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Design of Smart Gloves

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Abstract: **Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Because of this, a person who lacks in hearing and speaking ability is not able to stand in race with normal person. 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 person with the help of Smart Gloves. It means that using smart gloves communication will not be barrier between two different communities. With the help of these gloves disabled person can also get chance to grow in their respective carrier. Using such devices by disabled person also makes nation grow.**

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

I.INTRODUCTION

India constitutes 2.4 million of Deaf and Dumb population, which holds the world's 20% of the Deaf and Dumb Population. 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. Fig. 1 shows a survey analysis [1].

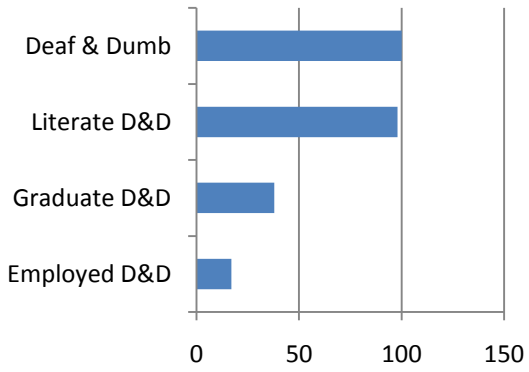

Fig. 1: Deaf and Dumb Work Survey

This decreasing ratio of Literate and Employed Deaf and Dumb population is a result of the physical disability of hearing for deaf people and disability of speaking for dumb people so it yields to lack of communication between normal person and Deaf and Dumb Person. 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 [2-4]. 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 [5-8].

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 [9]. In this project Flex Sensor Plays the major role, which are placed on fingers, as fingers bends it changes resistance depending on the amount of bend on the sensor [11].

Fig. 2 Sign Language Symbols

II. PROBLEM FORMULATION

The main aim of the proposed project is to develop a cost effective system which can give voice to voiceless person with the help of Smart Gloves. It means that using Smart Glove by the deaf person enables them to communicate with others which also helps to bridge the gap between person with disability and normal person. Problems faced by the deaf person regarding employment can be overcome by this method. 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 to 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.

III MATERIAL

III.I Flex Sensor

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 7[12]. 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.[13-14].

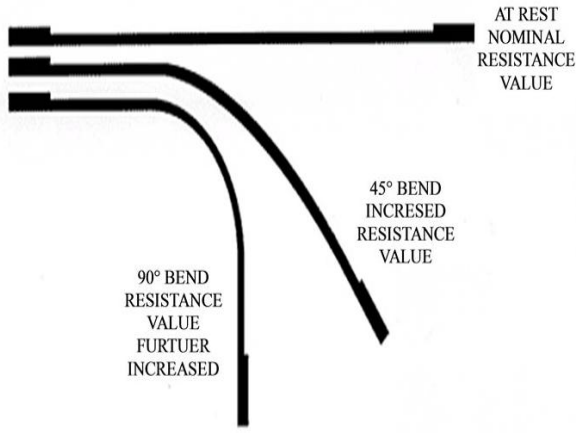

Fig.4 Flex Sensor Offers Variable Resistance Reading

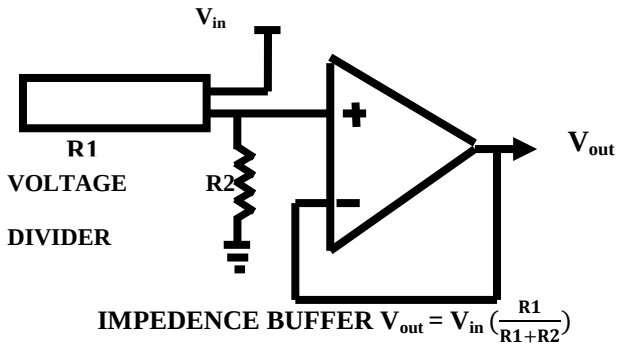

Fig. 5 Basic Flex Circuit

Figure 5 shows 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:

