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Hand Gesture Recognition Technology Based Wearable Sign Language Translator for Deaf and Dumb People

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Abstract

Communication is the best media for the general population to communicate their viewpoints to each other. Around nine billion peoples in the world are hard of hearing (deaf) and unable to speak (dumb). The Communications between deaf-dumb with a normal person have always been a challenging task. In this proposed method based on hand glove gesture recognition technique is used to minimize the communication gap between deaf and dump people and normal person. Deaf and Dumb people can utilize the gloves fitted with flex sensor to detect the hand gesture recognition. In proposed system used to easily communicate with deaf and dumb people and normal person.

Keywords — Sign Language; Flex Sensors; Hand Gesture; Deaf and Dump People; Communication.

I. INTRODUCTION

Gesture based communication has been a part of life for the person's disabled people. As a help of discussion, Sign language has been used for quite a long time by the hard of hearing and unable to speak group of people for doing intelligent communications. It emphasizes on manual and non-manual signs where the manual signs include fingers, hands, arms and non-manual signs include face, head, eye and body.

Gesture Recognition has Wide Ranging [1] Applications

1) Developing new standards for hearing impaired.
2) To detect the sign language.
3) Communicating through Mobile Phones/PC
4) To detect the finger moment [2]
5) Applying various methods for lie detection

Gestures appears in one too many mappings from the concepts to expressions and vice versa.

In this paper, different methodologies of gesture recognition are discussed, design of a hand glove for gesture recognition [3] into speech is proposed and the improvement periods of a complete, independent prototype of sensory glove are elaborated.

II. SYSTEM ARCHITECTURE

Gesture-XPLAIN aims at solving the problem of limited communication abilities of those people, who only knows sign language, to talk naturally with the rest of the world by transforming their sign language gestures it into a form of verbal communication [4]. The goal is to create a smart glove system and a mobile device that can continuously recognize sign language gesture and translate that into spoken words.

Figure 1 shows that the glove is fitted with a flex-sensors, gyroscope, magnetometer and accelerometer sensors to sense the movement made by hand and fingers. A low power ARM Cortex-M4 microcontroller recognizes the movement by means of acquiring, processing and running a sensor fusion algorithm. The system translates the sign recognized into meaningful text. This text is then transferred to a Smartphone app [5] over a Bluetooth channel where the text will be converted into speech.

Figure 1: System Architecture

This system is primarily designed to help the deaf and dumb people. But it can also be used by workers who work in high noise area, such as industrial machineries, to translate gestures [6] into speech. The system can be built as a low cost alternative to existing solutions. Another feature that makes this project interesting is that users can teach the system new gestures and add them to the existing standard gesture library. This gives degree of variation among sign languages, and also the need to do some custom gestures for the system the flexibility to meet the high those industrial workers.

III. PROPOSED SYSTEM

In this framework hand gloves is executed to capture the hand motions of a user. The data information glove is fitted with flex sensors along the length of each finger. The flex sensors [7] used to detect the finger moment. In this technique easily capture the gesture recognition [8]. In this flex sensor data send to the microcontroller. The user has to know the

indications of specific letters in order and he/she have to remain with the sign for two seconds. There are no restrictions for signs it is difficult to assemble a standard library of signs. Figure 2 shows that the hardware task module.

