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Missing sense a smart glove for sign to speech/text conversion

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Abstract
Communication is sending and receiving information between two or more people. Any task or transaction that requires more than one person can only be successfully completed with communication, but for a person with hearing and speaking disabilities, this proves to be a daunting task. These people use sign language to communicate, but again face difficulties communicating with people who don39; t understand the sign language. Communication for these people is visual, whereas normal people communicate verbally. This poses a hindrance in communication between these people. The objective of this work is to decrease this gap in communication. The main objective of the proposed project is to develop a low-cost wearable device which gives voice to a voiceless person. This device aims to bridge the gap in communication and enable people with disabilities, consequently helping their careers grow and unlock untapped potential.

Keywords: Sign Language, Gesture Recognition system, Flex Sensors

1. Introduction
Sign language is a medium which facilitates communication between people with speaking and hearing disabilities. It makes use of a variety of hand gestures and signs based on the movements of the palms and the fingers, which correspond to the different letters of the alphabet, helping deaf and dumb people to communicate visually. But since majority of the communication in the world is verbal, the people from the deaf and dumb communities are isolated, as the masses do not understand the sign language, consequently creating a wide communication gap between these communities.
The aim of our project is to develop a wearable electronic device which recognizes the hand gestures of the sign language using Flex sensors and translate into an audio output. This will help the integration of deaf and dumb communities into the mainstream society by allowing communication with larger demographic and hence providing greater opportunities.

2. Problem Formulation
The objective of the proposed project is to develop a cost efficient system which will enable the deaf and dumb people giving them voice with the help of smart gloves. It means using the Missing Sense device will help in bridging the communication gap between the people with disability and normal people. So in the proposed work an arduino based system using Flex sensors will be developed which is able to:

- To develop code for the device to read instruction from gesture recognition system using Flex sensors.
- To create an arduino based economical system to perceive the inputs from the Flex sensors.

3. Materials
3.1 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. 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.
By voltage divider rule, output voltage is determined and given b V out = V in * R1 / (R1 + R2), where R1 is the other input resistor to the non-inverting terminal.

3.2 Arduino Uno
The Arduino Uno is a microcontroller board based on the ATmega328P microcontroller. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power

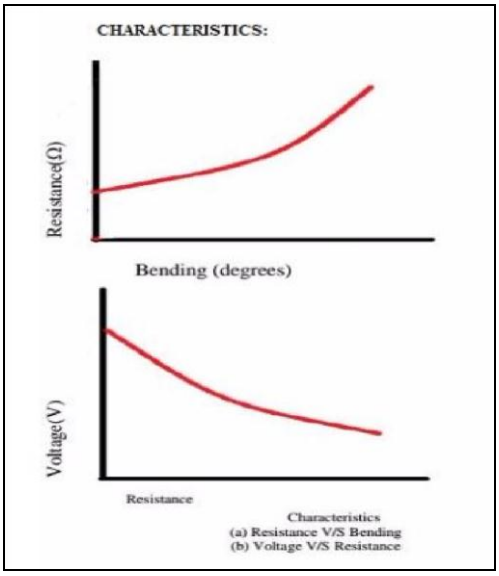

Fig 1

jack, an ICSP header and a reset button. 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. Arduino programs may be written in any programming language with a compiler that produces binary machine code.

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. The Arduino IDE supports the languages C and C++ using special rules to organize code. All output signals generated from flex sensors are in analogue form and these signals need to be digitized. The microcontroller digitizes all analogue signals from the sensors for sensor signal selection. It supports both serial and parallel communication facilities.

4. Implementation

The glove's purpose in this project is to capture the hand gestures of the user which the system intends to convert to sound signals. The glove has five flex sensors attached to the back of each of the five fingers and three contact sensors, two between index finger and middle finger and one on thumb. These sensors are connected to the serial inputs of the arduino in parallel with resistors connected to power. The contact sensor in the middle finger is directly connected to power and sends a signal when it comes in contact with either of the other two contact sensors by completing the circuit. When the user performs any gesture, the sensors send out output to the serial monitor. These received values are compared to the values already set for each alphabet. For each signal sent by the glove the corresponding alphabet gets stored in a string, and when the glove does not send any

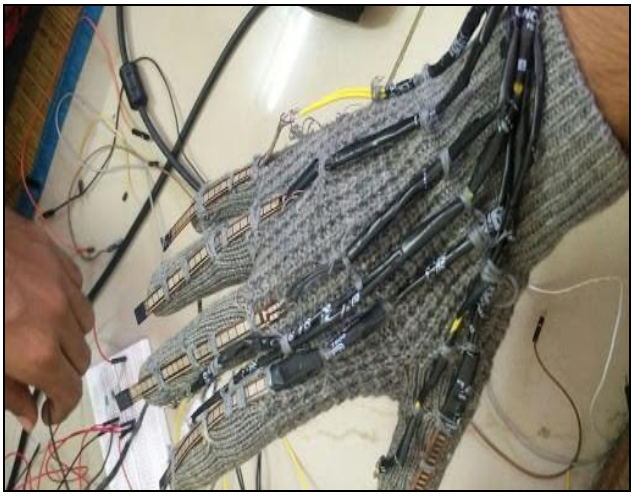

Fig 2

signals corresponding to any alphabet for more than two time cycles, a voice signal is produced for the string.

