COLLEGE OF APPLIED SCIENCE, KOZHIKODE

College of Applied Science,
Balan K Nair Road,
Kiliyanad, Kozhikode
PIN: 673001

ISL Deduction using Deep Learning

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Overview

As a part of the upcoming International Conclave on Generative AI and the future of Education, conducted by IHRD, we are planning to develop an android application that will help with the accessibility needs of people with speech impairments by understanding, learning and predicting Indian Sign Language.

Goals

1. **To understand the problem domain and present a solution:** Firstly, we wish to understand, analyze and work towards the issue at hand by presenting a solution to the current problems faced by the Indian community with speech Impairments.
2. **To generate a working model that can help solve the issues faced:** Next, we hope to put forth a working model, by developing an Android app that can help such individuals to converse freely with everyone around them.

INDEX

INTRODUCTION

Abstract

According to various surveys conducted around India, almost 6.5% to 7.5% of all the people having disabilities are having speech disabilities. Such people usually communicate with others using sign languages or through written communication. Sign Languages are usually hard for other people to understand which makes it extremely hard for them to communicate with other people.

Many of us are unaware of the fact that just like how different countries or states have different languages, sign language too are of different types. In America, they follow ASL also known as American Sign Language whereas in India and other South Asian Countries nearby, we use Indian Sign Language. This makes it difficult for other people who don't know sign language as well as people who only know ASL to communicate with ISL users.

This difficulty is what enlightened us to understand the need for a tool which can help people who communicate using ISL to communicate effectively with others. Upon some research, we found that we could easily identify the message if it was in ASL by using google translate tools for deaf and mute. There are more 3rd party applications too available for the same but an implementation available to the general public was unavailable. There were 1 or 2 papers available on it but no usable applications or demos. This led us to taking this up as a challenge.

Objectives and Scope

The main objective as discussed above will be to develop an accurate working model that can predict the actions and movements of the user and output exact translations of ISL. It would also be useful if we could add some references in the app which could also encourage non ISL users to take up learning ISL as there is no better way of communication than one in our own language.

The scope of this paper is not just limited to research but can extend to the everyday lives of people making it a better experience for them and improving their QoL (Quality of Life).

SYSTEM ANALYSIS

Initial Investigation

As discussed earlier, the need for an ISL translator was imminent when we found out that signing was different in different regions of the world. We started by searching for a solution but we only found good solutions for ASL.

Upon further research, we found that there were research papers on said subjects but what use is research if there is no real life implementation that could help the people in need? So we decided to dig a little more deeper and we found that there is no existing solution and we needed to find one.

There is one more concern here.The fact that most of our everyday users are supposed to be common people who might not be extremely fluent in english. So apart from ISL translation, if there was a way to integrate regional language translation, it would make the experience complete.

Existing System

As mentioned before, there is no currently existing system that works with ISL. There are ASL variants but those won't be of much help to us here in India.

Even the google tool is not openly available now and has been deprecated and removed from the playstore. This leaves the stage open with a need that if fulfilled will drastically change the lives of the people in need, here the deaf and mute community.

Proposed System

The system we intend to make is one which can translate ISL in real-time using the mobile camera. The app will translate the message and show it to the user hence making the communication process fast and efficient.

We also plan to include a module where the users can start learning to sign so that they will be able to easily communicate with their close ones without the need for translation in the future. This will also help bridge the gap and make them feel welcome.

Feasibility Study

The proposed system is feasible to design as all the required technologies are readily available. It is also economically feasible as it doesn't need any initial funding or it doesn't have infrastructure requirements that might hinder the development process.

Upon doing an in-depth study, we could confirm that the project is highly feasible and not risky and can be successfully completed given adequate time and support.

SYSTEM REQUIREMENT SPECIFICATION

Hardware and Software Specifications

We would require a fast and efficient system to do the processing as we will be using a Deep Learning Model. The device supposed to run the finished product is an Android phone with basic specifications. Considering the fact that it too will need to run the tensorflow lite model easily, we would recommend using mid-range devices with at least 4GB RAM and an efficient yet basic processor like the Snapdragon 4XX series or up or similar. The android device would also need access to the internet.

On the software side, we would need a newer version of Android, version 9 and up for optimal and 5 and up for minimal results. On the development side, we would need a Windows machine and access to Google Colab to generate the TensorFLow Lite Models and above all, an error free high quality set of data for training purposes.

Selection of Software

1. Android Studio:- Android (JAVA, XML for back-end and front-end respectively).
2. Google Colab:- Python to generate the TFLite models using Deep Learning

DESIGN AND DEVELOPMENT

As mentioned earlier, we plan to design and develop an android application for the user. The system design would be divided into 3 modules for ease of understanding and abstraction. The first module is supposed to deal with the Tensor Flow Model based on deep learning methods. The second module is the user interactive side which would prompt the user to turn on the camera and watch the movements and postures created in the sign language, analyze the sign and determine the message that the user wishes to convey. Finally in the third module, we wish to add an easy way of learning the basics of Indian Sign Language by showing images, gifs and or videos to help users learn ISL. We could also provide an option where the user can try signing themselves after they have finished learning ISl and get a score for it.

During the development phase, we plan to develop a high accuracy model first and then integrate it into the android app by exporting it into tensor flow lite. Then, we can proceed with our work with the android app.

No project is finished by release. Most importantly, we need to test it for bugs and issues and also make sure that it is accurate and produce correct results. We will need to conduct timely maintenance and updates to our systems by taking input from the users into consideration and finally need to make sure that we keep adding new features that will be helpful in the future.

FUTURE SCOPE AND CONCLUSION

I would like to conclude by once again highlighting the need for this project and how much of a positive impact this can bring to the community by making deaf and mute people feel included.We aim to use AI to create rippling changes in our society which can help improve their quality of life and bring them out of their shells to the general community.

We hope that this also helps generate a positive trend of learning ISl to converse with them as there is no better joy than for us to speak the language they speak, one of the signs. We hope to help people easily learn ISL and generate a trend where signing is practiced in day to day life and becomes a regular use language like English, Hindi etc.

Inally, there are many ideas that still remain as question marks, waiting to be incorporated. We hope to bring ASL to ISL and even more regional variant translations to this tool. We also hope to include more and more local and regional languages to help our users. Finally, an option like displaying the message live as they sign in AR would make the experience more immersive and satisfying. All this and more awaits the future of this project and above all, we hope to change people's lives for a better future.