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Design of Communication Interpreter for Deaf and Dumb Person

Pallavi Verma[1], Shimi S. L. [2], Richa Priyadarshani [3]

[1]Electrical and Electronics Department, Amity University, Greater Noida, Uttar Pradesh, India
[2]Assistant Professor, NITTTR, Chandigarh, India
[3]Electrical and Electronics Department, Amity University, Greater Noida, Uttar Pradesh, India

Abstract: ***In this paper, we describe gesture based device for deaf and dumb person as communication for a person, who cannot hear is visual, not auditory. Generally dumb people use sign language for communication, but they find difficulty in communicating with others who don't understand sign language. So there is a barrier in communication between these two communities. This work aims to lower this barrier in communication. The main aim of the proposed project is to develop a cost effective system which can give voice to voiceless people with the help of Smart Gloves. With the proposed work sign language is converted into text and speech using flex sensor and microcontroller. It means that using smart gloves communication will not be a barrier between two different communities.***

Keywords: Sign Language, Gesture Recognition system, Flex Sensors & Microcontroller.

1. Introduction

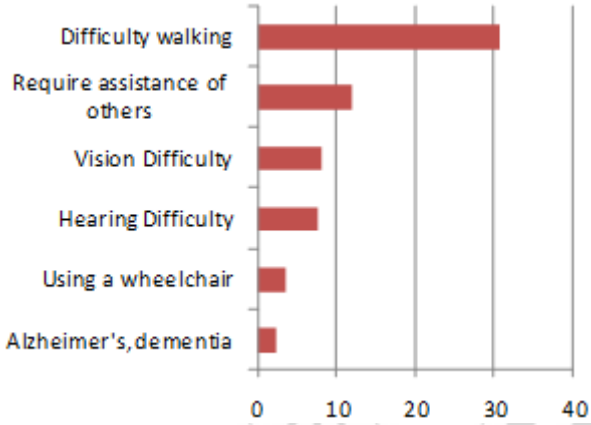

Figure 1: Data representing disabled person in the World

Man is a social being so it is natural for him to interact and communicate. Communication is a process of exchanging ideas, thoughts, feelings and information in form of verbal or non verbal message. Figure1 shows that over the world 7.6 million of the total population suffers from deafness and dumbness. But communication for a person who cannot hear is visual, but not auditory. This person lacks the amenities which a normal person should own. The big reason behind this is lack of communication, as deaf people are unable to listen and dumb people are unable to speak. The sign language is an important and only method of communication for deaf-dumb persons. As sign language is a formal language employing a system of hand gesture for communication (by the deaf).Sign Language symbol is shown in figure 2.

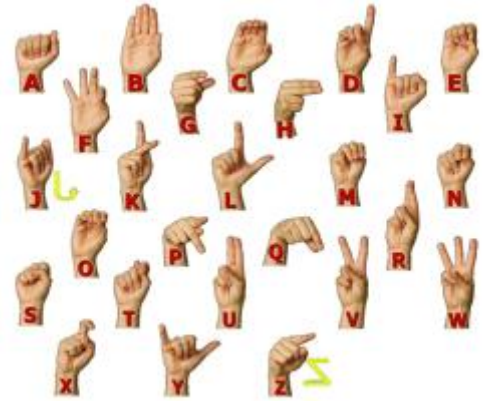

Figure 2: Sign Language Symbols

It actually becomes the same problem of two persons which knows two different language, no one of them knows any common language so its becomes a problem to talk with each other and so they requires a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the Normal Person and the Deaf person or the Normal Person and the Dumb person. To overcome this problem, we introduce a unique application. Our application model is a desirable Interpreter which translates. Natural English Sentences as, an text input by Normal Person for Deaf Person and Sign Language, in form of Gesture by a Dumb Person to Synthesized English Words which have a corresponding meaning in Sign Language which interprets a particular thing, as an Audio Output for Normal Person. This will help Normal and Deaf and dumb communities by removing the communication gap between them.

2. Related Work

Many scientists worked in the field of gesture recognition technology from 90's. In reference [1], EMG sensors and accelerometers are used to capture hand gestures. Reference [2] & [3] surveys gloves system and their applications. It also analyses the characteristics of the devices, provide a road map of the evolution of technology and discuss limitations.

