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GLOVE for Speech Recognition

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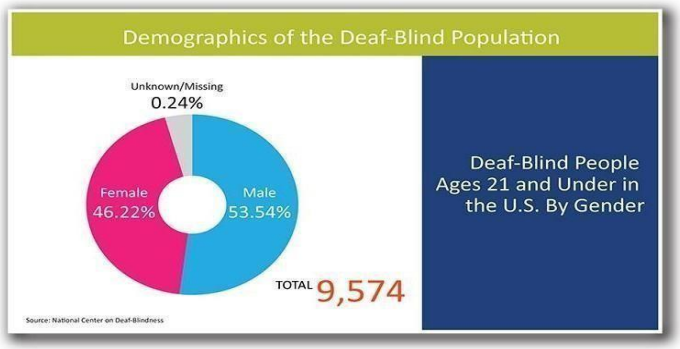
Abstract:-
Advancements in Biomedical field provide lot of assistive devices to help deaf people and visually impaired people. When it comes to the subject of deaf-blind people (who losses both hearing and visual ability) availability of such devices are very limited. Tactile signaling and manual alphabets are the most commonly methods used to make the reciprocal communication between the impaired and the surrounding environment possible. Existing devices like MyVox, Sparsha are use braille tactile reading/writing to make communication between two deaf blind users. Assistive systems available in market are high cost and invasive. The proposed system is wearable, non-invasive, compact and low cost. It can recognize the speech and convert into Morse code vibrations. Raspberry Pi is used to convert speech into text using microphone and then each text changed to Morse code using raspberry pi. These signals will be sending to micro haptic vibrating motors through GPIO pins of raspberry pi which are attached with user's fingers.

I. Introduction

From the statistics of the World Federation of the Deaf and blind, approximately 70 million people in the world are deaf– mute. A population of 360 million people are deaf, and 32 million of these are children. The majority of speech- and hearing-impaired people cannot read or write in regular languages. Sign language is the native language used by the deaf and blind to communicate with others. Sign language relies primarily on gestures rather than voice , and it combines the use of finger shapes, hand movements, and facial expressions. This language has the following main defects includes a lot of hand movements and limited vocabulary. Moreover, it is unfamiliar to those who are not deaf and blind and disabled people face serious difficulties in communicating with able individuals. This communication barrier adversely affect the lives and relationships of deaf people with the society. As a result dumb people need to use a translator device to communicate with individuals.

This is carried out by developing a glove equipped with sensors and an electronic circuit. Several benefits of using this device are that no complex data processing is needed there are no limitations on movements such as sitting behind a desk or chair; hand shape recognition is not affected by the background condition it is a lightweight, SLR-based glove device that can be carried to make mobility easy and comfortable and it is a recognition system that can be employed for learning SL for both deaf and blind people.

A person who is deaf-blind will have an unique experience of this world. For the people who visualize and hear, the world extends outward as far as his or her eyes and ears can reach. For the young child who is deaf- blind, the world is initially tough. If the child is profoundly deaf and totally blind, his or her experience of the world extends only as far as the fingertips can reach. Such children are alone if no one is touching them. Their ideas on the world depends upon what or whom they have the opportunity to get a physical contact.



Fig[1] Deaf-Blindness Population

If a child who is deaf-blind has some usable vision and hearing, as many do, world will be enlarged. Many children called deaf-blind have enough vision to be able to move about their environments, recognize familiar people, see sign language at close distances, and perhaps read large text. Others have hearing to recognize familiar sounds, understand some speech. The range of sensory impairments included in the terms deaf- blindness is great.

II. Causes for Deaf-Blindness

Some people are deaf-blind from birth. Others may be born hard of hearing and become blind or visually impaired later in life or vice versa. Still others may be deaf-blind that is, they are born with both sight and hearing but lose some or all of these senses as a result of accident or illness. Deaf- blindness is often accompanied by additional disabilities. Causes such as maternal rubella affect the heart and brain. Some syndrome or brain injuries that cause deaf-blindness may also cause cognitive disabilities and also physical disabilities. Major Cause of Deaf- Blindness Syndromes are Down, Trisomy 13, Usher. Multiple Congenital Anomalies are Charge Association, Fetal alcohol syndrome, Hydrocephaly, Maternal drug abuse, Microcephaly.