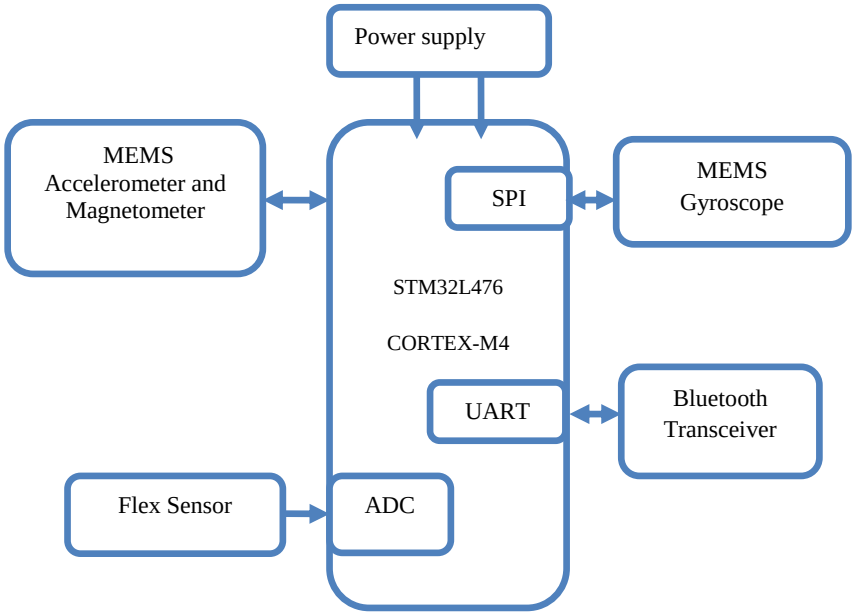


Figure 2: Block diagram For Gesture Recognition System

3.1 Hand Gesture Recognition

Gesture is defined as an expressive movement of body parts. Gestures are different postures made by the finger curls and bends [9]. Gestures are the medium for communication. In this system the gestures are the basic necessity which is required as the input. Figure 3 and 4 represents the location of sensors.

