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Hand Gesture Vocalizer

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ABSTRACT

Digital voice over is a social project aimed at improving the ability of speaking and hearing by enabling people to communicate better with the public. There are approximately 9.1 billion deaf and hard of hearing people worldwide. They encounter many problems while trying to communicate with the society in daily life. Deaf and speech-impaired people often use language to communicate but have difficulty communicating with people who do not understand the language.

Sign language uses sign language patterns i.e., body language, gestures and movements of arms and fingers etc. to convey information about people. relies on. This project was designed to meet the need to create electronic devices that can translate sign language into speech to facilitate communication between the deaf and dumb and the public.

KEYWORDS: *Digital Vocalizer, Flex Sensor, Sign Language, Gestures, Arduino Nano*

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I. INTRODUCTION

Sign language is a language that uses communication and body language to convey meaning, rather than saying sound patterns out loud. This can include hand gestures, gestures, and movements of the hands, arms, or body, and facial expressions to convey the speaker's thoughts. As long as there has been a deaf community, the lessons have come together. Languages are also used by people who can hear but cannot speak. Even if they use grammar in a conversational way, it has no place.

A lot of people utilise sign language to communicate when they just have auditory skills. Written languages, in contrast to spoken ones, employ space for grammatical purposes. Sign languages share the same linguistic capabilities and traits as spoken languages. There are hundreds of different sign languages used by deaf people all over the world. While some sign languages have legal recognition, others do not.

Deaf people use sign language to communicate with themselves and with ordinary people. It is difficult for people to understand these words. While they can express their message in writing, they cannot convey it to the readers. Languages help convey their message to the public. It translates sign language words into text or speech. There are many deaf and dumb people all over the world. All of them face the problem of communicating with others. By using sign language, they can reach more individuals with their message. It converts their sign language communication into spoken language. Numerous individuals throughout the globe are deaf or mute. They cannot find out how to communicate. Our work is part of a larger effort to eliminate this communication barrier by developing a glove endowed with sensors that can interpret sign language hand movements and convert them into written and spoken language.

A large part of the Indian population suffers from a speech impediment. Also, communicating in a language is not an easy task. This problem needs a better solution that can help speech impaired people communicate easily. For this reason, the communication gap is reduced for the speech impaired. This article offers an insight to help bridge or at least reduce the gap between current research methods in this field that focus heavily on the imaging process. But in this article, use the cheaper

and easier method. The idea is to make a glove that people with poor speech can wear, which will be used to convert sign language into speech and text. Our model uses Arduino Nano as a microcontroller related to flexible sensors and accelerometer, flex sensors to read movements. Also, for optimization, we are using an algorithm to better interpret the data and perform better execution. Next, we use python to interface the Arduino Nano with the microprocessor and finally convert it to speech.

Basically, an Artificial Neural Network is the main concept of our prototype. Flex sensors are placed on the part of the fingers of the glove and then basically that glove has to wear by deaf people, which converts the parameter like finger bend hand position angle into electrical signal and provide it to the controller and controller takes the action according to the sign. And to increase the accuracy we used an Accelerometer to detect the moment of hand, so that it will be beneficial for the people to use the glove by simply rotating the hand in any direction.

II. LITERATURE SURVEY

The intended purpose of the sign language translation system is to provide a portable means of communication with the deaf and mute by translating standard sign language into spoken English. The proposed system operates solely on a microcontroller and does not require a central processing unit. Embedded Systems are swiftly becoming the norm across all industries, according to another survey. Modern embedded application development is intelligently transforming our way of life.

The development of speech converter by using RF trans-receiver to send data to recorder leads to an effective use of advice.

M. S Kasar, Anvita Deshmukh [1] made a smart glove. A glove with a portable speaker and a sound generator, designed for speech-impaired people. The system is well designed, but only captures 4 different gestures and converts them into speech. Limitations: This is a very important task, but the potential for output is limited due to the small number of explanations that will emerge.

R.L.R. Lokesh Babu, S. Gagana Priyanka, P. Pooja Pravallikka, Ch. Prathyusha [2], as "Jest Vocalizer". It uses a speech-to-text converter for mobile users. Limitations: It is difficult and inconvenient to control the phone app all the time.

Prerana K.C, Nishu Mahato [3] proposed a method for gesture recognition. A system that reads the value of a particular move made by the user and predicts the outcome of that move. Restrictions: The system is unreliable as there is no information about all the letters and words created.

