Haptic feedback technology-based communication application for Differently abled people

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Abstract

Unlike normal people, every day is a challenge for the people who are visually impaired, deaf and dumb. It is extremely difficult for them to communicate with someone. Generally, it is observed that subjects who are blind and deaf find it difficult to communicate with others and often they are misunderstood. Also, it is almost impossible for them to communicate over long distances. To overcome this difficulty, there is a need to develop some tool or aid which will help them to communicate with others. An app can be developed to overcome their limitations where they could communicate fluently with minimal difficulties. The Morse code can be used as a way of communication for them.

Keywords: *Communication, sensory disabled, deafblind, deaf, dumb, visually impaired.*

1. Introduction

We human beings, have many organs but there are 5 important sense organs that connect us with the environment. Sensory organs are valuable because they allow us to interact to the world in which we live. Deaf, Visually Impaired and dumb are those unfortunate people who have difficulty in hearing, vision and speech. Analysis of data shows that 2% of the world's population have 'milder forms' of deaf-blindness whereas 0.2% of the world's population has severe deaf-blindness.[1] According to The World Federation of the Deafblind (WFDB) it is learnt that, between 20-75% of persons with deaf-blindness have additional impairments.[1] Hence, these people face utmost difficulties to communicate. Communication is one of the most important tools that aids us to connect with people. Connecting with people is essential in today's world.

The proposed app will help the person with sensory disabilities to overcome these restrictions of

communicating properly. The app is based on encoded language, i.e. Morse code. The Morse code is a code with standardized sequences of two different signal durations, called DOTS and DASHES. The DOTS and DASHES are differentiated by different durations of vibrations hence, the person using it can efficiently communicate with the other person. The disabled person could also send messages by using the volume buttons of the smartphone having this app, a single tap determining DOT and holding the button will determines DASH. This message sent through the internet can be translated into the desired language of the receiving person.

2. Problem statement

Statement of Problem

Communication is a basic human activity which empowers us to exchange thoughts and feelings to each other. People with sensory disabilities face difficulties to communicate with others. This proposed app will enable the person with sensory disability communicate with others person with the help of morse code with fluency and without any difficulty to understand.

3. Existing system

1) Sign Languages: People who were already deaf and as they grew start losing their vision, tend to use Sign language more. Sign languages are languages which uses visual-manual combinations with non-manual elements to express the meaning.

i) Adapted Signs: The people who are deaf-blind and have restricted peripheral vision uses this type of sign language, the signer signs at a particular small area mostly near chest, some signs are performed at waist level, which may need to be adapted.

ii) Tactical Signs: The deaf-blind person feels the signer's finger movements, position and the shape to understand the conversation. They can use either one-handed or two-handed tactical sign language.[2]

2) Speech reading: This method is a traditional method used for communication the deaf-blind person used touch to understand the conversation, he places his finger on the lips and chin of the speaker to understand.

3) Screen Braille Communicator (SBC): It is a device which is used as a medium of communication between the deaf-blind and other person. The device has two sides the sighted person will use the first side which has a qwerty keypad and an LCD display and the deaf-blind person will use the second side which has a braille display. He reads the text using touch, by placing the finger on the braille display. Also, he uses the braille display to text back.[2]

4) CapTel: The people with deaf-blindness use CapTel to make telephone calls. Where the person who is using it speaks directly to the other person while speech gets translated using voice-recognition technology, the person on the other end listens using the residual hearing and the text is displayed on the CapTel screen which he can read.

4. Literature Survey

Table No. 1

Sr. No.	Paper Title	Author	Year	Advantages	Limitations
1.	**Development of Communication in Deafblind Children [7]**	Gunilla Preisler	2006	Importance of communication between deaf-blind children and their parents.[7]	The solution of this problem was not given specifically.
2.	**Speaking and Understanding Morse Language, Speech**	Andras Arato, Norbert Markus, Zoltan	2012	Morse code and spoken language similarities and differences.[8]	Strategies are mentioned but lacking in giving the idea of implementation.
	Technology and Autism [8]	Juhasz			
3.	**Deafblind People, Communication, Independence, and Isolation [9]**	Marion Hersh	2013	Thorough survey on subjects of different countries and languages.[9]	The Research defines the problems of the deaf-blind, but the measures to overcome this was not given.

