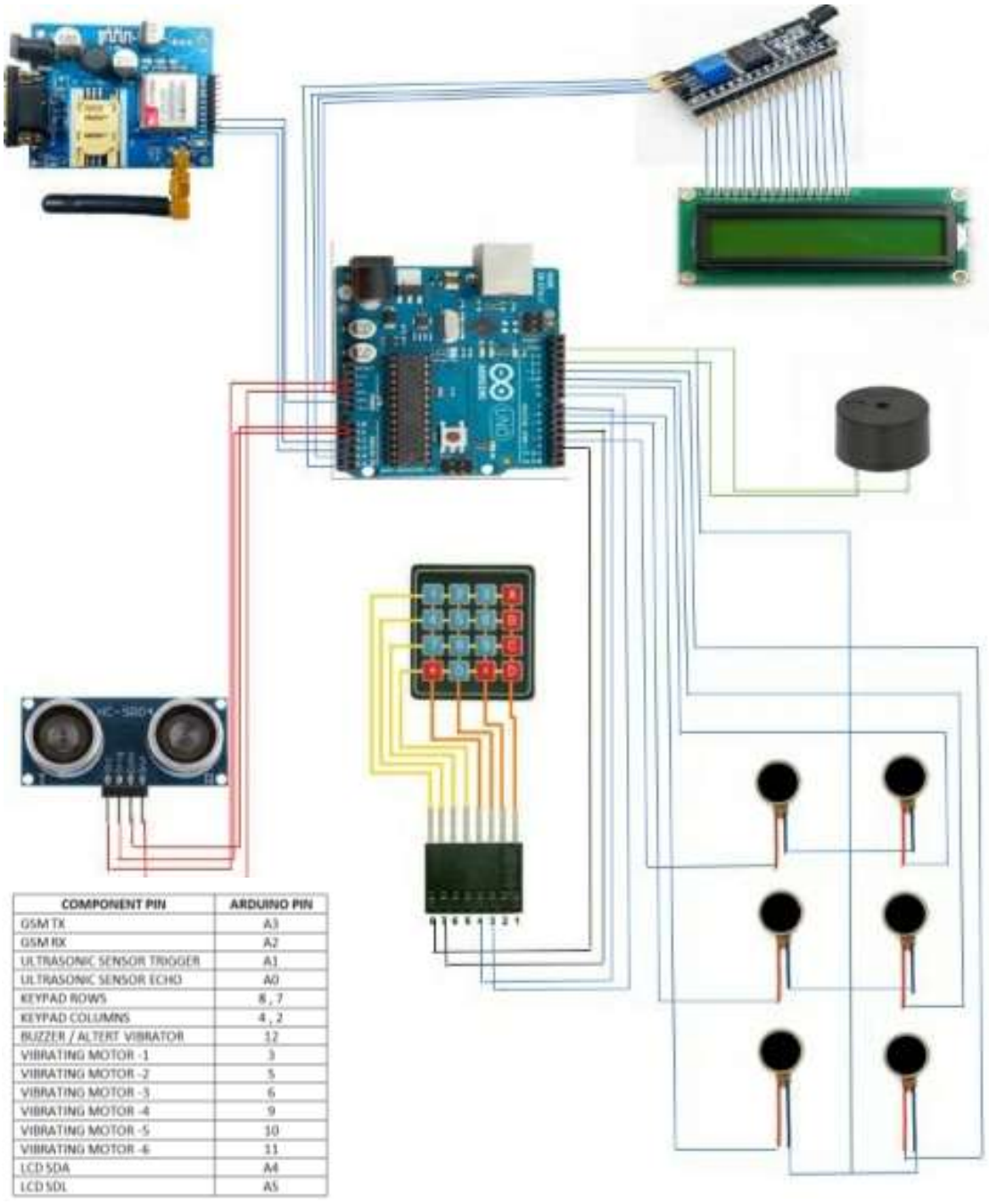


Fig 4.6: GSM SIM900AINTERFACING WITH ARDUINO

5. SCHEMATIC DIAGRAM:



COMPONENT PIN	ARDUINO PIN
GSM TX	A3
GSM RX	A2
ULTRASONIC SENSOR TRIGGER	A1
ULTRASONIC SENSOR ECHO	A0
KEYPAD ROWS	8 , 7
KEYPAD COLUMNS	4 , 2
BUZZER / ALTERT VIBRATOR	12
VIBRATING MOTOR -1	3
VIBRATING MOTOR -2	5
VIBRATING MOTOR -3	6
VIBRATING MOTOR -4	9
VIBRATING MOTOR -5	10
VIBRATING MOTOR -6	11
LCD SDA	A4
LCD SDL	A5

FIG 5.1 :SCHEMATIC DIAGRAM

6. RESULTS & DISCUSSIONS:

This paper bridges the gap between the blind-deaf people and the technological advancement in the telecommunication field by enabling Short Message Service (SMS)

system for them. For that we are using Braille language as the basis of the project. The working model of our project and its corresponding block diagrams are shown in the Figure 6.1 & Figure 6.2 respectively.

