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HELEN - A Device To Communicate With Deaf-Blind

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Abstract— **India has the world's largest number of blind people. The technologies are developing day by day in the communication field, especially in mobile phones which play a crucial role in our life. Disabled people are an integral part of our society. The blind and deaf people face many problems to communicate with the outer world.The visually impaired are the people who can have permanent or temporary loss of vision. Such people cannot see, read or write as normal human beings. There are several substituting equipment and aid to help them to lead a normal life.This project describes a bidirectional translation system to facilitate communication. This is a communication device which solves the loneliness of Deaf-Blind People. Acquired deaf-blind people can speak out but can't hear nor see. By using this device, deaf-blind people can communicate with people without any special knowledge like tactile signing.**

I. INTRODUCTION

Communication is the powerful tool for every individual to share their ideas. We continually absorb information from the surroundings by our senses - sight, hearing, smell, taste and touch. But mostly the information is shared via the sense of sight and audioception.Thus it is difficult for deaf-blind people to connect with the outside world due to the lack of these senses.There are 5,00,000 deaf-blind people in our country. These people cannot communicate normally as we normal people do. So to make their life easier we designed 'HELEN' (communication device for deaf-blind people) for their communication.

The blind and deaf people face many problems communicating with the outer world.The visually impaired are the people who can have permanent or temporary loss of vision. Such people cannot see, read or write as normal human beings. There are several substituting equipment and aids to help them lead a normal life.Braille is a series of raised dots that is read with the fingers by people who are visually impaired or deaf and blind.

The *Fig.1* shows the basic representation of Braille Script.

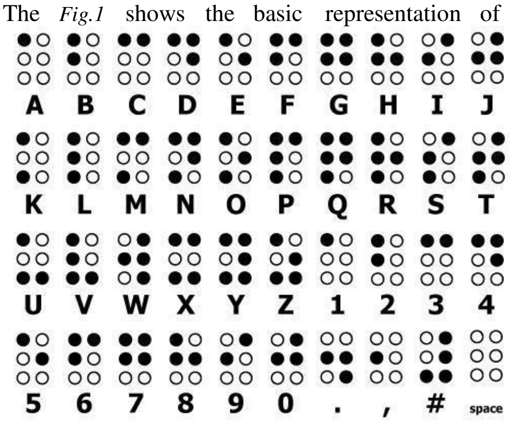

Fig.1 Braille representation

There are several substituting equipment and aid to help them lead a normal life.This project describes a bidirectional translation system to facilitate communication. The technologies are developing day by day in the communication field, especially in mobile phones which play a crucial role in our life. This is a small attempt by us to try to solve their problems by opening up the digital world to them. Braille has come under attack in recent years due to the following main reasons

- Most of the Braille equipment is mechanical.
- Computer Braille related software and hardware equipment are used quite less.
- There are hardly any devices for educational purpose and routine communication.

To acquire information necessary to carry out normal day to-day activities, this low cost real-time communication Braille Glove can immensely benefit the visually impaired and deaf people, who work in the computer environment[5]. This concept will go a long way in helping them learn on an equal footing with their sighted counterparts. The deaf- blind user wears the gloves and uses six fingers which each finger carries a unique vibration of braille language. If a person wants to read a character from the Mobile, then the character corresponds to a Braille code which is matched to the six vibration motors on the Braille Hand glove. Hence the vibration motors corresponding to the Braille code of that particular character vibrates and the character is read efficiently by the reader. It has a unique feature of typing messages through hand gestures of all the Braille codes. Hence different hand gestures correspond to different Braille codes[11]. Therefore, this paper focus has been on vibration in six different positions in the right hand which matched the Braille codes.

The user can adjust the intensity of vibration according to their need. When the sender sends a message , the gloves start vibrating according to the braille language. The device is portable and the user has to carry it with them to communicate.

II. RELATED WORKS

Deaf-blind people have many different ways of communication. The methods they use vary, depending on the causes of their combined vision and hearing loss, their backgrounds, and their education. Below are some of the most common ways that deaf-blind people communicate.

1.Screen Braille Communicator: Two people use a screen Braille Communication to chat with each other.Some deaf-blind people use a Screen Braille Communicator (SBC). This is a small, portable device that enables them to communicate with sighted people. The device has a qwerty keyboard with an LCD display on one side, and an eight-cell braille display on the other side. The sighted person types

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short text on the qwerty keyboard. The deaf-blind person reads the printed text by placing his or her fingers on the braille display. He or she then uses the braille display to type back text. The sighted person can read the text on the LCD display.