As shown in Table 1, Gunilla Preisler in "**Development of Communication in Deafblind Children**" based on the growth of communication between parents and their deafblind children in real life settings.[7]. Andras Arato, Norbert Markus, Zoltan Juhasz in "**Speaking and Understanding Morse Language, Speech Technology and Autism**" stated the importance and various implementation of morse code, he also explained the encryption and decryption of the morse.[8]. Marion Hersh in "**Deafblind People, Communication, Independence, and Isolation**", based on the analysis of 28 deafblind people from 6 different countries stated the communication difficulties between each other and the various issues of deaf-blind to feel left out in society.[9].

5. Limitations of the Previous Systems

In previous systems, the person with vision loss and hearing loss could communicate with others in face-to-face situations only, he cannot communicate over long distances. As for communicating over long distances they required either hearing ability for voice calls or vision for video conference calls. While the other systems which do not require hearing or visual abilities were only for face-to-face situations. Also, in some cases the deaf-blind person were misunderstood. The limitations were that the method of communication which was used for short distances was not being able to use over long distances.

6. Proposed System and Advantages

The Application is for ease of communication with sensory disabled people it can also be used by non-disabled for daily use. The app will be consisting of different ways to communicate with the desired person.

Features:

The User can communicate to the desired person by using either mobile data or Wi-Fi network the message will be sent through the internet. The user can communicate in either normal text, morse code or speech to text/text to speech format. The system will store older messages using the database. The user can also learn morse code in a specified section on the app.

Advantages of Proposed System:

This System is User friendly as any audience can use the app even the sensory disabled.

•   This system helps the sensory disabled to communicate with others over long as well as short distances.

•   The messages transferred will be encrypted for added security.

•   The system is designed such that the deaf-blind person would be able to interact with the with minimal difficulties.

•   The user can type the message (morse code) using the volume buttons of the mobile phone, speech to text or plain text using the keyboard of the mobile phone.

•   The user can get the message in the form of different types of vibrations, text to speech or plain text message.

User Registration:

The User needs to be registered first to the database to use the app. The User needs to fill the required fields to register like their name, date of birth, gender, contact number, email address, username, and password.

Friend Request:

The user needs to send friend request to the desired person to be able to contact with him. After the request is accepted by the other user, they will be termed as friends and will be able to communicate with each other.

Send Message:

After both the users are termed as friends, they can send messages using whichever format they want i.e. text, morse code or speech to text.
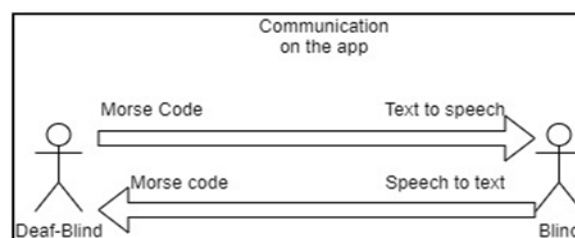

Figure 1: Communication on the app

2471

System Coding:

The proposed app is coded in Android Studio, it is an Integrated Development Environment (IDE) built for Android operating system. It is basically used to make applications for android operating system devices [3] using languages like java, kotlin, XML, etc.

The XML (extensible Mark-up Language) is used to create the layout files in the application, consisting of all UI elements. Java is used for the back-end coding of the application. Here Database is also linked as for transferring messages over the internet and for user authentication.

Morse Code:

It is a type of coded language which is used to represent alphabets, numbers, and punctuations by arranging the dashes and dots in a specific sequence. It was made in United States by an American Artist namely Samuel F.B. Morse during 1830s. [4] In World War II and the Korean and Vietnam wars, Morse Code was used for Communication.[4] The morse code can be translated using a simple chart.
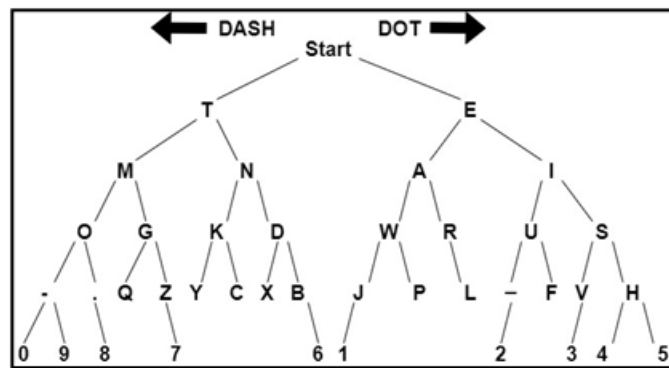
Figure 3-Morse Code Chart

