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Literature Survey on Digital Glove for Gesture Recognition

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Abstract: *In India about 6 million people are suffering from speech impairment and hearing impairment. People with speech impairment use sign languages to communicate with the society which is difficult for normal people to understand. Thus communication between deaf-mute people and normal people had always been a challenging task all over the world. Hence deaf mute communication required interpreter who will convert hand gestures into auditory speech. In past this project implementation involved the use of image processing concept and accelerometer. But the drawback of these implementations are projects were non portable and too expensive. Therefore system is being proposed with the use of flex sensors and accelerometer.*

Keywords: *Gesture Recognition, Sign Languages, Flex Sensors, Accelerometer*.

I. Introduction

Deaf-mute people need to communicate with normal people for their daily routine. The deaf-mute people throughout the world use sign language to communicate with other people. However, it is possible only for those who have undergone special training to understand the language [1] [2]. Establishing a communication with deaf and mute people be of utter importance nowadays. Gestures are basically the physical action form performed by a person to convey some meaningful information. Gestures are a powerful mean of communication among humans. In fact gesturing is so deeply rooted in our communication that people often continue gesturing when speaking on the telephone. There are various signs which express complex meanings and recognizing them is a challenging task for people who have no understanding for that language [4]. Sign language uses hand gestures and other mean of non-verbal behaviors to convey their intended meaning. It involves combining hand shapes, orientation and hand movement, arms or body movement, and facial expressions simultaneously, to fluidly express speaker's thought [1]. It is very difficult to find an experienced and educated translator for the sign language every time and everywhere. The motivation for developing such helpful application came from the fact that it would prove to be of utmost importance for socially aiding people and how it would help increasingly for social awareness as well [4]. The idea is to create a sign language to speech conversion system to translate finger spelling (sign) to speech, using flex sensors and accelerometer.

