Original Article

Assisting Mute People in Communication Using Flex Sensors

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Abstract - *Size Communication is the only medium through which one can express his feeling to others, but it becomes difficult in the case of mute people. Sign language is an important tool used by mute impaired people to communicate. A human-machine interface that recognizes the sign language would have a significant impact on mute people social life. The advancement in embedded systems can provide a space to design and develop a translator system to convert sign language into speech. The work presented in this paper mainly reduces the communication gap between dumb and ordinary people. In the proposed work, a human-machine interface has been demonstrated which recognizes the sign language through flex sensors and converts it into text and voice. The system employs raspberry pi and flex sensors.*

Keywords - *Embedded System, Flex Sensors.*

I. INTRODUCTION

It is estimated that over 481.2 million people around the world are suffering from some sort of disability. In recent years, the number of speech-impaired victims has risen rapidly due to accidents, diseases or birth defects. A person who is not able to speak or has lost this ability in some accident faces issues in communicating his thoughts, ideas, views, knowledge or feelings to society. A normal person needs to either learn sign language or seek the service of an interpreter to communicate with a speech-impaired person. As a result, a communication barrier exists due to which the mute people don't get social status as the general public. To minimize these barriers, a device has been proposed that converts hand gestures into sound. This project was meant to be a prototype to check the feasibility of recognizing sign language using flex sensors which are mentioned below.

II. FLEX SENSOR

Flex sensors are resistive carbon parts. It changes resistance as per the degree of bend. Flex sensors consist of a number of conducting particles. When there is any Bend, the conducting particles in flex sensors get separated. Due to this, current decreases and resistance increases. Therefore, flex sensors are also known as bend sensors. The variation in resistance is just about 10kΩ to 30kΩ. When there is no bend, its resistance is 10kΩ. The device incorporates within the device employing a potential divider network.
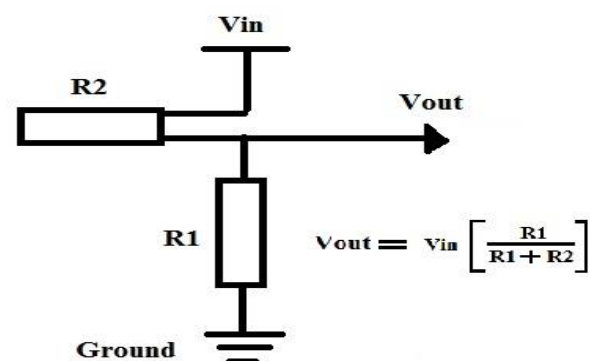

$$Vout = Vin \left[\frac{R1}{R1 + R2} \right]$$

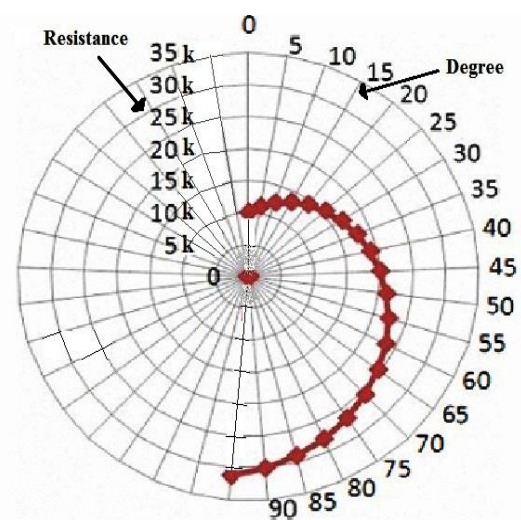**Fig. 1 Flex sensor as Voltage divider circuit**
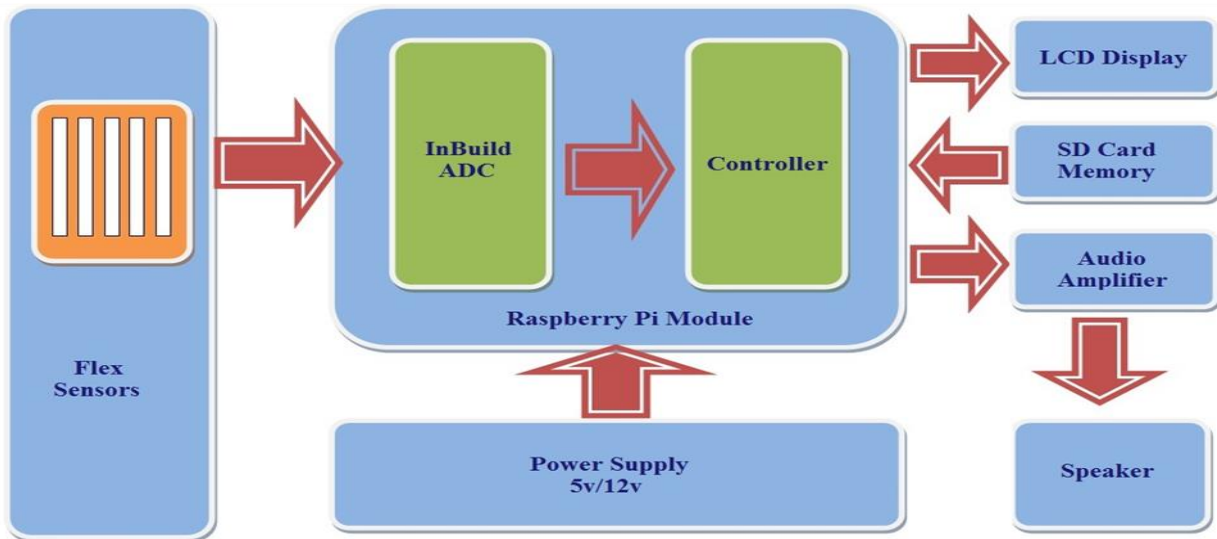

Fig. 2 Resistance Vs Degree chart

Fig. 3 Block diagram of system

III. WORKING PRINCIPLE OF SYSTEM

The system consists of a glove on which flex sensors are fixed that measures resistance as per the degree of bending and recognizes the alphabet gestures. Raspberry pi microcontroller is used to take input from flex sensors, and then this analogue data is converted to digital form by using a controller. Thus corresponding output with respect to gesture is displayed and is audible through a speaker. The functionality of each block is mentioned as follows.