Prematurity Congenital Prenatal Dysfunction AIDS, Herpes, Rubella, Syphilis, Toxoplasmosis, Post-natal Causes Asphyxia, Encephalitis, Head injury/trauma, Meningitis, Stroke.

III. Challenges faced by Deaf-Blind

A person who is deaf-blind must use the limited information available to him or her. If the person's sensory disabilities are high, and incase people in the environment have not made an effort to order the world for him or her in a way that makes it easier to understand, this challenge may be harder. Behavior and emotional obstacles often accompany deaf-blindness and are the natural outcomes of the sufferer's inability to understand and communicate.

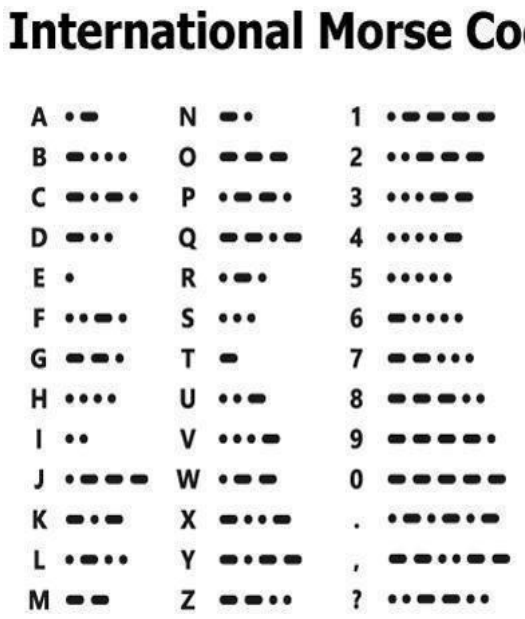
People who can see and hear often take the information that senses provide them. Events such as the approach of another person to introduce, an upcoming meal, decision to move out, a change in routine are all signaled by sights, hand movements sounds that allow a person to prepare for them. The child or adult who miss these because of limited vision or hearing may come to experience the world as an unpredictable, and possibly threatening place to survive. To some extent, persons who are deaf-blind must depend upon the good cause and sensitivity of those around them to make their world safe and understandable. The challenge of learning to communicate is the greatest constraint that children who are deaf- blind face. It is also the greatest point, since communication and language holds the power to make their thoughts, needs, and desires known to others. The ability to use words can also grows here worlds beyond the reach of their fingertips through the assistance of interpreters, books, and an ever-increasing array of electronic communication devices. In order to learn language, children who are deaf-blind should be dependent on others to make language accessible to them. Given that accessibility, the children who are deaf-blind faces the obstacles for engaging in interactions to the best of their abilities and availing the language opportunities provided to them. A person who is deaf-blind faces many challenges for learning to move around the world as freely as well as independently as possible. Individuals also should find living and working situations that allows them to use their talents and abilities in the best way. Most of the adults who are deaf-blind lead independent or semi- independent lives and have productive work and enjoyable social lives. This achievement depends in large part because of the education they have received since childhood, and particularly upon the communication with others that they have been inculcated to them. Think of thousands of words and sentences that most children hear before they speak on their own. A child who suffers from deaf-blind needs comparable language stimulation, adjusted to their ability to receive and make sense of it. Parents, caregivers, and teachers face the challenge of providing an environment which is rich in language, meaningful and accessible to the child who is deaf-blind. Only with such a rich language environment will the child have the opportunity to acquire language herself or himself. Those around the child can create a rich language environment by continually commenting on the child's own experience using sign language, speech, or whatever symbol system is accessible to the child. These comments are best made during conversational interactions. A teacher or a parent may, use gestures to name the object that the person is touching, or name the movement that they share. This method of naming an objects and actions which is carried out many times, may begin to give the child who is deaf-blind a similar opportunity afforded to the hearing child. So that making meaningful connections between words and the things for which they stand.