The below table shows the translation of the English alphabets to morse code language. There is a specific sequence of dots and dashes for each letter or number.

Figure 4-Morse code translation table

Learning Morse Code:

2472

Morse Code should be taught to the differently abled to use the app, for that there is a separate section that would help you to teach morse code to them. Braille Language is used to make them understand the Morse code chart.
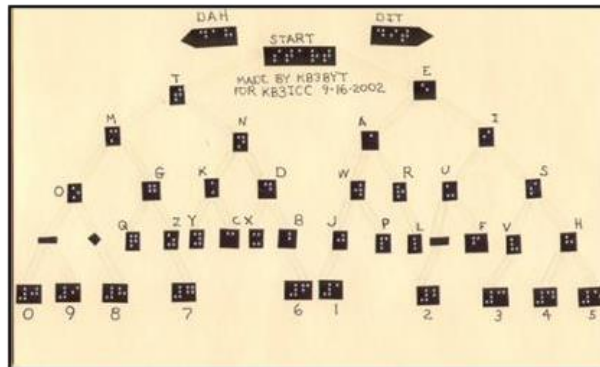

Figure 5-Learn Morse Code [5]

Stakeholders

Stake holders are directly or indirectly involved in the project which affects the outcome of the project.

1.   Admin:

The admin has rights to block or delete a user who violates the laws. If a user is reported multiple times, the admin sees to it that the user must me blocked or not.

2.   User:

The user is the one who uses the app and he firstly need to create a profile i.e. register into the app. After registration, he needs to set a username and password for his profile for further use. He can now add friends by sending them friend requests.
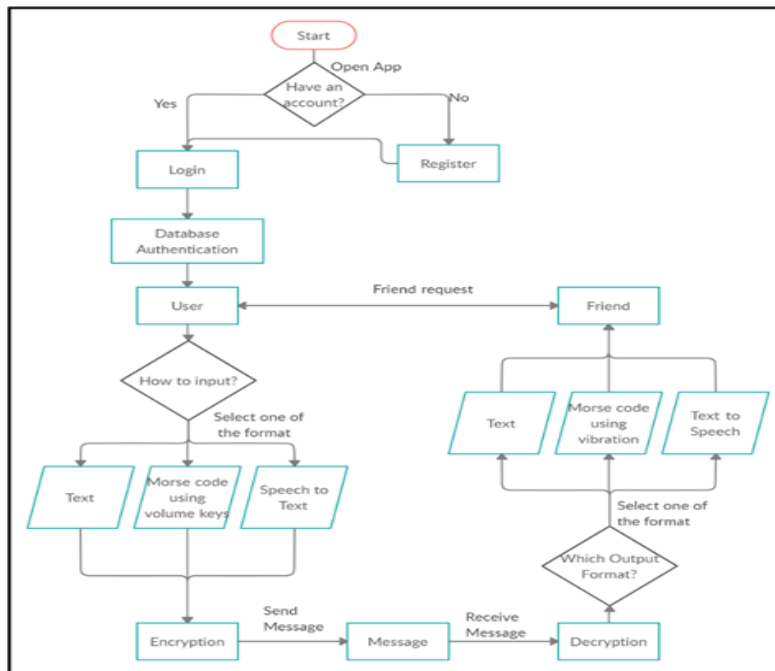