Output

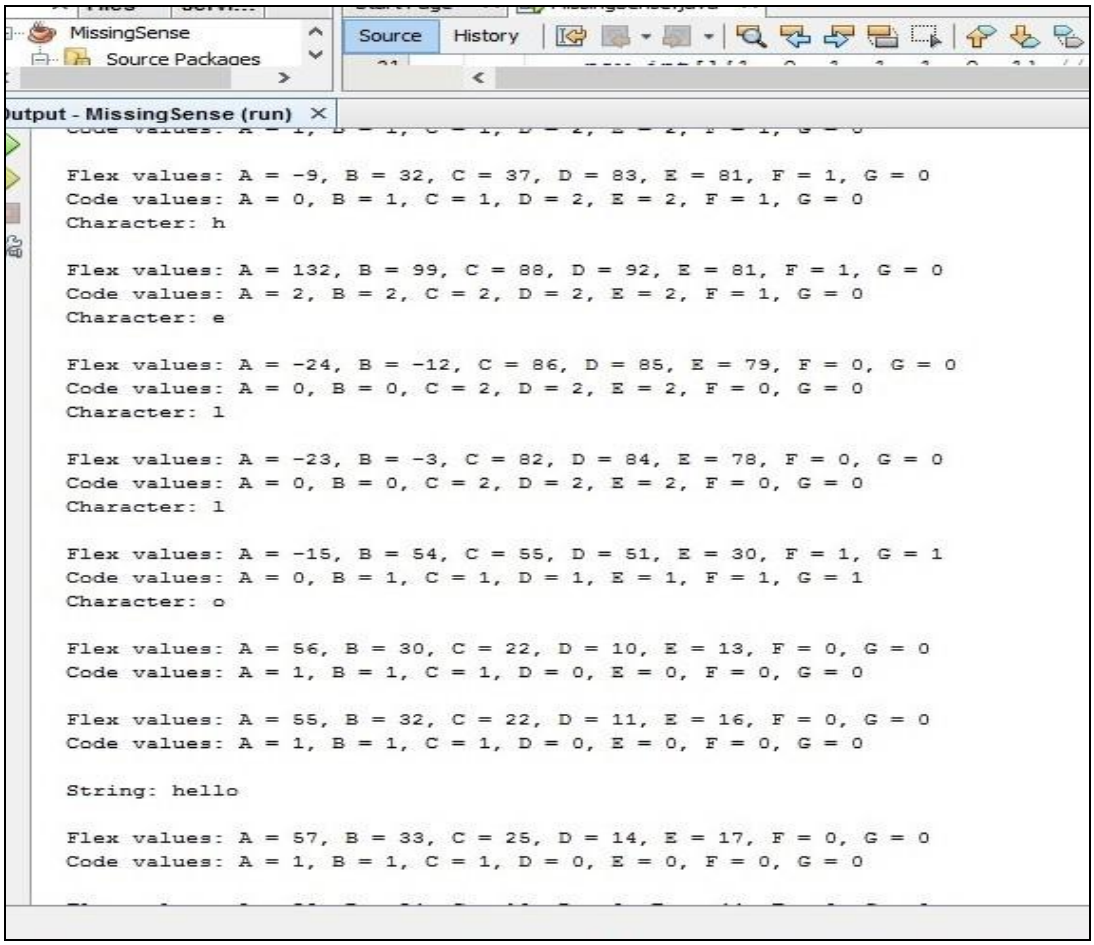

Fig 3

5. Methods and block diagram

It is the process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system. Software architecture is the high level structure of a system. The design is as explained in the following points:

5.1 Architectural Context Diagram

The architectural design of our system tells that the hand sign performed by the user is sensed by the sensor. Sensor sends the sensed value in the form of analog signal to the Arduino, which converts analog signal to the digital signal. Digital signal is then send to the computing device for matching. Computing device matches it with pre-stored value.

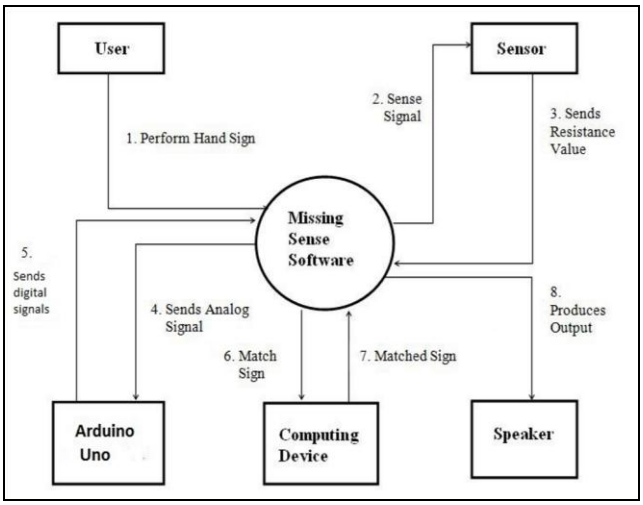

Fig 4

If the value matches with the pre store value sound is produced via speaker i.e. the message is conveyed.

6. Result

- The deaf and dumb people utilize these gloves to change over the signs performed by them into speech.
- From the accommodation of simple flex sensors, a user can interact with others in more comfortable and simpler way. This makes it possible for the users to communicate within their community as well as with other people and they can carry on with a normal life.
- The end product will have an inexpensive and simple configuration making it simple for user to work with.
- The system can perceive the signs more rapidly. Futhermore, real time recognition ratio of nearly 99

7. Future Scope

- This system has been implemented on windows platform but it can be extended to other platforms.
- The delay required between two hand signs for proper functioning of system can be removed to make system more user friendly.
- This system is currently implemented for communication in terms of letters and words, in future it could be expanded to be used for statements and hence giving better communication help for dumb people.

8. Conclusions

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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