Abhinandan Das [4], Flexibility sensors and gyroscope sensors for finger and hand movements, respectively. It uses a flex sensor on each finger with a gyroscope sensor inside to detect hands. This results in a combination of motions and thus a motion dataset. Data transfer is done by Xbee transceiver to facilitate data flow. When data is received, the microprocessor processes it and displays the output as a written text for the signed message. The text is displayed on the Grove-LCD. It will also be converted into speech by the Grove-buzzer sensor. Limitation: All sets can form a maximum of 200 words. Another disadvantage of this system is the use of letters and numbers, which significantly slows down communication. (Assam Engineering Institute and others).

Fig.1: The model of Hand Gesture Vocalizer

OVERVIEW OF COMPONENTS

For making this Sign Glove, we have mounted all the working components like LCD screen, DF player, Arduino Nano, and Speaker on the zero PCB and the flex sensors, Accelerometer are mounted in the gloves itself. As we have made use of Arduino Nano, which is a n open-source microcontroller board on which we have compiled our program to make our glove. For the operation of the glove, we are using the Flex sensors and ADXL335 accelerometer.

We have made use of a Flex Sensors which are fixed to the part of the fingers in the glove for sensing the movement of fingers. To operate the flex sensors one has to move the fingers in a specified way for getting desired output. The complete system is powered by a 12 volts rechargeable battery.

For sensing the hand movement, we are using ADXL335 Accelerometer which is mounted on the backhand to sense the movement of hand from the direction of its origin.