IV. Mode of communication to express their Thoughts

Along with the nonverbal and verbal mode of conversations, a child who is deaf- blind needs a easy routine for meaningful activities, and some way or ways that this routine can be communicated to them. Touch, gestures, and usage of symbols are some typical ways in which to let a person who is deaf-blind to know what is about to happen to them. Each time before the

affected person is picked up, the caregiver may gently lift their arms a bit, and then pause, giving the person time to ready themselves for being handled. Such consistency in treating them, will help the person to feel secure and to begin to make the world predictable, thus allowing the child to develop expectations.

Deaf-blind uses symbolic communication that is more reliant on predictable routine than people who are sighted and hearing. Predictable routine will help to reduce the anxiety which is often caused by the lack of sensory information. Principal communication systems for persons who are deaf-blind are these: touch cues, gestures, object symbols, picture symbols, sign language, fingerspelling, Signed English, Pidgin Signed English, braille writing and reading, Tadoma speech reading method, American Sign Language, large print writing and reading, lip-reading speech. Teachers, parents, siblings, and peers can continue conversations with children who are deaf- blind by learning to pause after each turn in the interaction to allow time for response. These children frequently have very slow response times. Respecting the child's own timing is crucial to establishing successful interactions. Pausing long enough to allow the child to take another turn in the interaction, then responding to that turn, pausing again, and so on—this back-and- forth exchange becomes a conversation. Such conversations, repeated consistently, building relationships becomes the eventual basis for learning the language. If the person who is deaf-blind becomes comfortable interacting nonverbally with others, subsequently he is ready to receive some sought of symbolic communication as part of those interactions. Often it is helpful to accompany the introduction of words with the usage of simple gestures and objects which serve as a symbols or representations for an activity. Doing so may help a deaf-blind person to develop the understanding that one thing can stand for another, and will also enable them to anticipate events.



Fig[2] Morse Code

V. Mobility and Individualized Education

In addition, the person who is deaf-blind will need help learning to move around the world. Without vision, or with partial vision, they will not only have hindrance in navigation, but may also lack motivation to move outward in the first place. Helping a young child who is deaf-blind learn to move may begin with thoughtful attention to the physical space around them so that whatever movements the child instinctively makes are rewarded with interesting stimulation that motivates further movement. Several orientation and mobility specialists can assist parents and teachers to construct safe and motivating spaces for the young child who is deaf-blind. In many circumstances person who is deaf-blind may also have additional physical health problems that limits their ability to move forward in life. Parents and teachers should support them by providing physical and occupational therapists, vision teachers, health professionals, and orientation team to plan accessible and motivating spaces for the people. Older children or adults who have lost vision can also get assistance from trained specialists in order to achieve as much confidence and independence as possible in moving about in their world. Education for a child or youth affected with deaf-blindness needs to be highly individualized by using the limited channels available for learning necessitate organizing a program for each child that will address the child's own ways of learning and their own interests. Assessment is very crucial at every step of the way. Sensory deficits can easily mislead even experienced educators into underestimating or overestimating intelligence and constructing inappropriate programs. Hellenkeller said Blindness separates a person from things but deafness separates him from people. This potential isolation is an important reason for engaging the services of persons familiar with the combination of both blindness and deafness when planning an educational program for a person who is both deaf-blind. By doing so, will help a child or youth with these disabilities to receive an education which maximizes their own potential for learning and for meaningful contact with this society. The earlier these services can be obtained, the better for the child.

VI. Architectural Design

In this Block Diagram, Five buttons and one microphone used as input devices and five haptic motors and one speaker used as output devices to the controller. Here, Raspberry Pi is used as controlling unit. Microphone used to get voice input from normal people and button used to get input from impaired people. When the speech to text conversion completed it gives to the encoding section and gives the user understandable vibrating output via haptic motors. Depending on the button status message of user conveyed to normal people with the help of a speaker.

