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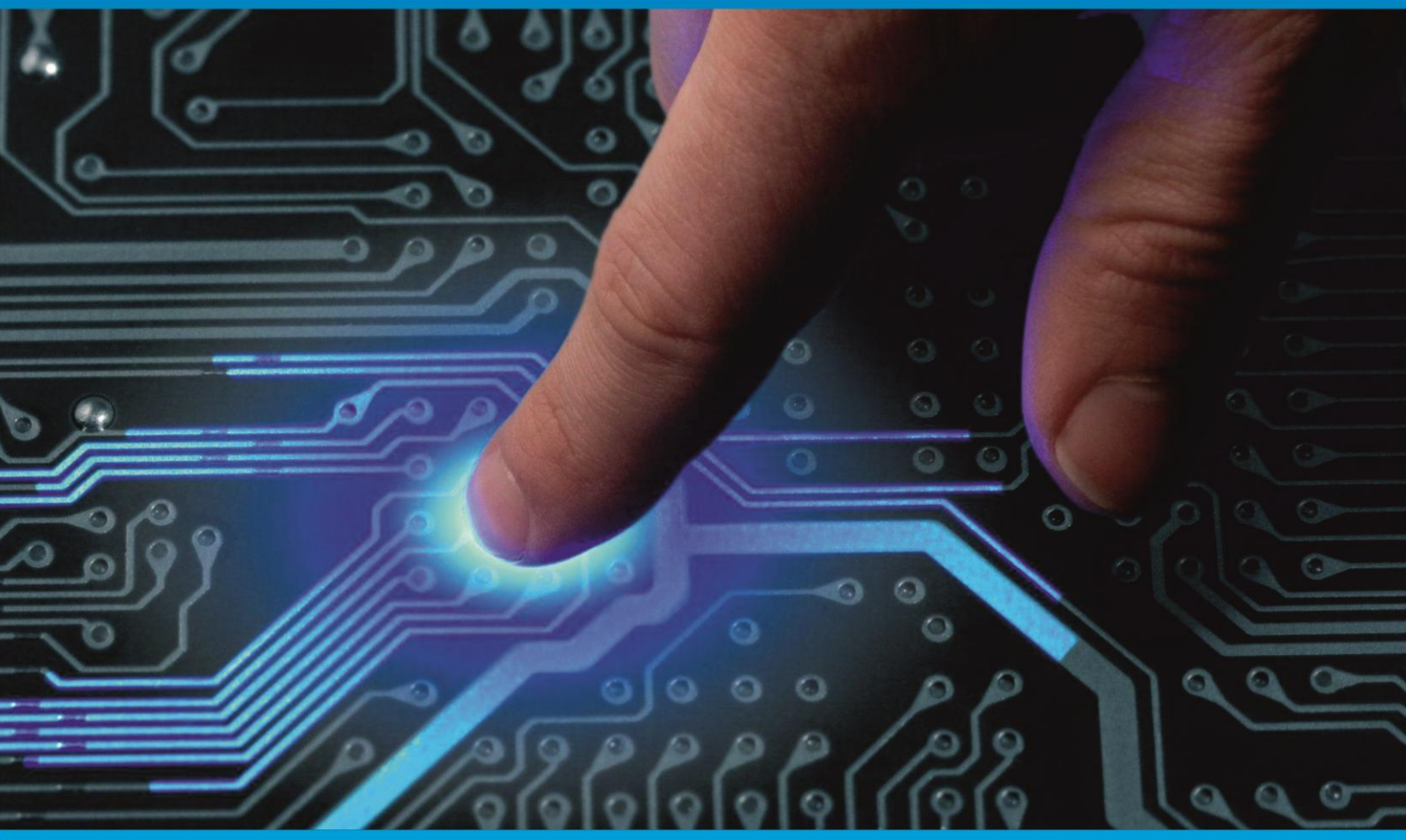