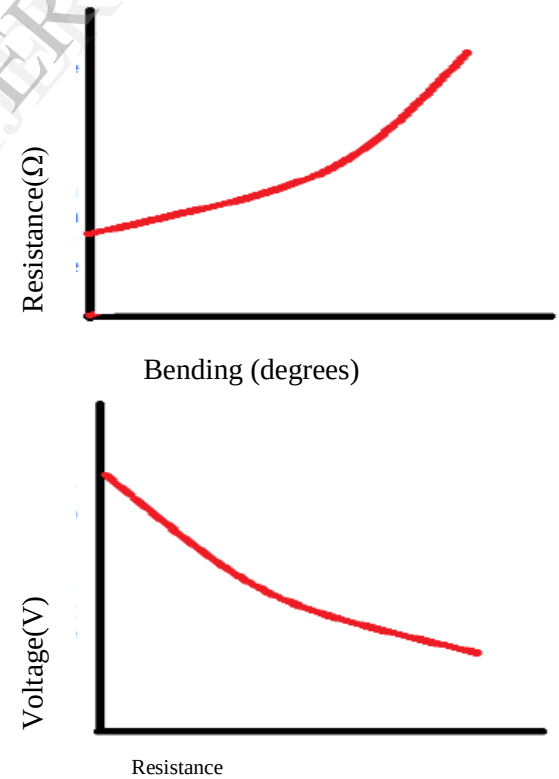

Fig.6 Characteristics
(a) Resistance V/S Bending
(b) Voltage V/S Resistance

Fig.7 Glove with flex Sensors

III.II PIC MICROCONTROLLER

Microcontroller is the heart of the device. It stores the required data and make use of if 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 [19-21].

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 PIC16F877A 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 [22].

III.III 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 [23-25].

III.IV 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 [26-29].

III.V 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 [30-31].

VI. METHOD AND BLOCK DIAGRAM

In this project data glove is implemented to capture the hand gestures of a user. Gloves are aimed to convert gesture into voice. In this project data glove is implemented to capture the hand gestures of a user Smart gloves having sensors in it captures the movement of user and converts analog input into digital output utilizing voltage divider rule. Then movement is given to microcontroller for further processing. Now gesture array is transmitted using RF transmitter and receiver. Recognized gestures are matched with prefeeded data and if it matches given to speaker using voice section.