Figure 6: Flow chart of the app

2473

7. Analysis

For better understanding the problems of the deafblind I conducted a survey using google forms which help to determine the stats of the problems faced for different people. Please NOTE, the opinions of 27 differently abled were taken into consideration and the results were as follows:
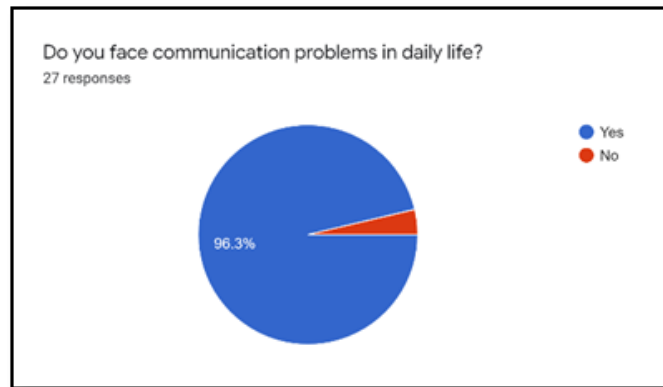

Figure 7

The given chart shows us who faces communication problems in daily life, 83.3% faces problems while communicating & 16.7% do not face communication problems.
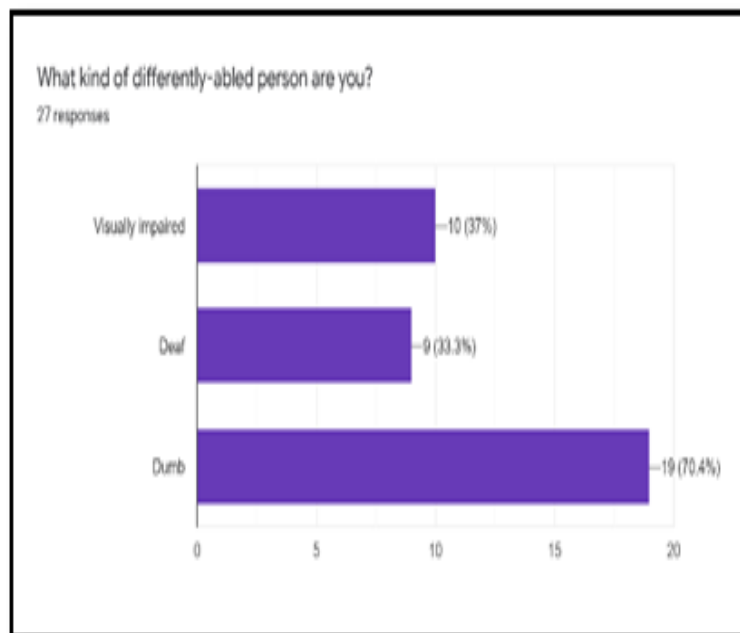

Figure 8

2474

The given graph shows us that 37% of the total survey were visually impaired, 33.3% have deafness and 70.4% are dumb.
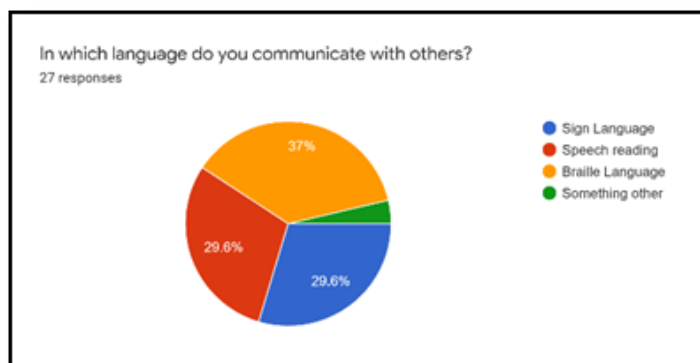

Figure 9

The given pie chart shows, in which language does they communicate. 29.6% uses sign language, 29.6% uses Speech reading for communication, 37% uses Braille language as a communication language and 3.7% uses something other than these languages.
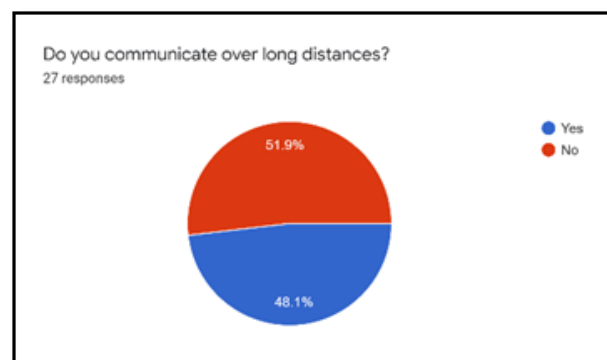

Figure 10

The given chart shows that 51.9% do not communicate over long distances, and the remaining 48.1% communicate over long distances.