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Smart Gloves Turns Sign Language into Text and Speech Using Respberry -Pi

Pooja S. Bhore, Vrushali A. Patil, Nilam A. Jadhav

Lecturer, Dept. of Computer Engineering, MSBTE, Pune, India

Lecturer, Dept. of Computer Engineering, MSBTE, Pune, India

Lecturer, Dept. of Computer Engineering, MSBTE, Pune, India

ABSTRACT: Human Beings communicate and know each other through thoughts and ideas. The best way to present your idea is through speech. But some people don't have the power of speech; the only way to communicate with others is through sign language. The problem with sign language is that it is confined to the people who are also deprived of the power of speech. These people are often termed as deaf and dumb. We can say that it is limited to the same set of persons that cannot speak. So, there is a need of technology which reduces this gap through systems that converts sign language into speech. So, our project 'Smart Gloves for Deaf and Dumb Students' attempts to bridge the communication gap by designing a portable glove that captures the users ASL (American Sign Language) gesture and outputs the translated text on a smartphone or any other device. The glove is equipped with flex sensors, contact sensors, and a gyroscope to measure the flexion of the fingers, the contact between fingers, and the rotation of the hand.

KEYWORDS: Hand gesture, Raspberry-pi microcontroller, flex sensors, python language.

I. INTRODUCTION

Communication between speakers and non-speakers i.e. dumb and deaf people can be problematic, inconvenient etc. This project attempts to bridge the communication gap by designing a portable glove that captures the user's gestures and outputs the translated text on a device. The glove is equipped with flex sensors, to measure the flexion of the fingers, and the contact between fingers.

The glove's Raspberry Pi microcontroller analyses the sensor readings to identify the gesture from a library of learned gestures. So, we are going to design and built a glove to be worn on the right hand that translate sign language into spoken English. Every person's hand is a unique size and shape, and we aimed to create a device that could provide reliable translations regardless of those differences. Our device uses five Spectra Symbol Flex-Sensors that we use to quantify how much each finger is bent. These sensors are read, averaged, and arranged into packets using a Raspberry-pi microcontroller. These packets are then sent serially to a Raspberry-pi to be run in conjunction with a Python script. The user creates data sets of information from the glove for each gesture that should eventually be translated, and the algorithm trains over these datasets to predict later at runtime what a user is signing [1].

II. RELATED WORK

Hand gesture recognition and voice conversion system for dumb people in our country around 2.78% of peoples are not able to speak (dumb). Their communications with others are only using the motion of their hands and expressions. We proposed a new technique called artificial speaking mouth for dumb people. It will be very helpful to them for conveying their thoughts to others. Some peoples are easily able to get the information from their motions. The remaining is not able to understand their way of conveying the message. To overcome the complexity, the artificial mouth is introduced for the dumb peoples. This system is based on the motion sensor. Per dumb people, for every motion they have a meaning. That message is kept in a database. Likewise, all templates are kept in the database. In the real time the template database is fed into a microcontroller and the motion sensor is fixed in their hand. For every action the motion sensors get accelerated and give the signal to the microcontroller. The microcontroller matches the motion with the database and produces the speech signal. The output of the system is using the speaker. By properly updating the database the dumb will speak like a normal person using the artificial mouth. The system also includes a text to speech conversion (TTS) block that interprets the matched gestures[2].

The communication between a dumb and hearing person poses to be an important disadvantage compared to communication be-tween blind and ancient visual people. This creates an extremely little house for them with communication being associate degree elementary aspect of human life. The blind people can speak freely by implies that of ancient language whereas the dumb have their own manual-visual language referred to as language. Language is

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also a non-verbal form of intercourse that's found among deaf communities at intervals the planet. The languages haven't got a typical origin and thence hard to interpret. A Dumb communication interpreter is also a tool that interprets the hand gestures to sensibil-ity speech[2].