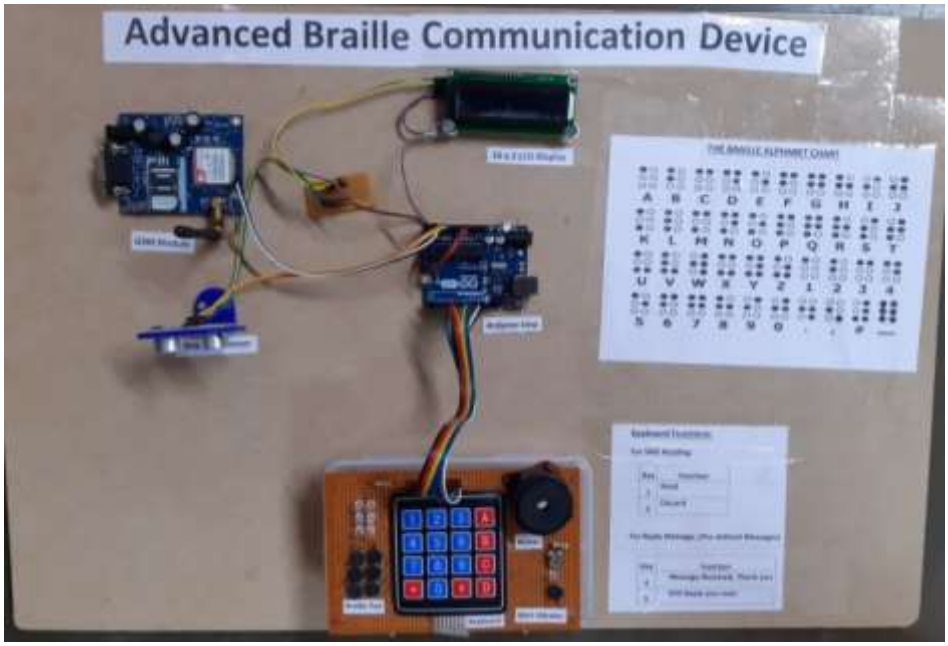


FIG 6.1: Working model

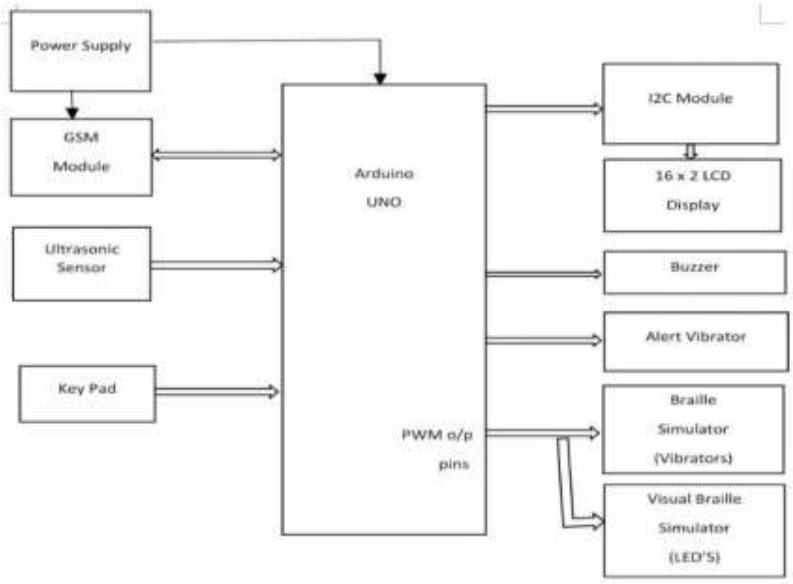


FIG 6.2.: Block Diagram

In this paper, we have used a GSM Module to achieve telecommunication with the world, when the project power up the GSM Module will starts initialization after showing the welcome screen. When the module is ready to receive the SMS it will display waiting

for message on the LCD screen, the corresponding working images were shown in figures 6.3, 6.4 & 6.5.

