TALKING HANDS – AN INDIAN SIGN LANGUAGE TO SPEECH TRANSLATING GLOVE

PROJECT REFERENCE NO.: 40S_BE_1744

COLLEGE : NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY, BENGALURU
BRANCH : DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
GUIDE : MR. SANKET SALVI
STUDENTS : MS. YARISHA HEERA
           MS. MADHURI K
           MS. SRAVANTI V S

Keywords:
Sensors; Android; Bluetooth; Data to Speech Conversion; Sign Language Translation; Assistive Technology.

Introduction:
Talking hands, is a pair of gloves, which is capable of recognizing the signs (Indian sign language) made by our hands, and converts it into form of speech, which helps speech impaired people communicate with others implemented through Arduino programming and a Smartphone application.

According to the recent statistics about 7.5% of Indians are speech challenged. Indian Sign Language is the only mode of communication used by them. Sign languages are not easy to recognize as they are difficult to understand and also highly complex to learn. The day to day functioning of people with disabilities as well as their independence can be developed and improved by use of products based on Assistive Technology.

A cogently operating sign language recognition system can provide a room for a speech challenged person to communicate with non-signing people without the need of a decoder. It can be used to accomplish speech or text, making the mute more self-dependent. Sadly, here hasn’t been a system with these facilities so far. All research till now have been restricted to small scale systems competent of recognizing only a nominal subgroup of a full sign language. However, these systems have not been effective enough to make them independent.

Objectives:
Our project aims at
• Helping speech challenged individuals communicate with others without the help of translators
• To make the device completely portable.
• To make this technology available to everyone.

Methodology:
The proposed framework is a pair of gloves integrated with different sensors which can convert Indian Sign Language to speech with the help of a smart phone to empower speech challenged individuals.

HARDWARE REQUIREMENTS:
Minimum system configuration:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart phone processor</td>
<td>Any Processor above 500 MHz</td>
</tr>
<tr>
<td>RAM</td>
<td>512MB.</td>
</tr>
</tbody>
</table>
Input device: Gloves with sensors.
Output device: Smart Phone.

- MPU6050
- Arduino Nano Board
- Bluetooth Module (HC-05)
- Flex Sensor
- Batteries (9V, 36V)

SOFTWARE REQUIREMENTS:
- Operating system: Windows 7 32-bit or higher/Ubuntu/Fedora.
- Development Environment: Arduino IDE and Android Studio.

Talking Hands is implemented in the following way:

Each glove comprises of a flex sensor on each finger, i.e. five flex sensors to determine the bend in the fingers. Each glove also consists of one MPU6050 sensor to determine the yaw, roll and pitch and an Arduino Nano microcontroller on the breadboard on the wrist. The cumulative reading of five flex sensor and MPU6050 will help us understand the orientation of hand in space. The left glove consists of one Bluetooth module which is configured in the slave mode. The right glove consists of two Bluetooth modules, one which is configured in the master mode to communicate with the left glove and the other to communicate with the smartphones Bluetooth. The Bluetooth module on the right combines the sensor values of both hands and transfers it to the Smartphone Application.

The Smartphone Application receives the cumulative readings of the right hand and the left hand via Bluetooth. The Smartphone Application implements a machine learning algorithm called k-Nearest Neighbor algorithm which classifies/maps the received readings into a class label or a particular sign based on the class label of the neighbor in the already determined Dataset.

The classified result is the equivalent word for the gesture. The corresponding words are translated into speech which is understandable by anyone who has no knowledge about sign language.
Prototype of the gloves

**Results:**
Consider an example where the speech challenged individual is trying to sign the word “Namaste”. The readings while making the sign “Namaste” is determined by the sensors and are transferred to the smart phone application. The application classifies the readings as a sign called “Namaste” and produces the corresponding speech as output.

**Conclusion and Scope For Future Enhancements:**
The proposed gesture recognition system converts Indian Sign Language to speech with the help of variety of sensors like flex sensor, gyroscope and accelerometer in order to successfully determine the position and orientation of the hand gesture.

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

We would like to extend the applications of these gloves in the field of education by making the gesture recognizable under Virtual Reality. The gloves can also be used for interacting with set of electronic devices across house using centralized IoT hub. We also believe that by introducing the concepts of machine learning we can teach the gloves to understand the gestures.