Markov's models are used for gesture recognition in reference [4] and [5]. In reference [6], real time data acquisition from cyber gloves and data transmitted through the internet is proposed. Sign languages are translated into a text form, to facilitate deaf people as well as text is displayed on the LCD in reference [7]. A methodology using a neighborhood search algorithm for tuning system parameter for gesture recognition is addressed in [8]. A novel method is introduced to design threshold model in CRF's has been proposed, which determined an adaptive threshold for distinguishing between signs in vocabulary and non sign patterns in [9]. A comprehensive framework is presented that addresses two important problems in a gesture recognition system in [10].

3. Gloves Design Process

3.1 Problem Description

The first thing in designing of gloves is identification of the purpose for which it has to be built along with specifying requirements. In this case, a system needs to be developed for deaf person which enables them to communicate with normal persons. Also helps to bridge the gap between person with disability and normal person.

So in the proposed work an intelligent microcontroller based system using Flex sensors will be developed which is able to:

- To develop coding for the system that receives its instruction from gesture recognition system using Flex sensors.
- To develop a microcontroller based cost effective system to recognize gesture and convert into coded form so that it can be displayed if code matches with predefined codes.
- Normal person can text their message using keyboard.

The wireless arrangement makes the device more comfortable to be used by the disabled person. Wireless transmission and reception of signals are done with the help of RF transceiver.

3.2 Method and Block Diagram

In this project, gloves is implemented to capture the hand gesture made by disabled person and converting it into speech as well as text. A pair of gloves with flex sensors along each finger, thumb and arm is used to capture the movement of user. With the help of flex sensors degree of fingers, thumb and arm are calculated in voltage terms using voltage divider rule. Microcontroller is used for various functions like analog to digital conversion of data from flex sensors. Then digitized data is encoded in encoder and transmitted. Received data is decoded by decoder and gesture recognition system matches the incoming data with prefeeded data. If data is matched then it is given to speaker using voice section. Block diagram of proposed work is shown on figure 3.

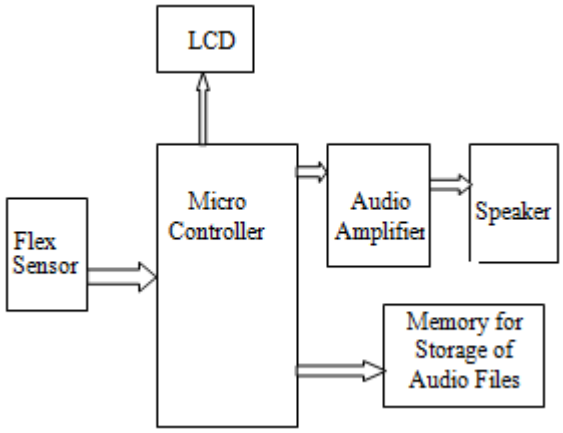

Figure 3: Block Diagram of Smart Gloves

3.3 Component Description (Hardware)

(A)Flex Sensors: Signed letters are determined using flex sensor on each finger. The flex sensors change their resistance based on the amount of bend in the sensor as shown in figure 3.

As a variable printed resistor, the flex sensor achieves great form-factor on a thin flexible substrate. When sensor placed in gloves is bent, it produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value. They require a 5-volt input and output between 0 and 5V. The sensors are connected to the device via three pin connectors (ground, live, and output). In device, sensors are activated in sleep mode. It enables them to power down mode when not in use.

