

Sri Lankan Sign Language to Text-Speech Conversion and Vice-versa

D. Manoj Kumar

Department of Software Engineering
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
it17050272@my.sliit.lk

K. Bavanraj

Department of Software Engineering
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
it17032766@my.sliit.lk

S. Thavanathan

Department of Software Engineering
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
it17068192@my.sliit.lk

G.M.A.S. Bastiansz

Department of Software Engineering
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
it17143950@my.sliit.lk

S.M.B. Harshanath

Department of Software Engineering
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
harshanath.s@sliit.lk

J. Alosious

Department of Information Technology
Sri Lanka Institute of Information
Technology
Colombo, Sri Lanka
jesuthasan.a@sliit.lk

Abstract— Sign Language is used by the deaf & mute community to communicate with each other. Not all of us are aware of the sign language & we do require a translation. Most of the Sri Lankan Sign Language is tightly bound to the deaf & mute which makes it difficult for the verbally challenged to communicate with ordinary people in Sri Lanka. In this paper, we present a translator which will translate the Sri Lankan sign language into text-speech & vice-versa which would benefit the verbally-challenged to express their ideas back & forth.

Keywords — machine learning, image processing, low-resolution image recognition, convolutional neural networks, natural language processing, real-time translation, semantic analysis, text-to-speech conversion.

I. INTRODUCTION

In this paper, we are planning to present a new solution to build a strong communication bond between Sri Lankan ordinary people & hearing-impaired or verbally-impaired people by introducing a translator which can convert Sri Lankan sign language into native languages in Sri Lanka & also, convert simple English phrases into Sri Lankan sign language [1]. However, the translator is done as a web-based application which can even detect images captured through low-resolution web cameras.

II. PROPOSED METHODOLOGY & EXPERIMENTAL RESULTS

The proposed system was categorized to 4 main sub-categories namely, hand gesture detection, image classification, text & voice assistant and text to SSL conversion to get the maximum result at the end. In hand gesture detection session, the most important part was model training. After splitting 247 pre-labelled images into train & test datasets, the model was trained by applying on top of TensorFlow models & faster RCNN configurations. After a successful model training, a live image was detected through web camera & train the image with the model until the accuracy of the image is more than 95%, it was sent to the next session for the classification purposes.

In image classification session, the detected image was sent through CNN classifier which pooling the image of hand sign continuously until a well-filtered hand-sign image appeared following the dimensionality reduction concept. After identifying the class of the hand-sign using an activation

function, the predicted letters which relevant to the filtered hand signs passed to next session.

In the next session, text-voice assistant, as the 1st part the predicted letters which got from the previous session were splitting into meaningful word segments with the assistance of phonetic conversion dictionary & some ML techniques such as NLP. Like the 2nd part, by using Speech Digital Processing in ML & converted that meaningful word segments into the audio format & display as the output according to the user preferences.

The last session of this system is the inverse function of the collection of above mentioned 3 sessions. Through Text to SSL Conversion session, it was planned to convert the user-entered text into Sri Lankan sign language. Since this is the 1st version of the application, this time the system only accept the text in the English language. By using “tokenization” method in nltk library in NLP & split the entered phrase into separate words. After comparing each separated words with the system database, the system had chosen relevant hand-signing for each word & create a GIF image using selected images of hand-signs. In the process of creating GIF images, Semantic Analysis was used. Also, this session has the ability to recognize the common words which use in day-to-day life & the unique name such as the name of a person, name of a city & complete the above mentioned 4th session considering the type of the word. Finally created GIF images of the hand signs displays to the user as the output.

III. CONCLUSION

In this paper, we present you an application which could translate Sri Lankan Sign Languages to text & voice and vice versa. First, to detect the hand signs, we used R-CNN based model and to translate them, we used the ML-based API which we developed. This API can be used in future developments which are related to the sign languages.

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