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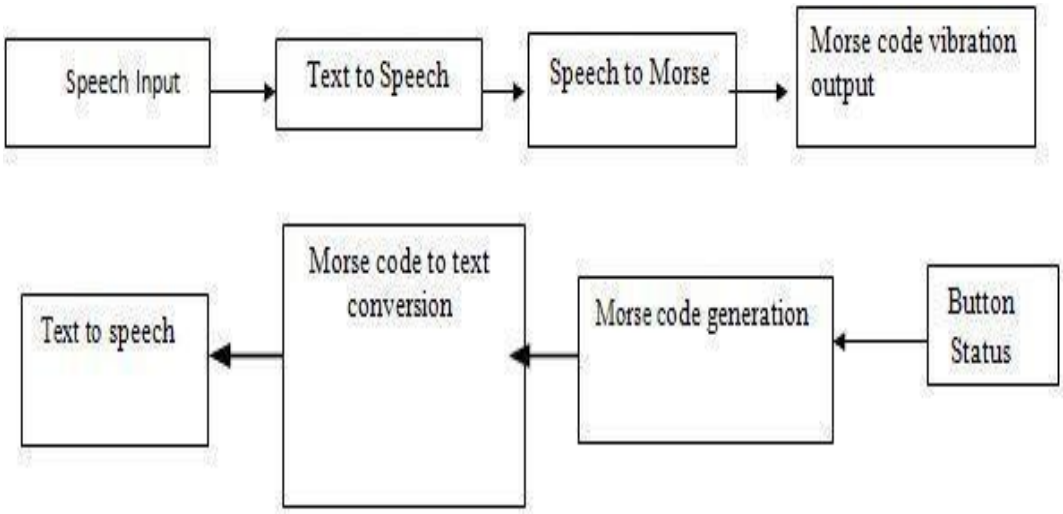
The below diagram consists two major actors called speaker and user. Speaker speaks to the user

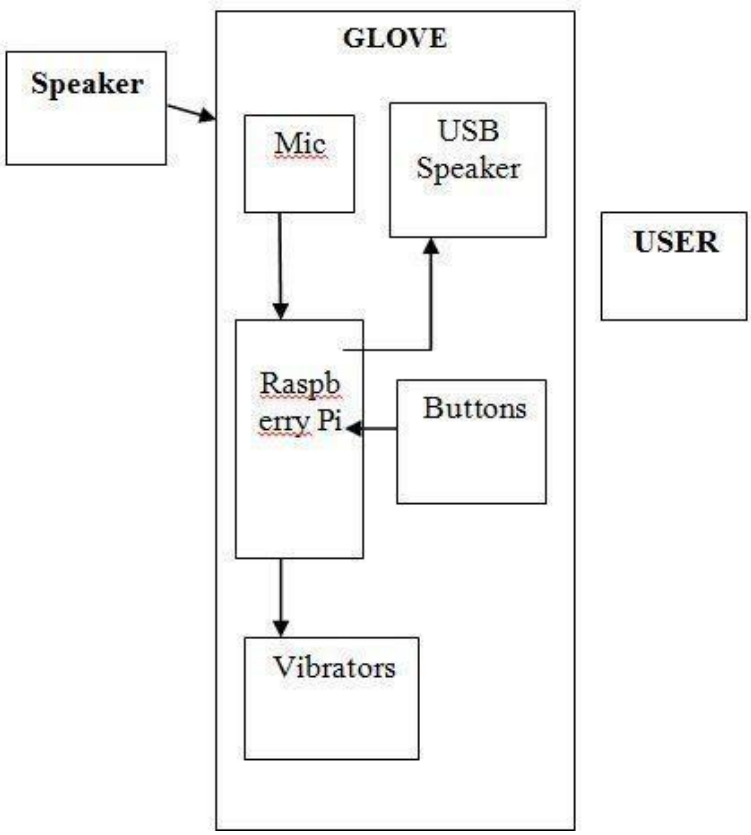
who suffers from deaf-blindness. The user has been assisted with the glove which contains the above mentioned components. Raspberry Pi is used as controlling unit. It supports the entire system by controlling the working mechanism. Microphone used to get voice input from normal people who is referred as the speaker in the above mentioned block diagram and button used to get input from impaired people. When the speech to text conversion completed it gives to the encoding section in terms of morse code and gives the user understandable vibrating output via haptic motors. Depending on the button status message of user conveyed to normal people with the help of a speaker. Haptic technology is also known as kinaesthetic communication or 3D touch. This is a technology that supports to analyse touch experience by applying forces, vibrations, or motions to the user. These technologies can be used to create virtual objects in a computer simulation, to control virtual objects, and to enhance remote control of machines and device. Haptic devices were incorporated with tactile sensors that measures the forces exerted by the user on the interface.

