

# Flexi Smart Glove: An Iot Based Sign Language Interpreter

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## ABSTRACT

Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Because of this, a person who lacks in hearing and speaking ability is not able to stand in race with normal person. Communication for a person who cannot hear is visual, not auditory. Generally dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. So there is a barrier in communication between these two communities. This work aims to lower this barrier in communication. The main aim of the proposed project is to develop a cost effective system which can give voice to voiceless person with the help of Smart Gloves. It means that using smart gloves communication will not be barrier between two different communities. With the help of these gloves disabled person can also get chance to grow in their respective carrier.

Using such devices by disabled person also makes nation grow. People suffering from listening impairment and voice disability usually make use of different sign of symbols and languages for their communication purpose. Sign languages are generally dependent on hand-driven gesticulations with various motion explicit

## I. INTRODUCTION

Communication between human being is not only through speech or voice however such differently abled people who try to communicate to the normal world find it difficult. Hence they use sign language to communicate [1]. Without using voice or speech as communication medium with one another there are several process of communication like hand shape, body and arm movements and facial expression this modes of communication is termed as Sign Language. Mute

community for example deaf and dumb people uses sign language as the medium of communication. As it is very tough for normal people to recognize and analyze sign language. Thus the barrier between normal people and mute community is created which can be broken through the study of sign language. All words that are used by normal people can be derived through sign language. The present work also guides different signs of letters to construct words which are correctly unavailable in sign language dictionary. Sentence construction can be done using sign letters and does work faster. The current research work uses "Bahasa Isyarat Malaysia (BIM) gestures. Fig.1 shows the sign gesticulations. to that particular language by which these people communicate. In sign language, gesticulation is basically specific movements of our hands with an explicit form build out of them. Current research focuses on converting the hand gesticulations based on electronic devices.

The gap between the sign language and verbal language is bridged through introduction of finger spelling which is nothing but the representation of numerical system through hands. Finger spelling acts as the master for learning sign language. This phenomenon motivated as to concentrate on finger, gestured word recognition. Around million of the entire population belongs to the mute community as per the new global estimates of WHO [2]. Low and middle income countries are the mostly affected with hearing disability due to ear infection as per the reports of WHO. Hearing loss is also caused due to measles and mumps. Researchers are working for the past decades in developing system capable of translating gesture into speech. This aims to bridge the gap between mute community and normal people. Vision approach is one of the approaches taken by the researchers to recognize and apply sign languages or fingerspelling..

## II. OBJECTIVE

To build a glove device to detect the sign language using arduino and helping speech challenged individuals communicate with others without the help of translators. To make the device completely portable and make this technology available to everyone.

## III. METHODOLOGY

The system comprises of a glove interfaced with Arduino ATmega328 Microcontroller for gesture recognition of the ASL. The glove is embedded with flex sensors and contact sensors. The flex sensors are connected to a voltage divider circuit to produce the desired range of values for the various gestures. The contact sensors are connected to the microcontroller through resistors. Resistors are included in the circuitry for limiting the flow of current. The various flex sensors connected to the voltage divider circuit are multiplexed using MUX4051. The Arduino ATmega328 microcontroller which interprets the various gestures made by the user.

This is done with the use of a predefined identification table that is discussed in section C of the methodology. The recognized characters are then displayed in the LCD display by the microcontroller. The Methodology of this Project includes

### 3.1 Design of aGlove

### 3.2 Sensors

#### 3.1 Design of aGlove

The input module to the system is a gesture glove with embedded sensors. The construction of the glove plays a key role in the character recognition efficiency of the system. Initially the glove was designed by positioning the flex sensor one on each of the index finger, middle finger, ring finger and the little finger. of the flex sensors are described in detail in the fle-x sensors sub section. Based on this ,the choice was made to position two 5cm flex sensors in each of the index ,middle and ring fingers and one flex sensor in littlefinger.

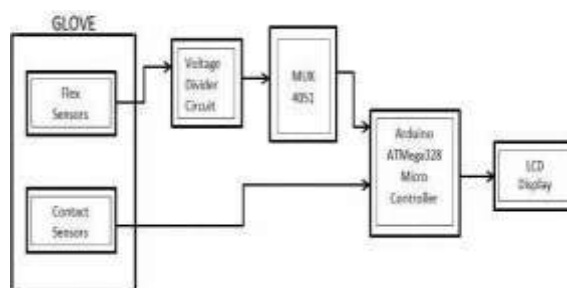


Fig. System block diagram

### 3.2)Sensors

4.1.1) FlexSensors

4.1.2) ContactSensors

4.1.3) Flex Sensors for Tracking Wrist Movement

#### 3.2.1) FlexSensors

Popularity known as bend sensors, these produce a variation in resistance with a change in the bend angle .To develop a low cost system,use of industrially available sensors is not feasible due to the high market price of about USD 7.95 for a unidirectional flex sensor of length of 2.2 inches.hence custom designed flex sensors were

built in the lab reducing the cost of a sensor to USD 0.017. The making of the flex sensors was done in two methods.