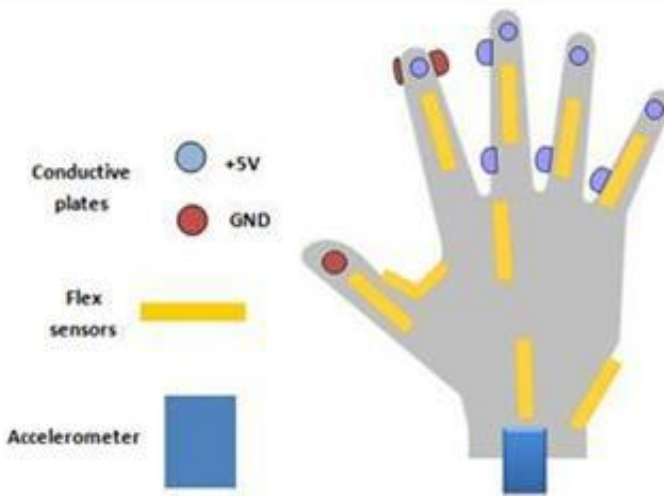


Figure 3: Location of Sensors

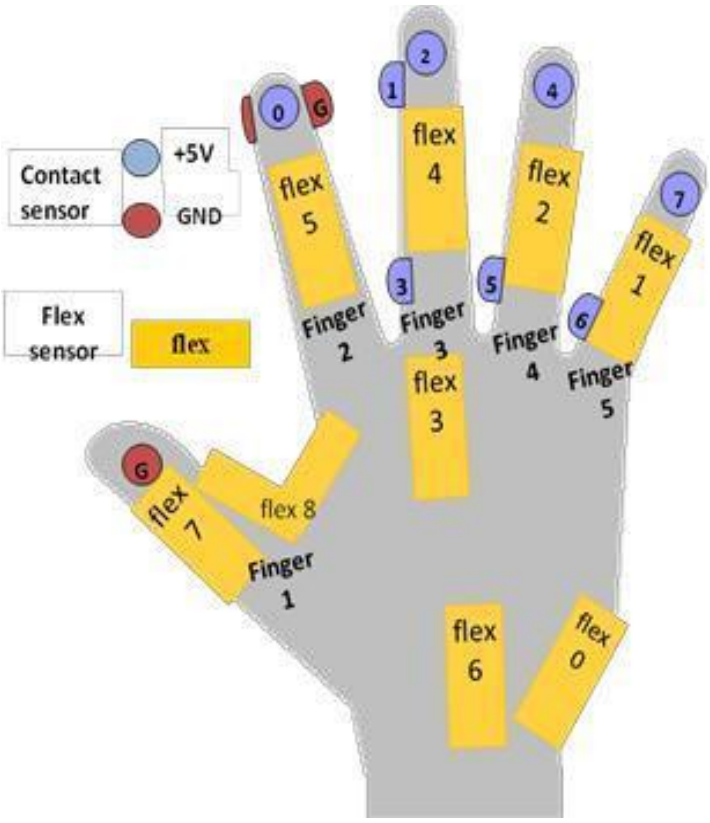


Figure 4: Labeling of Flex and Contact Sensors on the Glove

3.2 Sign Language Detection Techniques

Gesture recognition technique has reduced the gap between normal people and hearing impaired people. Two steps to identify the gesture sign language detection [10]. Figure 5 represents the sign language.

- Initially, Flex sensor detects the finger moment
- This sensor signal send to the microcontroller
- Finally microcontroller identified the gesture recognition.

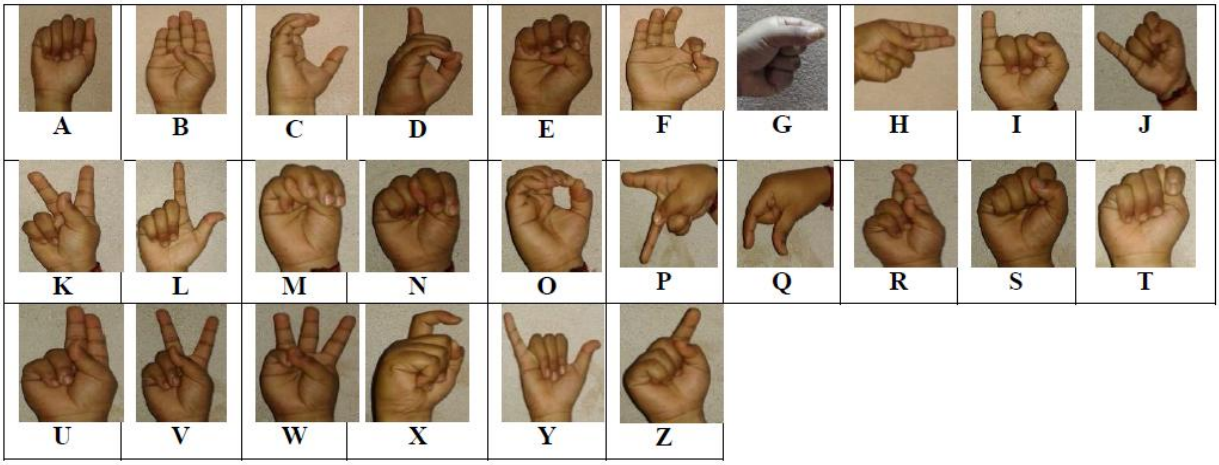


Figure 5: Sign Language

IV. RESULTS AND DISCUSSION

Flex sensors are fitted by gloves. According to the hand motion detection depends on the flex sensors of all fingers. The value of bending is in resistance. All fingers give different resistance value is depends on bent. The yield of flex sensor is given to the ADC of microcontroller which used to change over analog into digital signal. The required program written in Embedded c language. Figure 6 represents the hardware implementation.