2.Captel:A man follows a telephone conversation using CapTel with a large print on his computer screen.
Some people with hearing and vision loss use CapTel to make telephone calls. Using a special phone, the CapTel USB, people can dial into a captioning service that types the other caller's conversation onto a computer screen. Then, deaf-blind callers can read a conversation script on their screens in addition to listening to another caller on their telephones. The captions can be adjusted for color, size or font style on the screen.

III. PROPOSED METHOD

Our project HELEN, a device to communicate with deaf-blind people, a glove consisting of six rings worn on the person's fingers which translate a human voice into an understandable form through vibrations, a bit like Braille. The methodology with which we will implement is that we are developing a form in which six dots are distributed to different fingers ,The device has a glove with vibrators and It transmits 6-dot cells of Braille as vibration to six fingers Braille is a system of raised dots arranged in cells[10]. The number and position of the raised dots represent a letter, word, number or symbol. The App on a smartphone performs distant communicates information by linking with the device over the internet. The device translates the voice into an understandable form for deaf-blindness and vice versa. They need to depend on customary and universal strategies for getting data which incorporates material sensation, for example, finger Braille, manual letters in order and the print on palm strategy, however these techniques are repetitive, slow and inefficient[1].
These days, numerous frameworks have been created which can be interfaced to a PC to peruse content online which have assumed control over the old frameworks which included bulky frameworks like consoles and printers[2]. Important technologies used in the project include the main controller, vibration motors, microcontrollers as well as the mobile app. Numerous frameworks have been structured beforehand around there like the Braille embosser which is an extraordinary kind of effect printer which prints messages as Braille cells[3]-[7]. The Mobile App on the smartphone communicates information by linking with the device over the internet. The speech recognition engine and Braille dictionary are all present in the main controller so they can be used without problems in offline environments. In the glove, with vibrators it transmits 6-dot cells of Braille as vibration to six fingers. The Vibrator Motors to be used are that of an eccentric rotating mass vibration motor (ERM) uses a small unbalanced mass on a DC motor, when rotated it creates a force and that translates to vibrations. Microcontrollers act like a driver for the vibrators. These are two arduino micro boards. Small in size and can be enclosed in a glove.

There will be a need of precisely two Esp32s for the working of the whole framework, and the two of them have to connect with one another. The connection used for correspondence between the ESP32 is called ESPNOW. They check whether there is another message accessible on the firebase specifically spans. In the event that another message is identified, they get the message from the firebase and convert it to the related Braille letter. At that point they will send it from the RHS to the firebase when the catch is squeezed.

IV. system architecture

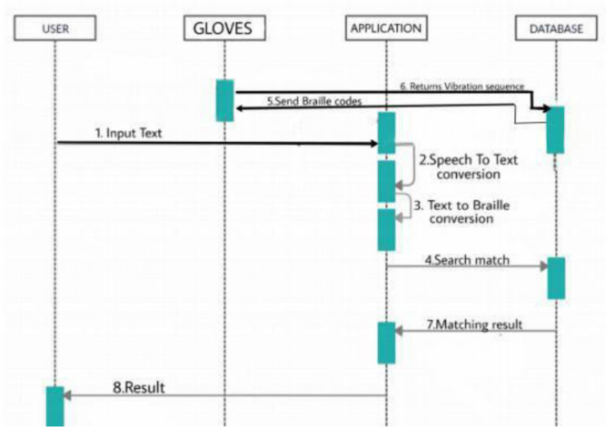

Fig.2 Overall Design

Fig2. shows the overall design of the project. In this architecture design shows that users text the message using the glove and android application to the database and vice versa.

V. SOFTWARE IMPLEMENTATION

Considering the hardware and software sections,the hardware section will be like:

As shown in the *Fig.2.1*,the main component which comes under the hardware section is Glove[4]. A glove consisting of six rings worn on the person's fingers which translate a human voice into an under-standable form through vibrations. Glove consists of ESP32. There will be a need of exactly two Esp32s for the working of the entire system, and they both need to communicate with each other. The protocol used for communication between the ESP32 is called ESPNOW. They check whether there is a new message available on the firebase in particular intervals. If a new message is detected, they fetch the message from the firebase and convert it to the corresponding Braille letter. Then they will be sending it from the RHS to the firebase when the button is pressed. Four position dip switch is connected to each ESP32. The DIP switch on the left side as well as the right side can be arranged according to the corresponding Braille letters. If the DIP switch we are turning on firstly is on the left side(LHS), the ESP32 placed on the left side will send the pin readings from left side to right side using ESPNOW protocol. So here in the RHS,it will combine with the data which has arrived from the left hand side. This step or the procedure will repeat multiple times until you get a proper/desired output.