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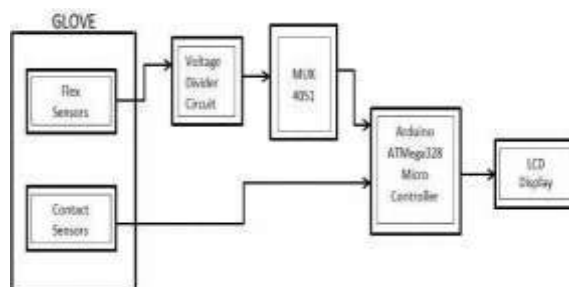


Fig. System block diagram

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#### 3.2.1) Flex Sensors

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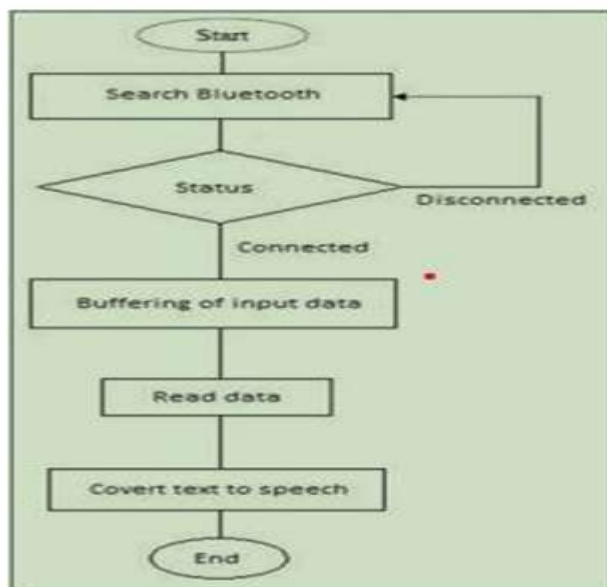
a) **Development Stage I:-** Two layers of veloster conductive bags that are cut out according to required dimensions are sandwiched between two jump wires of required length,for the two terminals.

requirements to use the command like interface or file editor to run programs. The program can be written in C++ as there is a C++ library in the Arduino IDE called wiring which makes which common input and output operation mucheasier.

#### 5.1.1) GUI Software (MITAppInventor)

Text to speech application for our smart phone Was developed using a freeware software.MIT app Inventor software ,to convert the text received from the smartphone via bluetooth.

Flowcharts shows the functioning process.



#### 5.1.2) Bluetooth

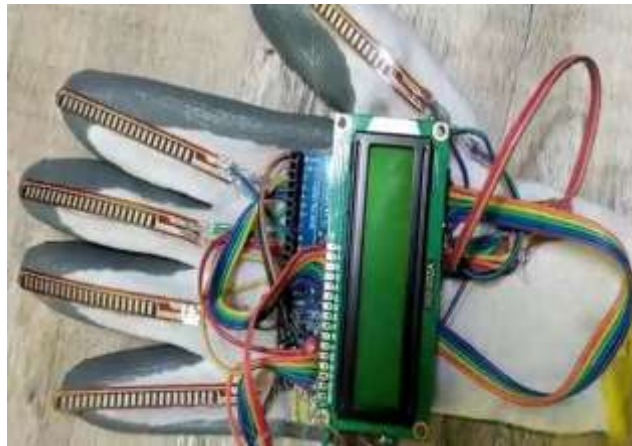
Bluetooth is a wireless technology that allows the exchange of the data between different devices exchange of data between different devices.whilebluetooth uses wavelength to transmit

information. It generally only works within a short distance for the devices to stay connected.

#### IV. OUTCOME

In this current work a significant amount of accuracy has been achieved for finger spelling recognition using smart gloves. The smart gloves approach proposal is meant to be prototype to check the feasibility of recognizing sign language. The output found was very satisfying. We have used freeware software for design of the former in MIT application inventor problem. The use of

Bluetooth as a communication protocol has given great enhancement in the design compared to other wireless communication protocols like ZigBee or RF. The future of this technology will evolve greatly if different languages can be converted into sign form and then with the help of those gloves we can convert it. The future proposal for the communication protocol that can be used is Wi-Fi or GSM for long distance communication.



#### V. ADVANTAGES

This system also aims at integrating the results of the sensors with a smart phone that maps the sensor reading to a corresponding sign which is stored in a database. The output is in the form of speech which can be easily understood by others. This system is autonomous, user-friendly, and a completely mobile system.

#### VI. APPLICATIONS

- This system is used in the field of education by making the gesture recognizable under virtual reality.
- This system is also interacting with a set of electronic devices across the house using a centralized IoT hub.

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