

DESIGN AND DEVELOPMENT OF ASSISTING DEVICE TO COMMUNICATE BETWEEN NORMAL PERSONS AND SPEECH IMPAIRED

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Abstract: According to WFD organisation there are around 70 million deaf mute persons in world and many organisations are working for their welfare. The ability of Deaf and dumb people to do things is very high and they can do wonders if proper education and awareness are created. The communication between two deaf people is easy and with normal people is herculean task. Deaf people need an efficient non auditory means of expressing and interpreting information in order to communicate and sign language have proven effective in communicating across a broad spectrum of requirements from everyday needs to sophisticated concepts. American Sign Language is the native sign language used in America where the research has been conducted, but the work is equally applicable to other signed languages. In this paper, we proposed a system to convert the sign language used by the speech impaired in to voice for the understanding of normal persons. The sign language converted in to electric signal with the help of sensors and its equivalent meaning is displayed as text by LCD and voice through smart phone. This system will help to improve the life style and employability of speech impaired persons.

Keywords: Sign language, Sensor, Smart phone, Controller

1. Introduction

The World Health Organization report unveil that about 15% of the world's population lives with some form of disability, of whom 2-4% experience significant difficulties in functioning. The global disability prevalence is higher than previous WHO estimates, which date from the 1970s and suggested a figure of around 10%. This global estimate for disability is on the rise due to population ageing and the rapid spread of chronic diseases, as well as improvements in the methodologies used to measure disability. One-fifth of the estimated global population experience significant disabilities.

US census bureau revealed that in USA around 2.7 million people approximately 1 in 100 are affected with some form of speech impairment. In which 5% of them are children's. According to the Data provided by Canadian Survey on Disability (CSD) 2012, almost 14 percent of the Canadian population aged 15 years or older – or 3.8 million individuals – reported a difficulty or impairment due to a long-term condition or health problem that limited their daily activities. The prevalence of disability increased with age, with the average onset age in early 40s. Persons with disabilities, on average as a group, are more likely to experience adverse socioeconomic outcomes than persons without disabilities, such as less education, poorer health outcomes, lower levels of employment and higher poverty rates.

People who suffer from hearing and/or speech disorder can be a victim of social isolation. Hearing impaired or speech disabled persons can become targets of bullying among normal people due to their disorders. The bullying can result in lowering of self-esteem in hearing or speech impaired persons, especially among young children. The main intent of this project is to provide a standalone device which will bridge the gap between the speech impaired and the normal humans which in turn uplifts the life of the disabled persons towards the growth of the society.

A device is developed to translate the alphabets of sign languages to text is explained in [3]. Hence communication between deaf mute and normal person becomes a large barrier. Proposed a Glove based system which translates the alphabets of American Sign Language into voice. Accuracy of recognizing the character is less. [4]. Laryngeal aerodynamic analysis measures respiratory and laryngeal functions reflecting the coordinative nature of voice production [7] An experimental study was conducted on normal hearing adults for high predictable and low predictable sentences in non-degraded and artificially degraded conditions of stimuli revealed that the score of High predictable sentence is high compared to the low predictable sentence. [9] Utilized Microsoft Kinect a motion capture

device which converts the human gestures into voice. [11] Classifiers like K-Nearest Neighbor (KNN), Proximal Support Vector Machine (PSVM) and Naïve Bayesian are proposed to translate the tamil sign language into tamil words. [12] To reduce the barrier, this paper proposed a system which convert standard sign language signs into corresponding text and speech. The conversion can be implemented by using two techniques. One is vision based and other is sensor based technique. In vision based technique a camera is used to capture the signs and in sensor based technique uses the flex sensors for sign recognition.

2. Block Diagram

The block diagram of proposed system is shown in figure 1.

