IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104128 |

Smart Glove for Deaf and Dumb Community

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ABSTRACT: The smart glove is an innovative wearable device designed for communication between deaf-mute and normal people. The smart glove assists the individual by providing them with a means of communication. This glove interprets hand gestures and converts them to text and speech which is understandable by normal people. It is equipped with sensors and a micro-controller which interprets the motions made and converts them to understandable language. The glove is designed in such a way that it is comfortable and easy to use for individuals. The smart glove has the potential to relatively improve the excellence of communication for deaf and dumb people by providing them with new means to approach the wider world.

KEYWORDS: smart glove, gestures, flex sensor, accelerometer

I. INTRODUCTION

Communication is a means by which we can express our feelings and ideas. However, millions of individuals around the world suffer from hearing and speech disabilities. Therefore, it is necessary to create a system that aids in closing the communication gap between those who are impaired and those who are not. People who have difficulty hearing and speaking communicate via hand gestures and precise movements. For average individuals, understanding sign language is really challenging. The major goal of this project is to develop a smart glove that can translate hand motions into text and speech, facilitating communication between the deaf and dumb, and non-disabled. The device's text-to-speech converter capability allows the text to be further transformed into speech.

II. LITERATURE REVIEW

The glove made use of communication via gestures with 14 ultras which had 10 sensors for the ten fingers out of which four sensors estimate variations and appropriation, also proposed a new Pseudo 2-d concealed Markov model structure. This structure utilized the T-com P2DHMM structure to build total words of 36 gestures which also includes ASL letter spelling letters [1]. There are different techniques for sign language recognition to check their effectiveness in recognizing signs. The authors evaluated the four different techniques which include Artificial Neural Networks, Gaussian Mixture Models, which include processing techniques, recognition models, and feature extraction techniques [2]. The device consists of a glove with sensors that analyze the hand gestures of the user which are interpreted through programming. The authors designed a gesture model that represents the motion of each gesture. The system is programmed with a dynamic algorithm to recognize continuous sequences of gestures[3].

III. PROBLEM DEFINITION

To provide those with disabilities a way to properly communicate with the outside world. People who have trouble in hearing and speaking often use conventional techniques of communication like texting or sign language, which have limitations and may not be effective in all circumstances. By implementing this tool to translate gestures into speech, the smart glove aims to get around these restrictions and make it easier for deaf and dumb individuals to connect with people who don't know sign language. The glove's construction makes it more comfortable to wear and enables gesture sensing and analysis, resulting in seamless communication.

IV. METHODOLOGY

This paper offers the concept o a tool that enables mute and deaf individuals to communicate with hearing people. Four flex sensors and an accelerometer are integrated into a glove that makes up the gadget. Whenever someone wearing the glove performs a hand gesture, the flex sensors detect the motion of the fingers and hand. The microcontroller board receives the data from the sensors for further processing. This paper offers the concept of a

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tool that enables dumb and deaf individuals to communicate with hearing people. Four flex sensors and an accelerometer are integrated into a glove that makes up the hardware. Whenever someone wearing the glove performs a hand gesture, the flex sensors detect the motion of the fingers and hand. The micro-controller board receives the data from the sensors, processes it, and then uses Bluetooth to communicate it to an application on a mobile device. The Arduino UNO will store the message associated with a specific gesture. The appropriate text will be shown on the LCD board connected to the glove whenever the gesture is recognized. The information will be transformed into speech. An Android app that will assist in translating the content into several languages is included in the software interface. The application will display messages associated with graphics in addition to speech and text. When communicating with a deaf and dumb person, a normal person will be able to comprehend his feeling and his need by using images, text, and spoken messages.