A. Raspberry Pi

The Raspberry Pi is a compact-sized computer that can be easily plugged into a computer monitor or TV. Enables people of all ages to research computing and to learn how to program in languages like Scratch and Python. It is capable of doing everything we would expect a desktop information processing system to perform, surfing from the net and playing high-definition videos to making databases, word-processing, and live games. Raspberry pi has the capability to intercommunicate with the exterior world and has been used in digital projects

B. Liquid Crystal Display

The output of the system is displayed on LCD. In our system16x2, LCD is used. The 16x2 indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, in total, 32 characters we can display on 16x2 LCD. The LCD will display the word corresponding to each hand gesture made by a user. This enables mute people to convey their thoughts using words... As deaf people can read the words directly from the LCD. Hence this system enables deaf people to communicate with Mute as well as normal people.

C. American Sign Language

Gestures are hand movements that convey meaningful information. American Sign Language is a standard sign language that is used in US and Canada. In this research, American Sign Language is used. ASL is transmitted from generation to generation, primarily through residential schools and dumb and deaf adults. The most effective way to communicate with mute people is to use sign language. The simplest system includes an understanding of finger spellings. These are shown below. According to this finger, a spellings database has been created for each alphabet.
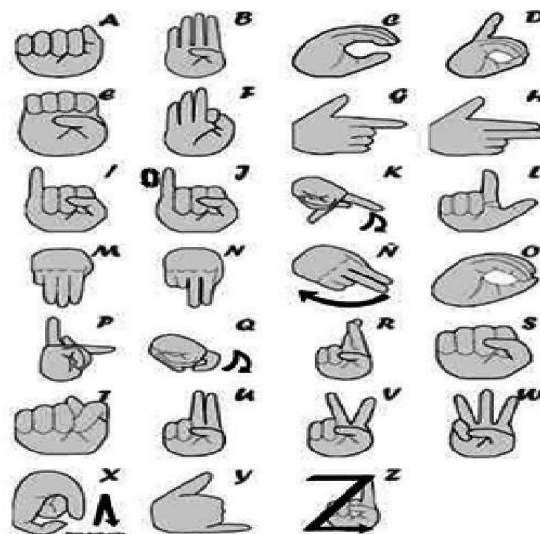

Fig. 4 Various forms of Gestures

D. SD CARD [External Memory]

The purpose of using an SD Card in this system is to store the data. The SD card stores the .wav file corresponding to each word present in the internal program memory of the ARM7 microprocessor. The microprocessor uses this data to play the output of the system on the Loud Speaker. The interfacing between SD card and microprocessor is through SPI protocol. Thus linking all the above blocks generates desired output for the system.
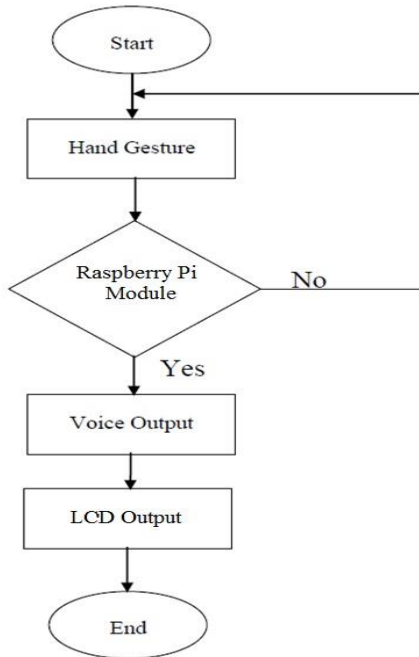
IV. FLOW CHART

Fig. 5 Flow Chart of System

V. BENEFITS OF RASPBERRY PI

Speed and Performance
Low power consumption
Multiple interfaces
Compressed module

A. Merits of System

Less Processing delay
Robust System
Low Power Requirement
Quick Response Time

B. Demerits of System

Memory requirement
Sequence of gestures

C. Application of System

Industrial Automation
Human-robot interaction
Intelligent Home Applications

VI. CONCLUSION

This system has improved a mute person's lifestyle. At the same time, it is beneficial for a blind person and a dumb person to communicate. It has reduced the communication gap between the mute community and normal people. This project aims to develop a useful tool that uses gesture recognition for reducing the communication barrier between the mute community and normal people. This project was meant to be a prototype for checking the feasibility of recognizing gestures. This project was conceptualized to provide a voice to the voiceless and aid hearing-impaired people. This Technique was implemented successfully with accuracy at a highly optimized cost.

VII. FUTURE SCOPE

The system can be extended to support more number signs and different languages mode. Various programming techniques can enhance the system's efficiency. Various programming logic can be introduced, more gestures.

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