Fig 6.3: WELCOME SCREEN

Fig 6.4 : GSM INITIALIZATION

Fig 6.5: WAITING FOR MESSAGE

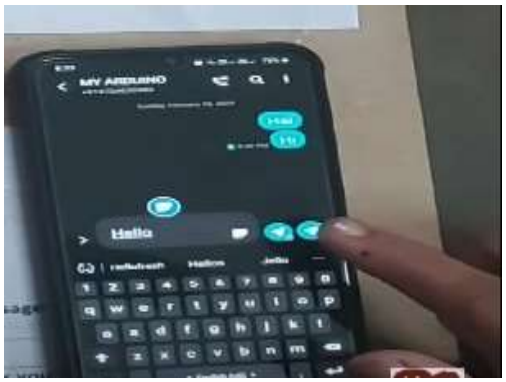


Fig 6.6: SENDING MESSAGE

Whenever the SMS is received to GSM module it will transmit to Arduino and “MESSAGE RECEIVED” will be displayed on the LCD screen.In parallel, the distance

from the Ultrasonic sensor and the user is measured using ultrasonic sensor, the corresponding working images were shown in figures 6.7, & 6.8.

Fig 6.7: MESSAGE RECEIVED

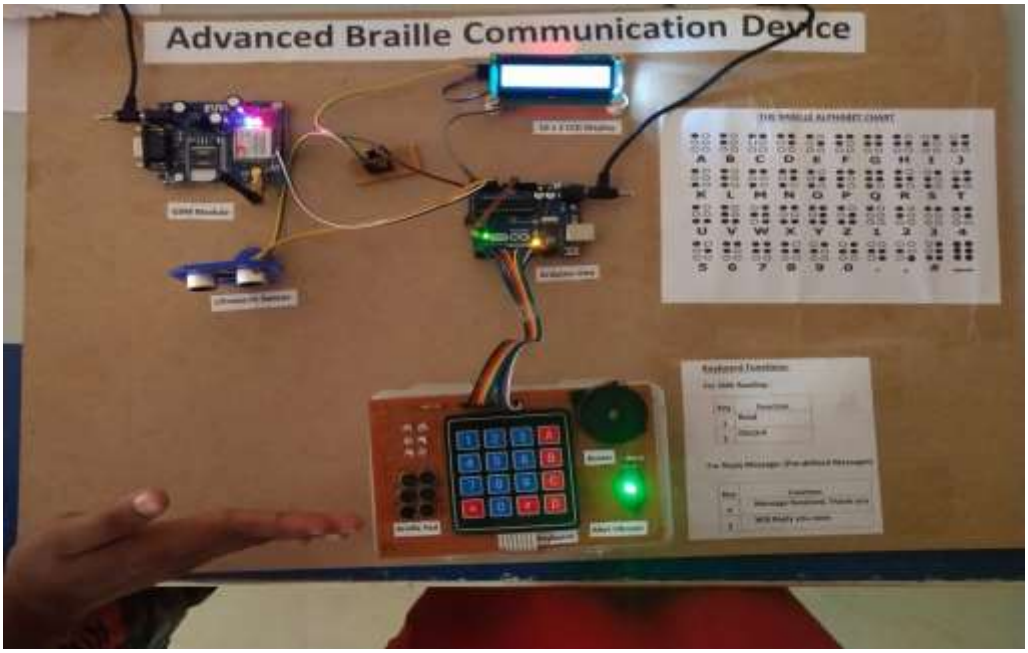


Fig 6.8: DISTANCE MEASUREMENT

If the person is within the range i.e., 36cms then only the buzzer will start ring and alert vibrator will starts vibrating. Because, our system is designed for blind-deaf people so there is no use of alerting with vibrator even person is not in the range of our device.

The buzzer is an indication for the blind person that he/she received an sms . If

beeping sound is received from buzzer then the user understands the message has been received. The Alter vibrator is an indication for blind-deaf people to understand that the message has been received. If the user wants to read the message he will press-1 from the keyboard, then the received message will be displayed alphabet by alphabet on the LCD. In Parallel, the vibrators will be vibrating to sense the letter by the blind person.For our identification6 LED's are arranged like Braille pad and these LED's also blinks along with vibrators. This process can be observed from the figures 6.9 to 6.11. After sensing the messages by the blind person, he may also give reply to the sender using keyboard keys 4 or 5. If the user presses a key '**4**' then "**MESSAGE IS RECEIVED, THANKYOU**", this message is sent to Arduino as reply from user.If the user presses a key '**5**' then "**WILL REPLY YOU SOON**",this message is sent to Arduino as reply from user.The reply message is sent to sender through GSM module, we can observe the working of reply message system from the figures 6.12 & 6.13.