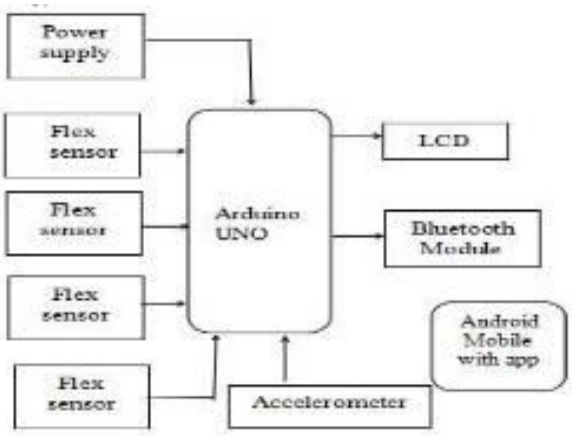

Fig.1 Block diagram of Smart Glove

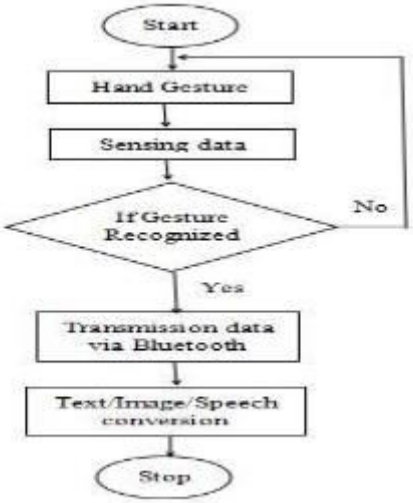

Fig.2 Flow chart of Smart Glove

A.FLEX SENSORS

Flex sensors are not only limited to measuring bending angles, but they can also be used to detect other physical changes such as compression, stretching, and torsion. Those are sensitive to external factors such as temperature and humidity, and their output signals can vary accordingly. The durability of flex sensors is affected by the number of times they are flexed, and repeated use can cause material fatigue and reduce their lifespan. Sensors can be integrated

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with wearable technology to monitor and track the movement and position of body parts in real time, which can be useful in medical and sports applications.

B. ACCELEROMETER

Accelerometers are often used in the study of seismology to detect and measure earthquakes and other seismic events. One of the unique applications of accelerometers is in the field of aviation, where they are used to measure the rate of change of an aircraft's velocity and altitude. Accelerometer can be used in automotive testing to measure the performance of a car's suspension system and to detect and diagnose issues related to vibrations and stability. Some accelerometers use specialized materials such as quartz, which can provide higher sensitivity and accuracy compared to other materials.

C. BLUETOOTH MODULE

Bluetooth module is a hardware device that provides wireless connectivity between devices over short distances. This uses radio waves to transmit data between devices. The data is transmitted in small packets, and the devices establish a connection by pairing with each other. The module supports data rates ranging from 1Mbps to 3Mbps.

D. ARDUINO UNO

The Arduino UNO is based on the ATmega328P micro-controller which is an 8-bit micro-controller with 32KB of flash memory for storing the program code,2KB of SRAM for data storage, and 1KB of EEPROM for non-volatile data storage. The board can be powered using a USB cable or an external power supply with a voltage range of 7 to 12V and the built-in voltage of this board is 5V and can be used to power other components connected to the board.

E. MIT APP INVENTOR

Provides a visual programming environment that allows users to create mobile apps using drag-and-drop blocks. This makes it easy for users to create complex apps without having to learn traditional programming languages and it provides a live connection between the user's computer and their app in real-time as they build it.

V. RESULTS AND IMPLEMENTATION

When the system is turned ON, text, images, and speech will be given out through the mobile application according to the hand gestures. There have been several smart glove prototypes developed for deaf and dumb communities that to enhance conversation and aspects of life. Overall, smart gloves have the potential to upgrade communication. As technology advances and becomes more accessible, it is likely that we will see more widespread implementation of smart gloves and other assistive devices for this community.

VI. CONCLUSION

In conclusion, a smart glove for the deaf and dumb has the potential to significantly improve communication and quality of life for persons who have trouble speaking. Users may be able to communicate more effectively and quickly thanks to this technology, which combines sensors and machine learning algorithms to overcome language barriers. The creation of a smart glove for the deaf and dumb is a promising development, but there are still many obstacles to be surmounted. For instance, it will be necessary to thoroughly test and improve the sensors and algorithm's accuracy and dependability. Additionally, because the technology might not be broadly available or affordable, there might be problems with accessibility and cost.

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INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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