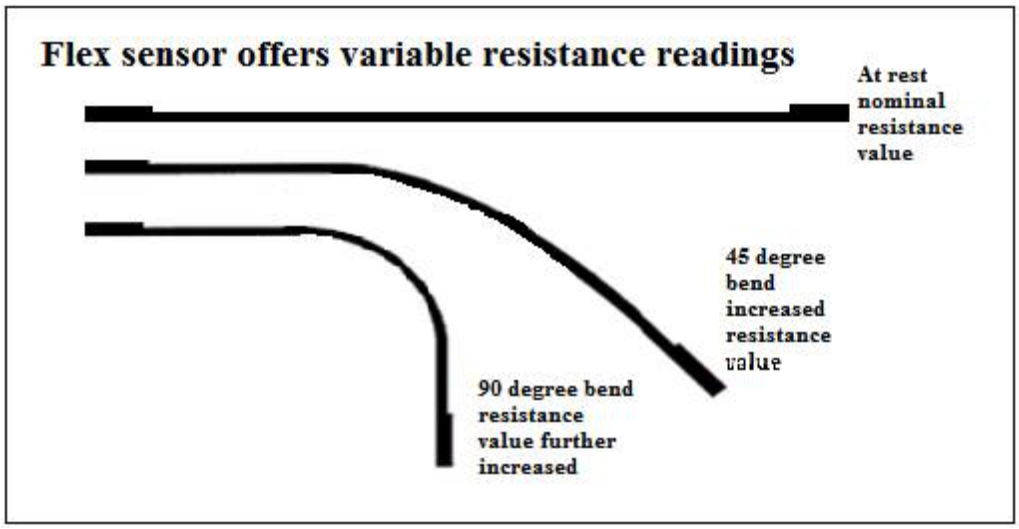
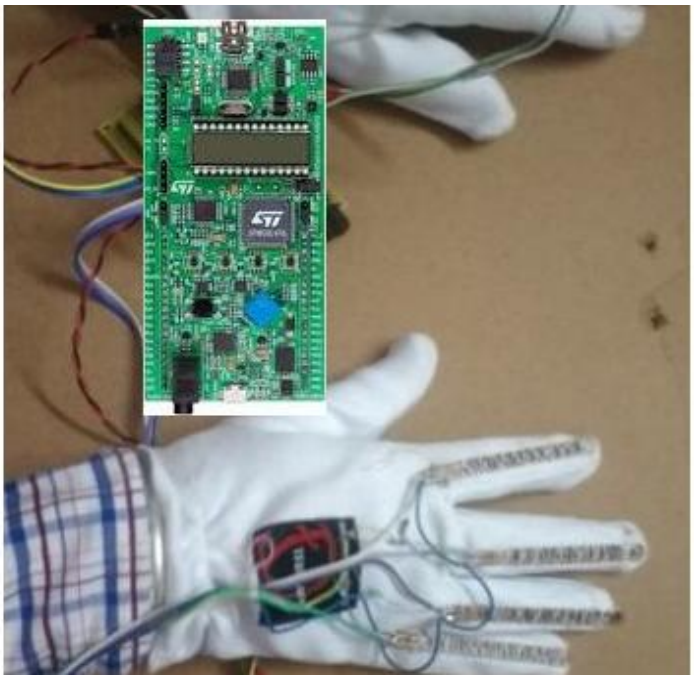


Figure 6: Hardware Implementation



SR. NO.	NUMBER	HAND GESTURE OF SIGN LANGAUGE FOR NUMBER	LOGIC LEVELS AS PER VALUES OF FLEX SENSOR				
			F1	F2	F3	F4	F5
1	0		1	1	1	1	1
2	1		1	0	2	2	2

Figure 7: Demonstration

The glove based gesture communication system recognizes the letters and numbers. Figure 7 represents the hardware and software demonstration. In this gesture recognize technique used five flex sensors. This sensor used to identify the finger movement and this data information send to the microcontroller.

V. CONCLUSION

In the proposed electronic based hand gesture recognition technique easily identify the alphabets and numbers. The proposed system is valuable for communication between deaf and dumb people and normal people and the electronic speaking system was developed to minimize the communication problem between deaf and dumb people and normal person. Deaf or dumb people can use the gloves fitted with flex sensor to form gestures according to sign language which will be converted in to speech. In proposed system helps to deaf and dumb peoples which are communicated with normal peoples by using hand gloves gesture recognition techniques.

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