Now considering the software section the main part is the application which is developed by using Android studio. The application works like it takes input from the person in the form of text or speech (Speech: which is converted to text). The corresponding input is sent to the firebase from which the ESP32 will be able to detect it and be able to begin it's procedures mentioned above. The application will also be able to adjust the vibration speed and the duration of the vibrations.

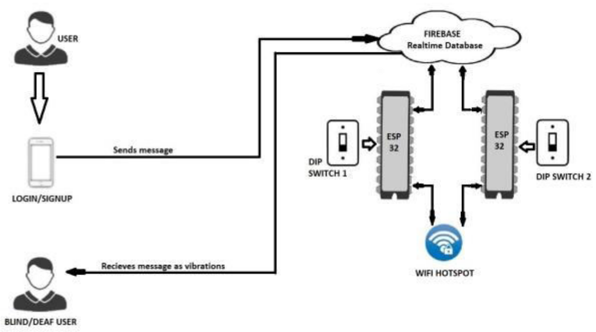

Fig.2.1 Implementation

V I. RESULTS

The presentation model deals with two sections firstly the hardware section secondly the software section.The hardware section mainly includes a pair of gloves which is monitored by a pair of ESP32s.The software section consists mainly of an application which eases the communication.

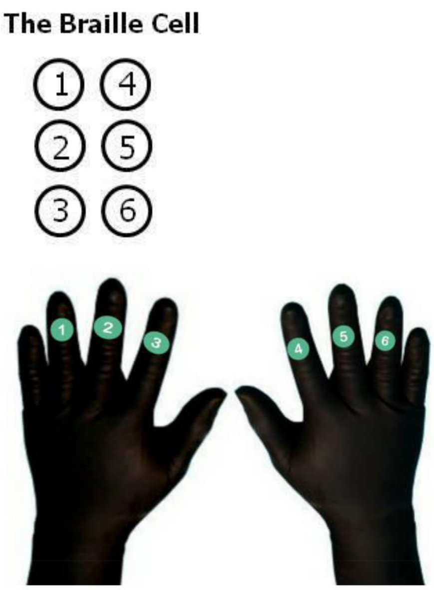

Fig.3 Standard Braille Script Cell

Fig3. shows the Braille Cells which is allocated to three fingers on both hands,with the help of vibrational motors attached to each fingers used,allows the user (here Blind/Deaf) to feel the vibrations corresponding to the alphanumeric representation of Braille Script as shown in .The switches within the gloves help the to send the messages to the users at the other end[8].

Fig.4 Welcome page

Fig.4 shows the home page of our application which includes options for signing up,logging in as an existing user or guest user.

Fig.5 Login and Sign UP Pages

Fig.5 shows the Login and SignUP pages which helps the user to manage an account in the application.The Login page is for the existing users and the new users can create an account using the SignUP page and use the Login option afterwards.The account helps in saving the progress/the data used by the person using the application.

Fig.6 Message receiving and sending pages

Fig.6 shows the message sending and receiving pages.The sending page is normally used by the normal section of users whereas the receiving page is used by the blind or deaf user.The receiving page also includes an option to replay the message received in case the special user is not able to understand the message the initial time.

Fig.7 Settings Page

Fig.7 shows the settings page which includes a logout option and an option to set the vibration intensity and the vibration duration according to the needs of the users.

VI CONCLUSION

The Braille Hand Glove can be successfully used to receive as well as transmit text data from and to the glove. In our work we present a low cost, efficient and portable hardware design of a Braille hand-glove and a software application which can be used by the deaf-blind people to communicate with the outside world.The use of a set of discrete symbols (Braille) instead of continuous gestures allows a less complex design because sensors and actuators provide an impulse or to produce a stimulus.. Thus the device uses less parts and is cheaper.Although the glove is comfortable to wear, the wearer can perceive and interpret incoming messages by vibrational motors on the six fingers in the glove.This communication device provides deaf-blind people to interact with the normal people and this makes them easy to communicate with outside world.

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