The word *haptic*, from the Greek, means "tactile, pertaining to the sense of touch". Simple haptic devices are common in the form of game controllers, joysticks, and steering wheels. Haptic technology helps in investigations of how the human sense of touch works by allowing the creation of controlled haptic virtual objects.

Most researchers distinguish three sensory systems related to sense of touch in humans cutaneous, kinaesthetic and haptic. All perceptions mediated by cutaneous and kinaesthetic sensibility are referred to as tactual perception. The touch sense may be classified as passive and active. But the term haptic is often associated with active touch to communicate or recognize objects.



Fig[3] Conversion Flow



Fig[4] Block Representation

VII. Components Used

a. RASPBERRY PI

The Raspberry Pi is a series of small single- board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote basics in computer science mainly in schools of the developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals or cases. However, some accessories have been included in several official and unofficial bundles. An SD card inserted into the slot on the board acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA TV set, a more modern monitor, or even a TV using the HDMI port.

Fig[5] Raspberry Pi

b. SPEAKER

Computer speakers range higher in both quality and price. Computer speakers sometimes combined with computer systems are too small, plastic, and have mediocre sound quality. Some speakers may have equalization features such as bass, treble controls etc. Speakers inbuilt with Bluetooth feature can be connected with a computer by using an Aux jack and compatible adaptor. More sophisticated computer speakers can have a subwoofer unit, which enhances the bass output. The larger subwoofer enclosure usually contains the amplifiers for the subwoofer and the speakers. Some computer displays have basic built-in speakers. Laptop computers have built-in integrated speakers, usually small and restricted sound quality to conserve space. Instead of using a computer speaker for better sound, a computer system can be connected to any external sound system, to get typically a high-power and high- quality setup.

Fig[6] Speaker

c. TOGGLE SWITCH

The toggle switch is a kind of electrical switch that is provided with a handle or lever that makes it possible to control the flow of electric current or signal from a power supply to a device or with in a device. It is a hinged switch that can assume either of two positions ON or OFF.

Fig[7] Toggle Switch

d. VIBRATOR

A vibrator or beeper is an signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers include alarm devices, timers, and vibrators for user input such as a mouse click or keystroke. It is also referred as buzzer. This buzzer or vibrator creates a vibration which is received by the user with in the glove.

Fig[8] Vibrator

VIII. Result

Deaf-blindness is the sum of both hearing impairment and vision impairment. The absence or impairment of both distance senses gives a condition which is more disabling than the sum of each. Deaf- blindness is usually rare among young people but becomes easier at higher ages. Deaf-blindness can be either congenital or acquired. The heterogeneity of the population has been reported to be huge. Different levels of vision and hearing loss, different use of language modality, different kinds and severity of additional disabilities, and different medical aetiology are some of the variables splitting the group. Hence by inserting the glove the objective of this project has been achieved.

IX. Conclusion

A Glove for deafblindness is designed and implemented with different gestures. Each gesture specifies basic needs. This system is more reliable, efficient, easy to use and a light weight solution to the user as compared to other proposed systems. This bridges the communication gap between speech impaired people and others. During this project we have faced various challenges and we have tried to minimize the problem. Since, we observed that they cannot handle bulky and delicate in structure. The output is in the form of vibration which is easily understood by the affected person. This system will provide assistance to the deafblindness people to express their needs using gestures.

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