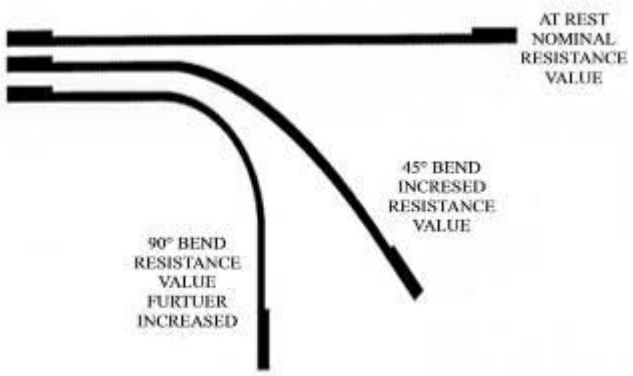

Figure 4: Variation of resistance with degree in bend

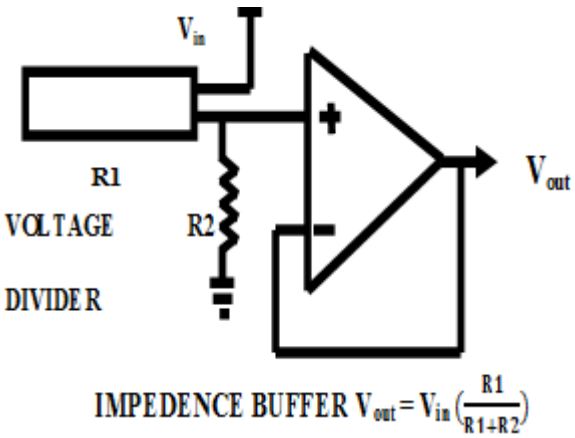

Figure 5: Basic Flex Circuit

Figure 5 show circuit of basic flex sensor which consist of two or three sensors are connected. The outputs from the flex sensors are inputted into op-amps and used a non-inverted style setup to amplify their voltage [16].The greater the degree of bending the lower the output voltage.

By voltage divider rule, output voltage is determined and given by $V_{out}= V_{in}$ *R1 / (R1 + R2), where R1 is the other input resistor to the non-inverting terminal. Characteristics: (a) Resistance V/S Bending (b) Voltage V/S Resistance

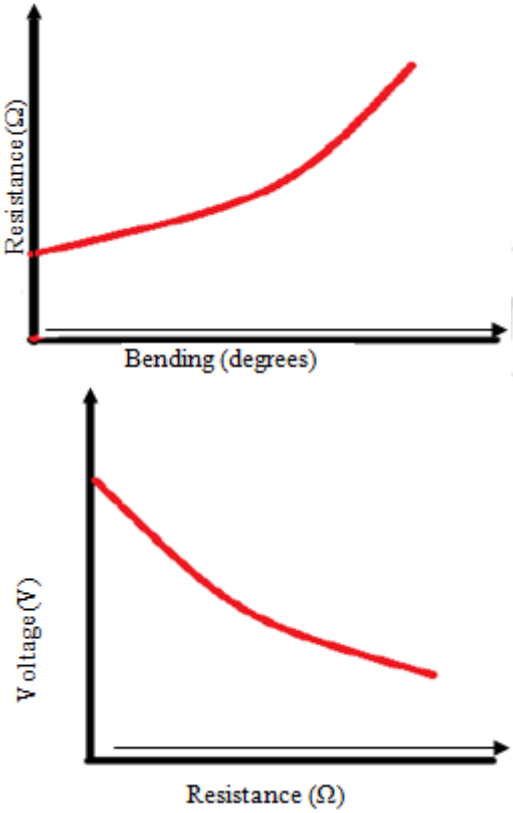

Figure 6: Characteristics

Table 1: Resistance and corelated Bending

Degree	Voltage (Analog)	Digital	Resistances (Ohms)
0	3.655	748	27200
10	3.725	764	29215.686
20	3.797	777	31585.366
30	3.866	791	34049.828
45	3.968	812	38483.412
60	4.071	833	43842.105
75	4.174	854	50532.544
90	4.276	875	59121.622

(B) PIC Microcontroller: Microcontroller is the heart of the device. It stores the required data and makes use of it whenever the person uses the device. This device helps deaf and dumb person to announce their requirement. By this the person who is near can understand their need and help them. PIC microcontrollers can be programmed in Assembly, C or a combination of the two. Other high-level programming languages can be used but embedded systems software is primarily written in C. All output signals generated from flex sensors are in analogue form and these signals need to be digitized before they can be transmitted to encoder. Therefore microcontroller ATmega 16 is used as the main controller in this project. It has inbuilt ADC module, which digitizes all analogue signals from the sensors and inbuilt multiplexer for sensor signal selection. It supports both serial and parallel communication facilities.

(C) Encoder/Decoder: The output from the PIC microcontroller is encoded by encoder. The programmed address/data are transmitted together with the header bits Via an RF. It is used to correct the error at the receiver end, if any error had occurred. In the receiver it is decoded by decoder.

(D) Gesture Recognition Section: The gesture manager is the principal part of the recognition system. It contains data to match with incoming data. The system tries to match incoming data with existing posture. The bend values of the fingers and for each posture definition the distance to the current data is calculated. Then, the position/orientation data is compared in a likewise manner.