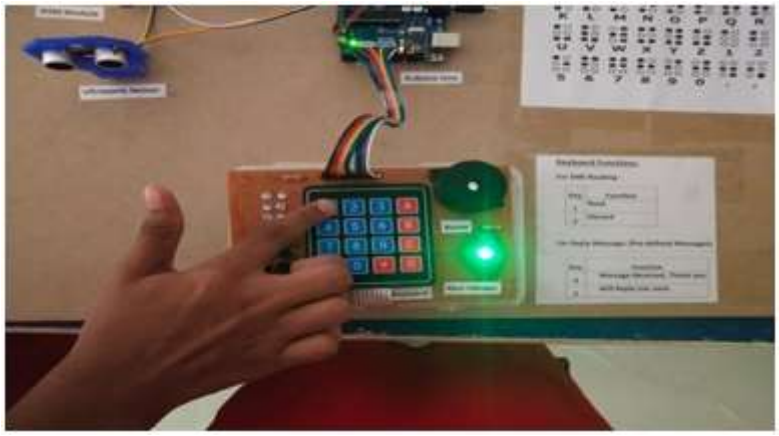


Fig 6.9 :INPUT FROM KEYBOARD TO READ SMS

Fig 6.10 :DISPLAYING MESSAGE ON LCD

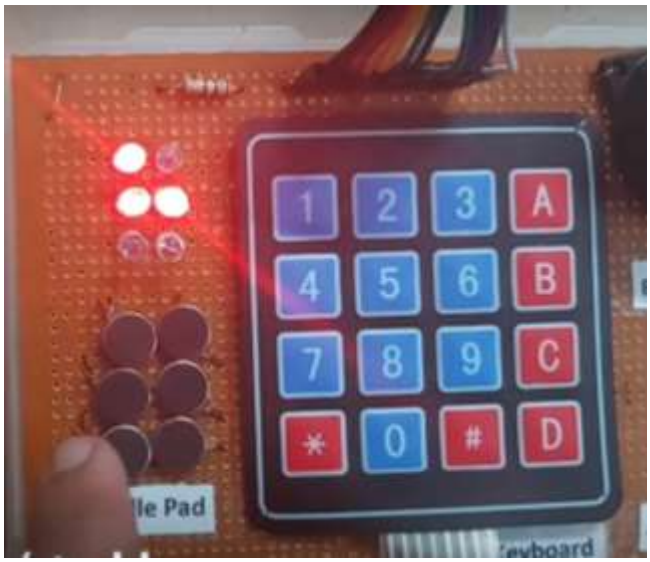


Fig 6.11: SENSING MESSAGE USING BRAILLE PAD

Fig 6.12 : SENDING REPLY MESSAGE

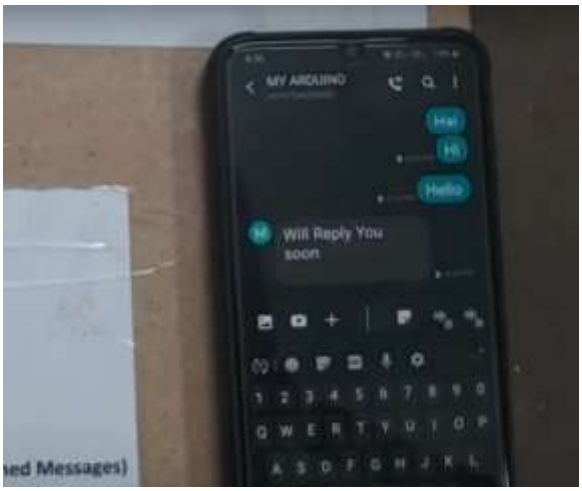


Fig 6.13 :RECEIVEDREPLY MESSAGE

7. CONCLUSION & FUTURE SCOPE:

The proposed system has been developed with the help of necessary hard ware. The "ABraille Based Short Message Service Communication DeviceFor Blind – Deaf People" has been tested successfully and it is functioning well.

Here we conclude that by doing important modifications in the communicating device for the physically challenged people it is possible to read the messages very easily with the help of vibrator sensors. In the proposed work, if the physically challenged person is near to the device, then the system is successfully activated with the help of ultrasonic sensor. After this, the incoming messages are successfully warned by using a buzzer. Then the person can able to select to read or discard the message with the help of key pad.In this way this project explains the idea of messaging system for visual &hearing impaired people. This vital technology tool and its application in the area of telecommunication have significant and widespread. It allows environmental barriers to be removed for people with a wide range of disabilities.

Thus with some modifications in previous conventional communicating device, we can accommodate large number of visually impaired people in communication system. In this way system is modified to read the SMS in a string, also blind person able to read the e-mail also. In recent years, SMS messaging system for disability and handicapped communication aids has become widely deployed in large amount. Text to Speech is also finding new applications outside the disability market in future. The small drawback in our designed system is the mobility. This problem can be rectified in future by embedding the Braille pad in mobile phone itself, so that the visual &hearing impaired people can easily carry the device to anywhere.

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