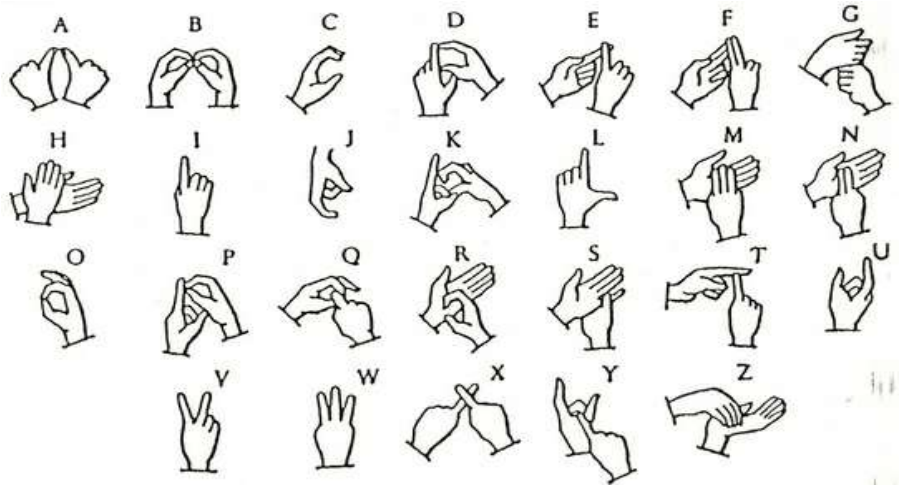

Fig .1 Alphabets in ISL

II. Literature Survey

Many scientists are working in field of gesture recognition. Keeping the same concern in mind many developers have come up with innovative systems. Few of such systems are as follows- A different method had been developed by Archana S Ghotkar, Rucha Khatal, Sanjana Khupase, Surbhi Asati and Mithila Hadop through Hand Gesture Recognition for Indian Sign Language consisted of use of Cam shift and HSV model and then recognizing gesture through Genetic Algorithm, in the following applying cam shift and HSV model was difficult because making it compatible with different MATLAB versions was not easy and genetic algorithm takes huge amount of time for its development [5]. A method had been developed by P Subha Rajan and Dr G Balakrishnan for recognizing gestures for Indian Sign Language where the proposed that each gesture would be recognized through 7 bit orientation and generation process through RIGHT and LEFT scan. The following process required approximately six modules and was a tedious method of recognizing signs [6]. A method had been developed by T. Shanableh for recognizing isolated Arabic sign language gestures in a user independent mode. In this method the signers wore gloves to simplify the process of segmenting out the hands of the signer via colour segmentation. The effectiveness of the proposed user-independent feature extraction scheme was assessed by two different classification techniques; namely, K-NN and polynomial networks. Many researchers utilized special devices to recognize the Sign Language [8]. Byung - woo min et al., presented the visual recognition of static gesture or dynamic gesture, in which recognized hand gestures obtained from the visual images on a 2D image plane, without any external devices. Gestures were spotted by a task specific state transition based on natural human articulation [9]. Static gestures were recognized using image moments of hand posture, while dynamic gestures were recognized by analysing their moving trajectories on the Hidden Markov Models (HMMs). M. Delliraj and S. Vijaygakumar propose a system with a flex sensor and IMU (Inertial Measurement Unit) to recognize sign symbol, speech synthesis chip for voice output and speech recognizing module for converting voice to sign symbol interfaced with microcontroller [10].

III. Proposed Methodology

This project consists of two main modules, one is flex sensor based gesture recognition module and another is voice module. Flex sensors and accelerometer are mounted on the glove and they are fitted along the length of each of fingers. They are used for sensing the hand movements. Flex sensors are used to measure the degree to which the fingers are bent. Accelerometer within the gesture recognition system is used as a tilt sensing element, which in turn finds the degree to which the finger is tilted [1]. The flex sensor is interfaced with the digital ports of Arduino uno microcontroller. The output data stream from the flex sensor and accelerometer are fed to the Arduino microcontroller, where it is processed and converted to its corresponding digital values. Microcontroller compares these readings with the predefined values and the gestures are recognized and text is displayed. This text output obtained from the sensor based system is then sent to the voice module. The voice module consists of eight channels, in which eight words can be recorded. Voice recording and play back module is used for giving audio information to the person. So that sign alphabets will be available in audio format through speaker.

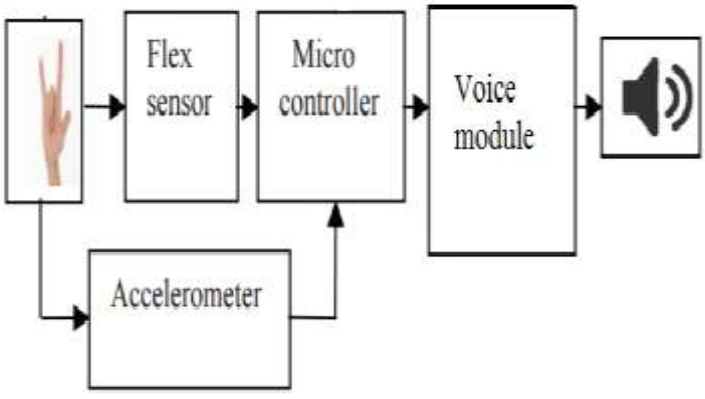

Fig 2. Block diagram of proposed sensor based system

IV. Applications

The applications of hand-gesture recognition systems include,

- Gesture recognition to remotely control a television set.
- Home automation.
- Robotic arm controller.
- Gesture recognition for wheel chair control.
- Gesture recognition for games.
- Gesture recognition for character-recognition.

V. Future Scope

Earlier we were facing following limitations which are mentioned below,

1) Image processing can be significantly slow creating unacceptable latency for video games and other similar applications.
2) Different users make different gestures causing difficulty in identifying motions.
3) Many gesture recognition systems do not read motions accurately due to factors like insufficient background light, high background noise etc.
4) The sign language to speech converter system which converts the gesture to audio with the help of MATLAB has the drawback that it always require a computer for conversion and it is non portable.

So we are planning to make such a system which will convert the gestures into speech using flex sensors which is portable.

VI. Conclusion

In past the implementation of gesture recognition has certain drawbacks. Thus we are planning to make a digital glove. This system will consist of Arduino, Flex sensor, Accelerometer, and Voice module to convert hand gesture into audible speech. This project will lower the barrier of communication between mute and deaf community with the normal world. Thus this project will be used by dump and deaf people as Assistant for themselves.

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