

HAND GESTURE RECOGNITION AND VOICE CONVERSION SYSTEM FOR SPEECH IMPAIRED

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Introduction:

Studies have found that deaf people are around twice as likely to suffer from psychological problems such as depression and anxiety. The suggestion from most researchers is that these issues are a result of the isolation associated with deafness. Obviously, it is more difficult to communicate with others when you're hearing impaired.

The hearing disorder may be broadly classified into three types.

Sensorineural hearing disorder: This disorder causes a prominent form of hearing impairment. It is caused when the receptor nerves and hair cells are damaged mainly because of age, noise. Sensorineural hearing disorder affects the pathways from receptor to brain. Majority of the times, this disorder can't be rectified medically or surgically, but can be assisted by the use of hearing aids.

Conductive hearing disorder: This kind of hearing loss is caused as a result of blockages within the outer or bodily cavity due to fluids, tumors, earwax. This blockage halts the sound waves from attending the receptor. This disorder can often be healed surgically or cured with medication.

Auditory Neuropathy Spectrum Disorder (ANSD): This disorder is caused when the sound waves vibrating the cochlea are not organized or the hearing nerve doesn't process sound even if receptor encounters sound normally. There are possibly many reasons for this disorder like directly inherited through genes from the ancestors or due to trauma. ANSD can be induced in several cases such as lack of oxygen at birth, blood transfusion is required, premature birth, at

the time of birth, ototoxic drug exposure, immune disorders, mumps caused by infection and many more.

As D&D people use sign language to communicate it will be thought to them through special schools and among them American Sign Language (ASL) is the most preferred one and is employed by USA, India, parts of Mexico and Canada. ASL may be a language with its own unique rules of grammar and syntax. ASL also grows and changes with time like the rest of the languages and ASL is welcomed by many high schools, colleges, and universities in fulfilment of contemporary and foreign language honor requirements.

Objectives:

1. To implement a user friendly interface for the communication between the system and the user.
2. To bridge communication gap between D&D people and common people.
3. To boost confidence in D&D people by giving them a voice.

Methodology:

We propose to do the project using Smart gloves and LabVIEW software for translation based on the American Sign Language system. We use flex sensor to obtain the biosignals from finger based on hand gesture using LabVIEW software.

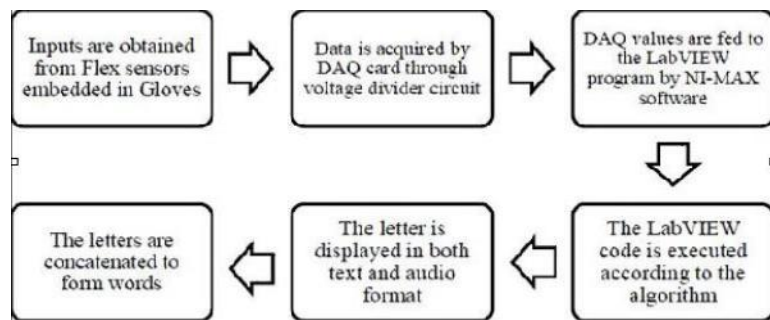


Fig.1. Overall block diagram of hardware and software.

The input from each of the five-flex sensor is obtained and analyzed if the corresponding finger is open, half closed or fully closed. Depending on this, 0, C or M is assigned as obtained. Such strings are concatenated from all five fingers and are concatenated. The concatenated string is then compared with the string assigned to each letter and the corresponding letter is shown. These letters are then concatenated to form words. The flowchart of the software implementation of processing the values obtained from the flex sensors is depicted.

Signal Conditioning Circuit: Figure 2. shows the voltage divider circuit for connecting fiexible resistive sensors Let Resistance of Flex sensor be R_F and we use another resistance $R = * k2$. The input voltage is V_{in} and voltage obtained is V_{out} given by: V_{out} coming from

each flexible of Resistive Sensors is connected to Analog input Channel NI USB-6008 DAQ card.

All 26 letters were then gestured using the smart gloves and the LabVIEW software. Could convert these signals to their corresponding values. The algorithm is based on the flow chart depicted in Figure 3. The input from each of the five-flex sensor is obtained and analysed if the corresponding finger is open, half closed or fully closed. Depending on this, O, C or M is given as obtained. Such strings are concatenated from all five fingers and are concatenated. The concatenated string is then compared with the string assigned to each letter and the corresponding letter is shown. These letters are then concatenated to form words and sentences. The output is given in both text and audio format.

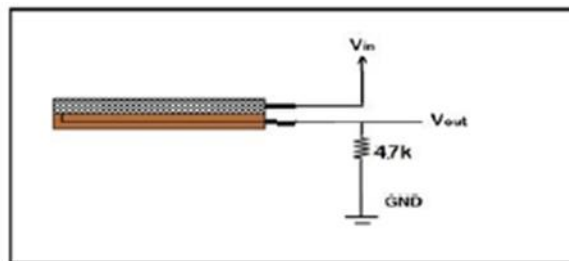


Figure 2: Voltage divider circuit

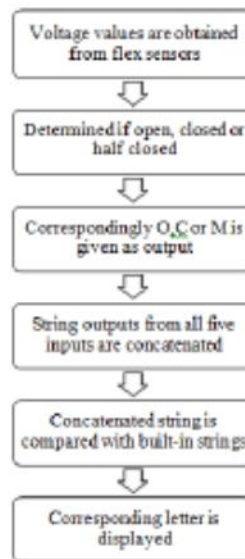


Figure 3 Flowchart of the sequence

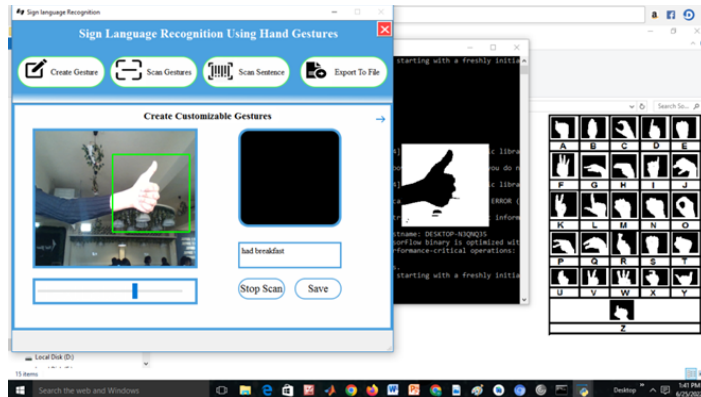


Figure 4 Picture of Sign Language recognition

Results and conclusion:

1. This project uses the hand gestures and flexes as input while the output is in the form of audio or text.
2. To implement an assistive device for the deaf and dumb community in converting the sign language into corresponding text and audio outputs display on graphical user interface.
3. Able to recognize all 26 (A-Z) letters according to American Sign language and to build words up to length of Six letters along with an audio output.

Scope of future work:

1. Other than only American Sign Language, in future this type of signal conversion can be implemented for various languages.
2. More signs can be included with more data collected.