Figure 11

The graph shows us the different platforms used for communication, 26.7% uses voice calls, 73.3% uses video calls ,60% uses text messages for communication and 6.7% uses other hand sign.
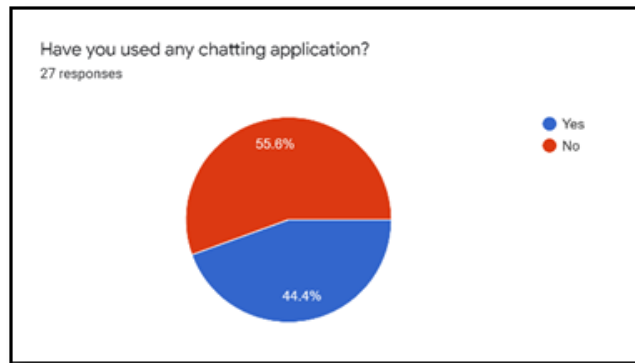

Figure 12

The given char shows us 55.6% have used some chatting applications whereas 44.4% haven't used any chatting application.
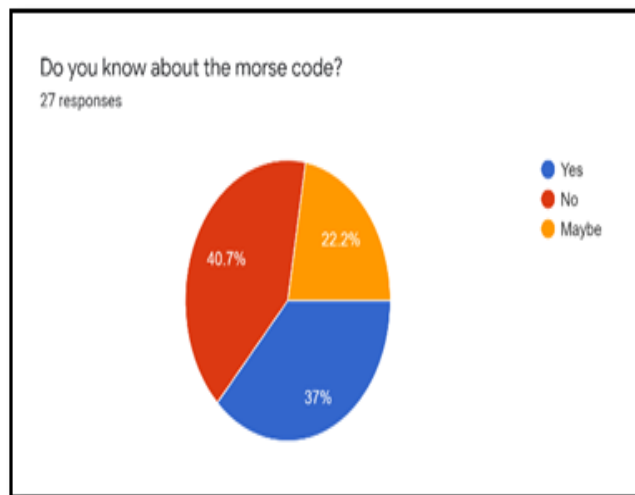

Figure 13

The chart shows the awareness of morse code, 37% knows about the Morse code, 40.7% don't know about the morse code and the remaining 22.2% are not sure.
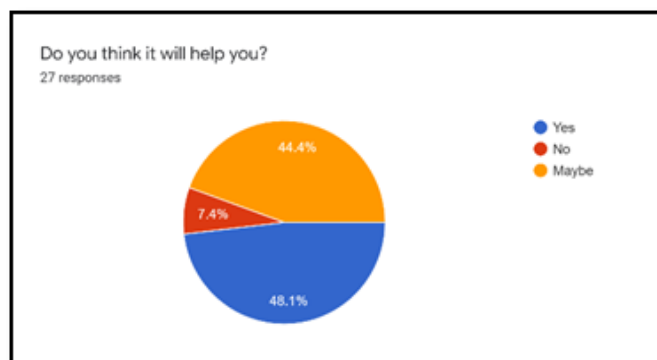
Figure 14

The given chart shows that 48.1% thinks that morse code would help them for communication, 44.4% are not sure will the morse code will be helpful and 7.4% says that, the morse code will not be helpful for communication.

8. Future Scope

The Some of the future scope that can be done to this system are:

- We can add some emergency services which can help the disabled user to communicate to hospitals and police stations.

- Providing the system with gps services will help to track the disabled user location.

- The application can be more user friendly to make it less difficult for the user to use it.

- We can add a feature for changing the functionalities of the volume keys according to the user.

9. Conclusion

The proposed system provides an android based application which will be helpful for the deaf-blind community to communicate freely with minimal difficulties. This will help those disabled people to blend in the society. The app can also be used as a chatting application for the desired audience.

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