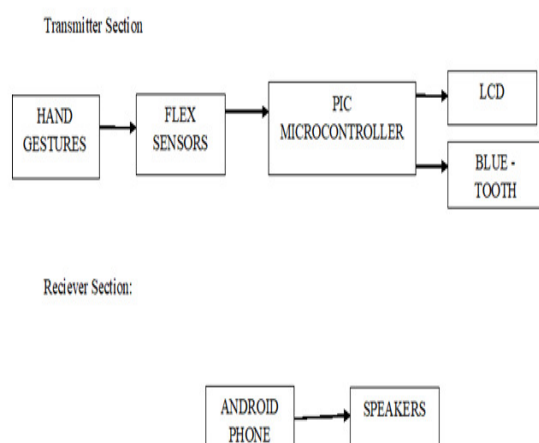


Figure 1. Block diagram sign language to speech converter

The sign language used by the speech impaired persons will be captured by flex sensor which contains the carbon resistor with the size of 2.2". The sensors are fixed in glove and its resistance will change by bending the finger for doing the sign language. The change of resistance causes the change of output voltage directly proportional to the degree of angle bent. The combination of flex sensor and static resistor can be used as voltage divider. It will produce stable output in the temperature range of -35 degrees to +80 degrees. The output from flex sensor is converted in to text form by PIC microcontroller. The various sign symbols are performed with glove and output voltage from flex sensors are noted for further programming of controller. The analog voltages from sensors are converted in to digital by 8 channel inbuilt ADC in the controller. In this paper, 10 different sentences which are essential for basic survival are

implemented with the combination of different signs. The equivalent meaning of the performing signs is converted in to text by the controller and is displayed in LCD display. The controller output is connected to Bluetooth module to connect with smart phone. The APP is installed in smart phone to convert the text in to equivalent voice and is displayed through mobile phone.

The various sign languages implemented in this paper are shown in figure 2.



Figure 2. Various sentences implemented through sign language

3. Hardware Implementation

The hardware setup for implementing the sign language is shown in figure 3. The coding is developed in MPLAB and imported to controller. Calibration will be done with different circumstance and inputs are feed to the controller. The sign language performed is converted in to text and is displayed in LCD. The microcontroller is coupled with smart phone through Bluetooth and text to speech converter will convert in to voice. The entire design is portable and easy to carry by the speech impaired persons. Accelerometer can be used to measure the direction of hands so that signs can be implemented more accurately.

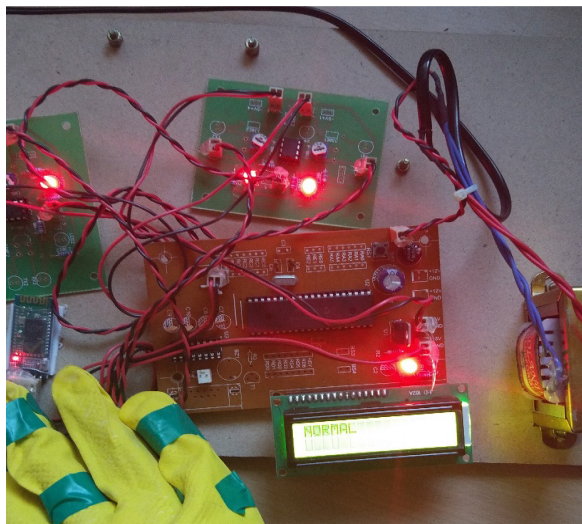


Figure 3. Hardware Implementation of Proposed System

5. Conclusion

The communication between two deaf people is easy and with normal people is herculean task. Deaf people need an efficient non auditory means of expressing and interpreting information in order to communicate with normal persons. The sign language converted in to electric signal with the help of sensors and its equivalent meaning is displayed as text by LCD and voice through smart phone. This system will help to improve the life style and employability of speech impaired persons. There are few complexity with sensor based system. Accelerometer can be included for accurate conversion of sign languages. More sentences can be implemented if it is implemented with vision based recognition. Due to shortage of memory and number of sensors, only basic sentences are implemented.

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