(E) Voice Section:
After gesture recognition system, data is sent to voice section. In this, data is matched with feeded data. If the data is matched with feeded data then it is given to speaker and display system.

3.5 Software Used

(A) C Program
It is a powerful, feature rich development tool for PIC microcontroller. It is designed to provide the programmer with the easiest possible solution for developing applications for embedded systems, without compromising performance or control.

4. Result and Discussion

(a)

(b)

Figure 7: (a) Smart Gloves and its assembled circuit (b) Text being displayed in response of Sign language.

- Disabled use these gloves to convert sign performed by them into text.
- From the convenience of simple flex sensors, a user is able to interact with others in more comfortable and easier manner. This makes it possible for the user to not only interact with their community, but with others also and they can also live a normal life.
- In Figure7 when user made alphabet 'A' using sign language wearing smart gloves, then with the help of flex sensors and microcontroller it displayed using the LCD.

5. Conclusion

Smart Gloves is proposed to bridge the barrier of communication between disabled person and normal person. Sign language is the only medium for deaf and dumb persons to share their feeling or thoughts with other but their communication is restricted to other disabled person as normal cannot understand what they wants to say. Using smart gloves fitted with flex sensors helps them to convert sign language in text and also given to speakers. With the help of Smart gloves the gap or bridge between two different communities can be filled up.

References

[1] Yun Li,Xiang Chen, Jianxun Tian, Xu Zhang, Kongqiao Wang and Jihai Yang, "Automati Recognition of Sign Language Subwords based on Portable Accelerometer and EMG Sensors", IEEE Engineering in Medicine and Biology Society, Vol.59, No.10, pp. 2695 –2704, October 2012.

[2] Laura Dipietro, Angelo M. Sabatini and Paolo Dario "A Survey of Glove-Based Systems and Their Applications", IEEE Transactions on Systems, Man and Cybernetics—Part C: Applications and Review, Vol. 38, No. 4, pp. 461-482, July 2008.

[3] Praveen Kumar, S Havalagi and Shruthi Urf Nivedita, "The Amazing Gloves that give Voice to the Voiceless", International Journal of Advances in Engineering & Technology, Vol. 6, No.1, pp. 471-480, March 2013.

[4] Sanshzar Kettebekov, Mohammed Yeasin and Rajeev Sharma, "Improving Continuous Gesture Recognition with Spoken Prosody", Proceedings of the 2003 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'03), ISBN # 1063-6919/03, pp.1-6

[5] Masumi Ishikawa and Hiroko Matsumura, "Recognition of a Hand-Gesture Based on Self organization Using a Data Glove", ISBN # 0-7803- 5871-6/99, pp. 739-745.

[6] Subash chandar, Vignesh Kumar and Willson Amalraj" Real Time Data Acquisition and Actuation via Network for Different Hand gestures using Cyber glove", International Journal of Engineering Research and Development ISSN, Vol. 2, No.1, pp. 50-54, July 2012.

[7] AmbikaGujrati, Kartigya Singh, Khushboo, Lovika Sora and Mrs. Ambikapathy, "Hand-talk Gloves with Flex Sensor: A Review", International Journal of Engineering ScienceInvention ISSN, Vol. 2, No.4, pp. 43-46, April 2013.

[8] Toshiyuki Kirishima, Kosuke Sato and Kunihiro Chihara, "Real-Time Gesture Recognition by Learning and Selective Control of Visual Interest Points", IEEE Transactions on Pattern Analysis and Machine Intelligence, VOL. 27, NO. 3, MARCH 2005, pp. 351-364.

[9] Praveen Kumar, S Havalagi and Shruthi Urf Nivedita, "The Amazing Gloves that give Voice to the Voiceless", International Journal of Advances in Engineering & Technology,Vol. 6, No.1, pp. 471-480, March 2013.

[10] Juan P. Wachs, Helman Stern and Yael Edan, "Cluster Labeling and Parameter Estimation for the Automated Setup of a Hand-Gesture Recognition System", IEEE Transactions on Systems, Man, and Cybernetics—Part A: Systems And Humans, VOL. 35, NO. 6, NOVEMBER 2005, pp. 932-944