A gesture in associate degree extremely language is also a certain movement of the hands with a particular kind created out of them. Facial expressions collectively count toward the gesture, at constant time. A posture on the other hand is also a static variety of the hand to purpose an emblem. Gesture recognition is classed into a pair of main categories: vision based mostly and detector based. The disadvantage of vision based totally techniques includes advanced algorithms for process. Another challenge in image and video method includes varied lighting conditions, backgrounds and field of scan constraints and occlusion. The detector based totally technique provides larger quality. The primary aim of this paper is to introduce an issue that will efficiently translate language gestures to every text and sensibility voice. The interpreter makes use of a glove based totally technique comprising of flex detector, instrument sensors. For each hand gesture created, a symptom is formed by the sensors appreciate the hand sign the controller matches the gesture with pre-stored inputs. The device not exclusively interprets alphabets but cans even sort words exploitation created gestures. A training mode is gettable on the device therefore it fits every user and accuracy is inflated. The device will even be able to translate larger gestures that require single hand movement. Gesture recognition implies a method by that knowledge is collected from parts of the physical body (usually the hand) and processed to work out attributes like hand form, direction and speed of gesture being performed.

III. PROPOSED METHODOLOGY AND DISCUSSION

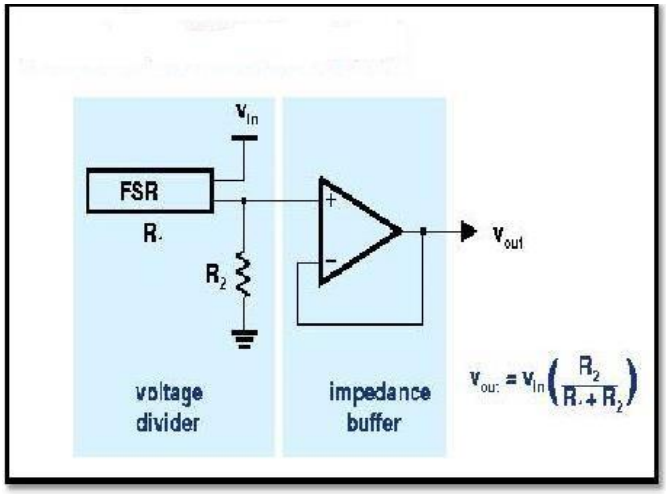

fig 1: Basic flex sensor circuit

The figure 1 shows the basic circuit diagram of flex sensor. Using flex sensor, we measure the change in resistance Motion Sensors (Flex Sensor) - The flex sensors are the sensors that change in resistance depending upon the amount of bend on the sensor. They convert the change in bend to electrical resistance. They can be unidirectional and bidirectional. Available in thin strip form. The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius the smaller the radius, the higher the resistance value. Flex sensors has the length from 1 inch to 5 inch i.e. near about 73mm in length and 6.35mm in width. The resistance of the flex sensor varies above or below 550Ω. The main difference between unidirectional flex sensor and bidirectional flex sensor is that, as the unidirectional flex sensor is bent, the resistance increases, while when a bidirectional flex sensor is bent, the resistance decreases. At rest or 00 bend, the resistance of the unidirectional flex sensor is 10KΩ.As it is further bent at 450, the resistance increases per the bent. At 900 bent, the resistances of the unidirectional flex sensor range from 30KΩ to 50KΩ[3].

IV. SIMULATION RESULTS

Design of this project is very simple. It requires very cheap component for implementation such as: Rasberry pi 3 model b, controller, Flex sensors and audio speaker. But first we must select a suitable sign language for this project.