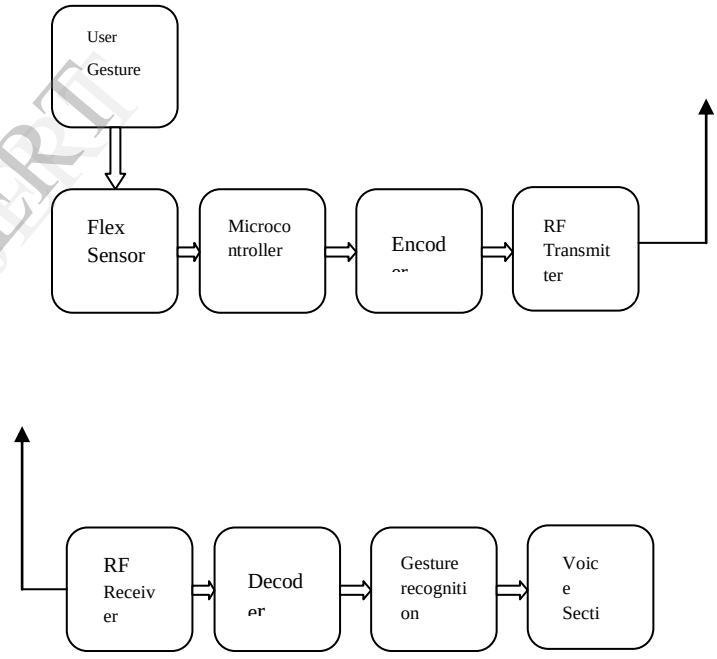

Fig. 8 Block Diagram of Smart Gloves

IV. FLOW CHART OF SMART GLOVE

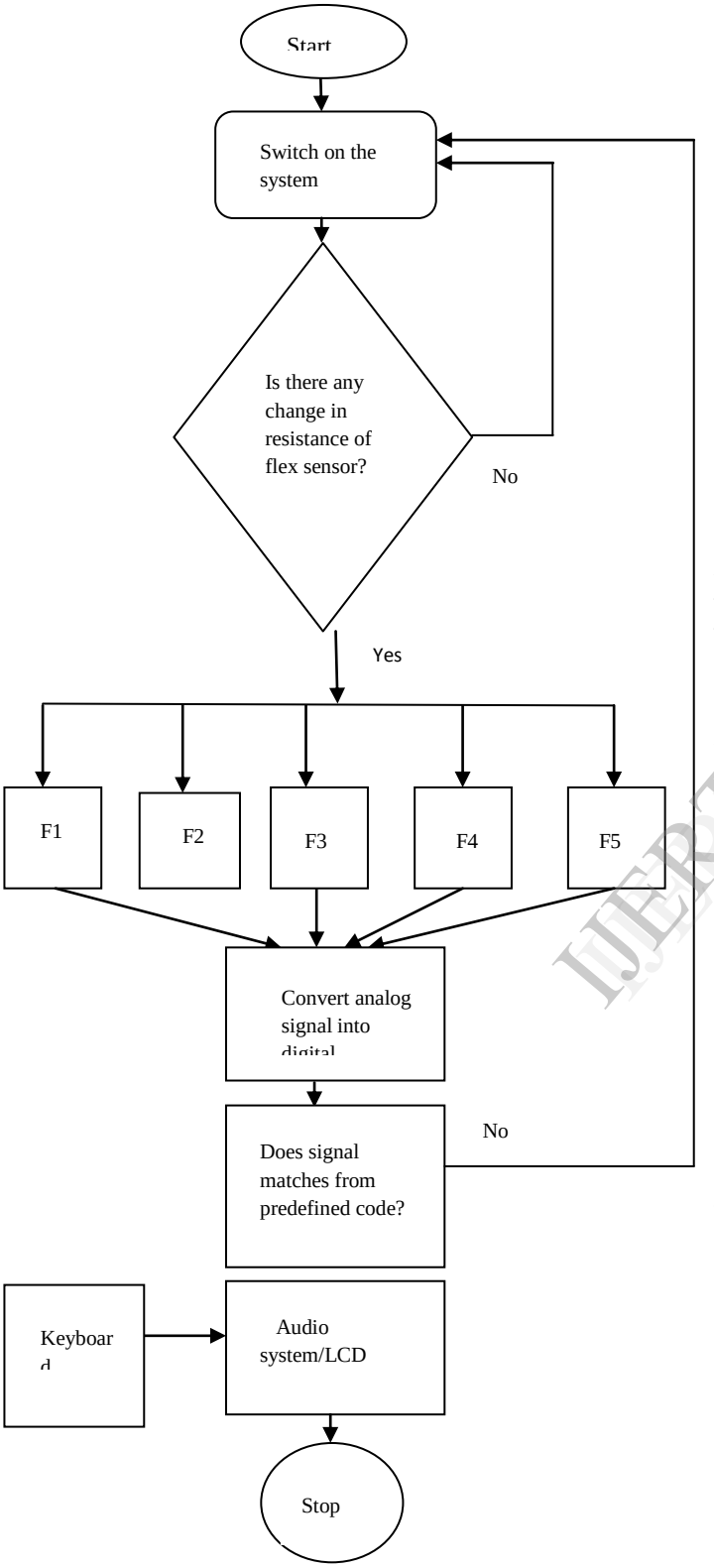

Fig.9 Flowchart of Smart Gloves

V. RESULT AND DISCUSSION

- Disabled use these gloves to convert sign performed by them into speech.
- 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 normal life.
- The end product will have a cheap and simplistic design making it easy for users to interact with.
- The system is capable of recognizing signs more quickly. Furthermore real time recognition ratio of nearly 99% can be easily achieved

VI. CONCLUSION

Sign language is a method used for communication by disabled person. Here we are converting sign language into text and speech so that communication is not limited between them only, utilizing data gloves communication barrier between two different communities is eliminated. Using data gloves disabled person can also grow in their carrier and makes nation grow as percentage of disabled person are millions in count. Making their future better ,making nation better.

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