

Android Application for Sign Language to Text/Speech Translator

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Abstract— Living in the 21st century we are still facing the problem of communicating deaf and dumb disability people. As we know they having a particular set of sign languages they make gestures through hands to convey their message to the opposite person but in the major of cases sign language becomes a barrier for a normal person because only the trained person can understand it by decoding the sign gesture. So this project deals with an application which will translate some common sign language gesture through image processing by detecting the hand gestures via mobile camera and convert into a text message format and send it through the social media site so the person with no knowledge of sign language gestures can also understand it and communicate with the opposite person. The proposed system will fully be based on the software and try to reduce the hardware burdens of the existing one. It will help to reduce the language barrier from the deaf and dumb community.

Keywords: Sign language, Image Processing, Mobile camera.

1. Introduction

In accordance with recent statistics, 70 million people spent their life being mute is an inability to speak, often caused by a speech. This is a matter of regret for those peoples who can't express them self in words through their speech. Even it's hard for them to manage their day to day activities. They also find it challenging to communicate with other people using their sign languages. This application will help the mute society by providing a better and more convenient means of life by communicating with other people. Our main motive is to build a product that will help the mute community to live their life with more ease. So being in the digital world each one of us uses a smart phone in their day to day life, so why not use this smart phone as a tool for communication for the mute community as well. So in our project we are developing an android application that uses image processing for translating the sign languages to text/audio.

2. Literature Survey

In ^[1] the author develop a device for hand gesture to speech conversion using hardware components. This paper uses flex and Accelerometer for sensing the hand gesture and converts the analog signal to digital then it gives to the Raspberry Pi which displays it using LCD Display and gives audio using an external speaker connected to the Raspberry Pi.

The^[2] mainly focuses on gesture to speech conversion using hardware components. They used flex sensors and microcontrollers with the Blue Tooth module to achieve this. This paper used both hardware and software, the hardware is used for sensing the gesture and processing the input and then the data is sent to the android phone using the Blue Tooth module connected to the Arduino

The ^[3]emphasizes only on computer software to convert gesture to speech using an image processing algorithm in computer vision using the database. It takes the image via a web camera as an input to produce the speech. The image is first undergoing pre-processing to enhance the feature of the image. Then the image is changed into binary and reduces noise and removes background to extract the feature which is used for matching it with the stored database and we get the desired output in the text then it can be converted into speech.

The objective of the ^[4]is to build a product that converts gestures to speech. It uses smart gloves, microcontroller, LCD display and speaker. It translates the sign language to text using smart glove and microcontroller then the text is displayed in the LCD display and speech of the text is played using a speaker.

2.1 Summary of Related Work

The overview of the comparison of different parameters are given in Table 1

Table 1 Summary of the literature survey

Literature	Advantages and Disadvantages
[1]	Advantage: The use of flex sensors and raspberry Pi gives a faster performance. Disadvantage: every time the user needs to carry the whole device.
[2]	Advantage: Use of computer based software makes more reliable. Disadvantage: Less mobility and portability.
[3]	Advantage: Smart glove, LCD display and speakers makes the device more convenient for use. Disadvantage: Bulky hardware devices
[4]	Advantage: Hardware embedded system with use android mobile gives efficient results. Disadvantage: Need to take care of both hardware components as well as the mobile phones.

3. Implemented Work

The process is to translate the hand gesture of sign language to text/speech. An image of a hand doing sign language gesture is captured using a mobile camera then using an image processing algorithm the image converted into text or speech and send it to the opposite person. We are using YOLO (“You Only Look Once”) algorithm for gesture detection and google text-to-speech API for the conversion of gesture to speech or text.

3.1 System Architecture

The system architecture is given in Figure 1. Each block is described in this Section.

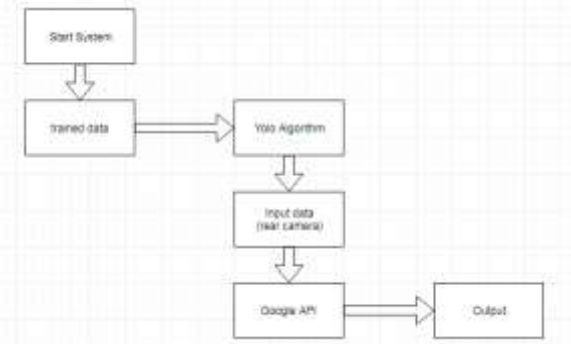


Fig. 1 System architecture

A. YOLO (“You Only Look Once”): Yolo is the most commonly used algorithm for real-time object detection. The basic idea behind this algorithm is used to predict the object so before getting started we should know what to predict. The YOLO apply the single neural network to the full image then divides the image into an S x S grid and comes up with rectangle boxes, and probability for every region. It achieves high accuracy even in the real-time. The algorithm “only looks once” at the image in the sense that it requires only one forward propagation pass through the neural network to make predictions. After non-max suppression (which makes sure the object detection algorithm only detects each object once), it then outputs recognized objects together with the bounding boxes.

B. Google Colab: We used google Colab for training the dataset for Recognition and Detection. Google Colab is a cloud-based free service provider from Google for the higher-level programming and dataset training purpose for the image processing and neural network projects and also supports GPU which is free.

C. TensorFlow: After the training of the dataset we obtained the .weight file from google colab and then we converted .weight file to .pb (protobuf) with the help of TensorFlow model convertor.

D. Android Studio: We generated an android(APK) using an android studio with the help of the YOLO classifier and protobuf file.

E. GTTS: We used google text-speech API with the YOLO algorithm in android studio for conversion of text of the detected object to speech.

4. Requirement Analysis

The implementation details are given in this section.

4.1 Software

In this section, software which will be needed to achieve our aim for developing android application for sign language translator are given

Table 2 Summary of Software Requirements

SN	Software	Description
1	Google Colab	Google Colab is a cloud service for programming and training purposes offered by Google with GPU.
2	Python	Python is a high-level, general-purpose programming language. It mainly focuses on object-oriented approach aims to help programmers write clear, logical code for small and large-scale projects.
3	Tensorflow	Tensorflow is the library which is mostly used for building the machine learning and Artificial intelligence applications.
4	Android Studio	Android studio is an IDE for developing android based application.
5	GTTS	Google Text-To-speech API is an google based API is offers the conversion of text to speech and vice versa.

4.2 Hardware

For completing our aim of developing an android application for sign language translator, the following hardware will be used.

Table 3 Summary of Hardware Requirements

SN	Name	Description
1	Operating system	A 64-bit operating system is required to run Android 2.3.x (Gingerbread) and higher versions. Older versions can be used in 32-bit systems.

2	Hard Disk	Minimum of 250GB of free disk space in the hard disk to compile and build the application
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5. Conclusion

Sign language is used by the deaf or mute community for the purpose of communication. But still there are number of problem and barrier arises when an normal person tries to interpret it. The main motive of our project is to reduce the hurdle of the sign language communication. So with the help of our project the deaf or mute people can communicate easily by just doing the hand gesture in front of the mobile camera which will then convert the hand gesture into text and speech so that the opposite person can easily understand it. The major feature include that it is an android application which can accessed easily with smart phone, so it can be applicable in routine life.

6. Future Scope

- We want to add more features like Sign language keyboard.
- We will also add Sign language Writing Recognizer.
- Implementation in iOS for apple user

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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