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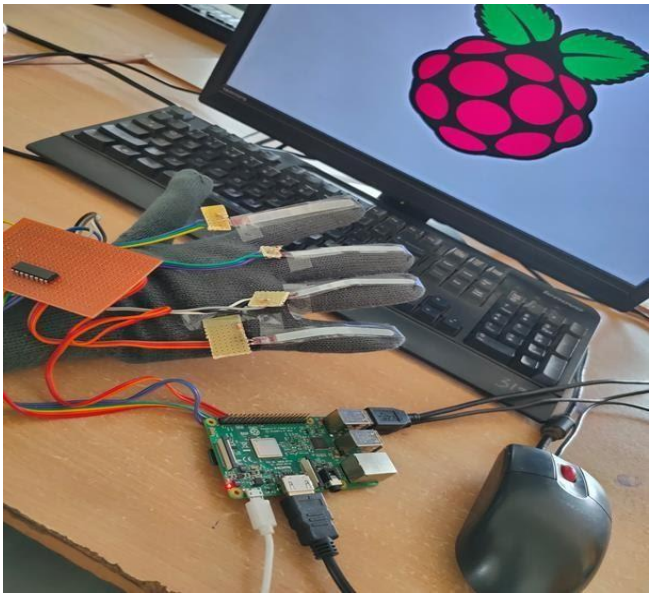
Different countries have their own sign language but English sign language is considered as universal language. So, we can make use of English sign language for all alphabets to convert them into various gesture for all alphabets in English sign language.

We have 'Gesture' as key thing in our project. Sensors in the glove pick up gestures and are proceed in controller to a form word. Then word is transmitted to Rasberry pi which runs text to speech software developed using python. The sensor data are converted into text and then to voice output. This illustrated in block diagram of project.

We designed and built a glove to be worn on the right hand that uses a Python script to translate sign language into spoken English. Every person's hand is a unique size and shape, and we aimed to create a device that could provide reliable translations regardless of those differences. Our device uses four Spectra Symbol Flex-Sensors that we use to quantify how much each finger is bent, and the MPU-6050 (a three-axis accelerometer and gyroscope) can detect the orientation and rotational movement of the hand. These sensors are read, averaged, and arranged into packets using an Raspberry-pi microcontroller. The user creates data sets of information from the glove for each gesture that should eventually be translated, and the algorithm trains over these datasets to predict later at runtime what a user is signing. Then the respective letter is get printed in LCD and further the text is converted into audio using espeak library in python[4].



V. CONCLUSION AND FUTURE WORK

we could recognize asl alphabets with 100% accuracy if we use the combination of flex, contact and accelerometer sensor. when the experiment was conducted 10 times the average success rate was 91.54%. the time between two asl alphabet recognition is 500 ms. this time can be reduced by increasing the clock rate. data from sensors are received in parallel while the program running on the micro controller is sequential. so, with the use of parallel programs or threads time can still be reduced or the system can be used in real time. the present work only includes recognition of asl alphabets that can be further extended for asl words and sentences. the system can further be added with the capability of transmitting the data wirelessly. this can be accomplished by using the bee module. this paper demonstrates the recognition of asl alphabets using single hand that can be extended to double hand. the project currently uses the serial monitor of the raspberry pi 3 model b that displays the output of the glove formation on the computer screen. text to sound converter ic may be used to speak the alphabets and words. the system may be added with voice talkback using an android app that can spell out or communicate the data or the signs being developed by the user simultaneously.

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BIOGRAPHY

Pooja Swapneel Bhore is a lecturer in computer Department, College of Pimpri Chinchwad Polytechnic, Pune University. I completed Master of ENTC in 2005 from Shivaji University, My interest in Arduino,IoT, Embedded System, VLSI etc.

Vrushali Avinash Patil is a lecturer in computer Department, College of Pimpri Chinchwad Polytechnic,Pune University. I completed Master of Computer Engineering in 2015 from North Maharashtra University, Jalgaon. My interest in Computer Graphics,Database and Algorithm etc.

Nilam Ajay Jadhav is a lecturer in computer Department, College of Pimpri Chinchwad Polytechnic, Pune University. I completed Master of Computer Enginerring in 2016 from Savitribai Phule University, My interest in Networking, Relational Database and PL/SQL etc.

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