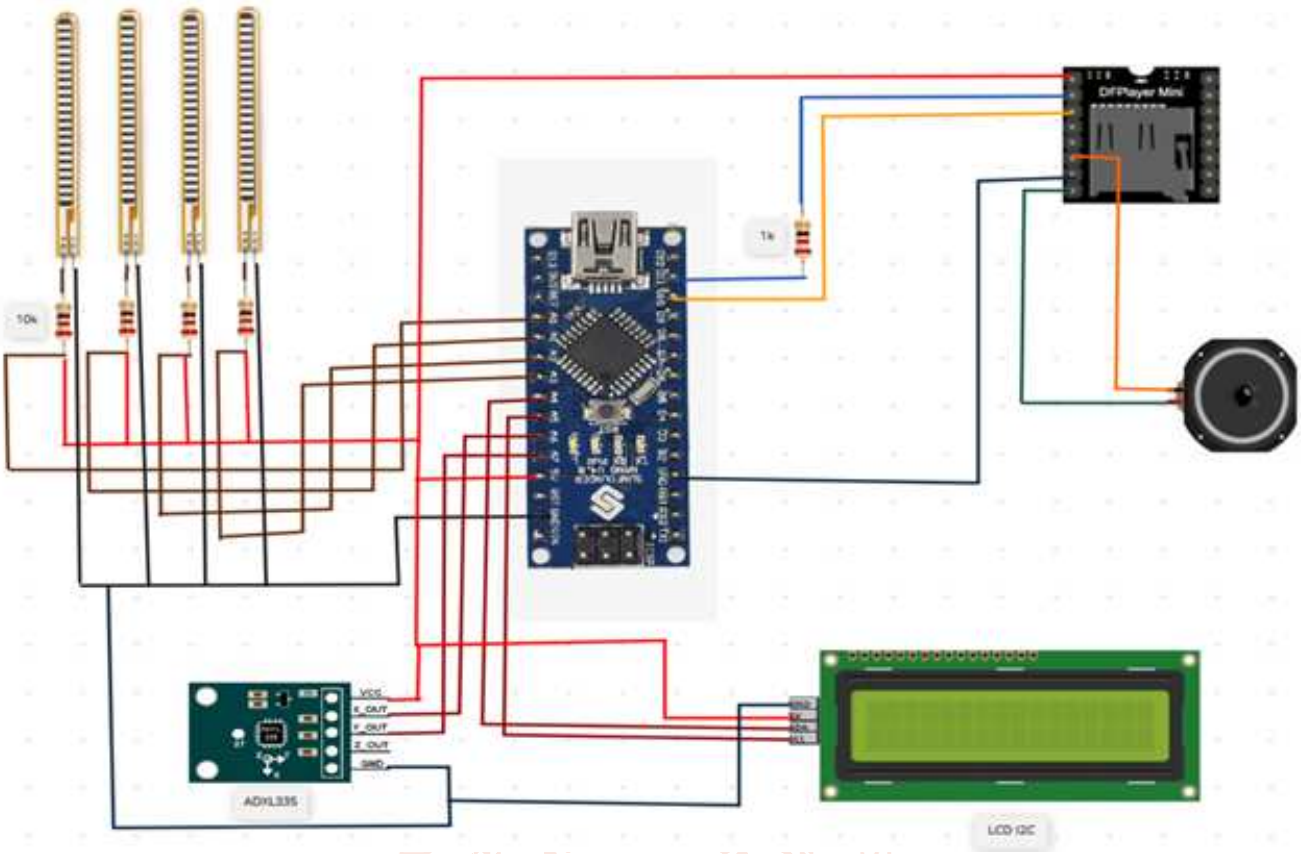

Fig.2: Circuit Diagram

III. WORKING

The key notation behind this thing works is that it basically converts the sensed signal values to the electrical energy.

The basic working principle of our project is based on the flex sensor. To implement these, we adjust all the wooden flex sensors above each of the fingers of glove. The main components of the gesture vocalizer are the microcontroller, the audio processing unit, and the LCD display; the sensors (flex and an accelerometer) are worn on the hand of the hearing-impaired individual.

A glove consists of 4 flex sensors, which are connected on each finger and an accelerometer. This piece of technology is a glove that renders hand movements into human-understandable noises and simultaneously displays the same information on an LCD screen. Inside the glove are flex sensors that convert physical parameters, such as finger bending and hand position angle, into an electrical signal that is then sent to an Arduino NANO controller. The audio processor microprocessor is responsible for storing and reproducing any recorded audio communications. The use of an LCD panel that can display text messages makes communication more accessible for individuals with hearing impairments.

An Arduino Nano microcontroller, which is a small programmable electronic device, is used to process data from flex sensors. The flex sensors are connected to the analog input pins of the Arduino nano and the microcontroller reads the analog values from the sensors.

A gesture recognition algorithm is implemented in the Arduino code, which analyzes the changes in resistance values from the flex sensors to determine the type of hand gesture being made. The algorithm can be trained to recognize different gestures, such as a fist, an open hand, a thumbs-up, or a peace sign, depending on the specific application requirements.

The Arduino can also be connected to a speaker or a buzzer, which serves as the audio output. The speaker can generate vocalized commands or responses based on the recognized hand gesture. For example, if the user makes a fist gesture, the vocalizer can generate a voice command like "HELP" or "WATER," and if the user makes a peace sign gesture, the vocalizer can generate a voice command like "cancel" or "back."

The user can interact with the hand gesture vocalizer by changing the hand gestures in real-time. The flex sensors continuously measure the bending movements of the hand, and the Arduino updates the

LCD screen and speaker output accordingly based on the recognized hand gestures.

The hand gesture vocalizer can be customized by reprogramming the Arduino with different algorithms or patterns to recognize specific hand gestures based on the user's preferences or application requirements.

Fig.3: Working condition model of Hand Gesture Vocalizer

1. ADVANTAGES:

- Hand gesture is simply based on moving the and fingers for the deaf people so that they can easily communicate with normal people.
- Compact yet highly sensitive.
- Hand gesture vocalizer can provide accessibility benefits for individuals with physical disabilities or limitations, allowing them to control devices or applications without the need for physical touch or fine motor skills.
- A glove-mounted hand gesture vocalizer can be highly portable, allowing users to carry and use the system easily without the need for additional equipment or installations.

2. DISADVANTAGES:

- Currently due to cost of all the sensors and budget limitations we choose to limited gestures which can perform by single hand.
- The accuracy and reliability of hand gesture recognition with flex sensors and accelerometers may depend on various factors, such as sensor quality, calibration, and environmental conditions. Inaccurate or unreliable gesture recognition can result in unintended actions or frustration for users.
- Wearing a glove for an extended period of time may cause physical discomfort, such as hand fatigue or discomfort due to the pressure or tightness of the glove.

3. CONCLUSION

This paper has described a specific object of concept which is used in a particular area. The the hand gesture vocalizer project presents an innovative approach by utilizing hand gestures to control vocalized output. Through a combination of machine learning algorithms and sensor technology, the project demonstrates the potential of using hand gestures as an intuitive and efficient means of controlling vocalized output and simultaneously presents on the LCD screen.

Overall, this project contributes to the advancement of normal-deaf peoples interaction and opens up new possibilities for enhancing communication and interaction in diverse domains.

The project is capable to give the desired output by reading the values given by the sensors. The overview describes how the project functions and will be implemented in the future.

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