**SINHALA SIGN LANGUAGE TRANSLATOR FOR**

**DEAF AND SPEECH IMPAIRED PEOPLE USING**

**CONVOLUTIONAL NEURAL NETWORKS**

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# DECLARATION PAGE OF THE CANDIDATE & SUPERVISOR

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# ABSTRACT

The Sign language is a visual language used by the people with the speech and hearing disabilities for communication in their daily conversation activities. It is completely an optical communication language through its native grammar. In this paper, hoping to present an optimal approach, whose major objective is to accomplish the transliteration of 24 static sign language alphabet words and numbers of Srilankan Sign Language into humanoid or machine decipherable English manuscript in the real time environment. Since Srilanka has a native sign language deaf/Signers become uncomfortable when expressing their ideas to a normal person. Artificial Neural Networks (ANN) and Support Vector machines (SVM) has been used as the technologies of this proposed system. Pre- processing operations of the signed input gesture are done in the first phase. In the next phase, the various region properties of pre-processed gesture image is computed. In the final phase, based on the properties calculated of earlier phase, the transliteration of signed gesture into text and voice been carried out. Proposed Model is developed using Python and Python libraries like OpenCV, Keras and Pickle.

***Keywords***— **Artificial Neural Networks, Static gestures, Gesture recognition, Support Vector Machines, Gesture Classification**

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# LIST OF ABBREVIATIONS

|  |  |
| --- | --- |
| **Abbreviation** | **Description** |
| SSL | Srilankan Sign Language |
| ASL | American Sign Language |
| AI | Artificial Intelligence |
| ANN | Artificial Neural Networks |
| CNN | Convolutional Neural Networks |
| KNN | k – Nearest Neighbor |
| NN | Neural Networks |
| SVM | Support Vector Machine |
| Conv2D | Convolutional 2 Dimension |
| FLD | Fisher's direct discriminant |
| LDA | Linear discriminant analysis |
| HMM | Hidden Marcov Model |
|  |  |

# LIST OF ABBREVIATIONS

**CHAPTER 01**

# INTRODUCTION

## Prolegomena

Speech disorders / speech impairments are a type of communication disorder where the way of speaking normally is disrupted. This can cause to stuttering , lisps etc. People who are unable to speak due to this speech disorder are called muted people. Muteness AKA mutism is a word which came from Latin word “*mutus*”(silent). This happens most of the time while maintaining the ability of understanding the speech of others. Mutism is identified at early childhood which is observed as lack of speech with the people who know the person such as family , friends and caregivers. Symptoms may vary from above mentioned stuttering , adding extra noise , elongating words and distorting sounds when talking. Separating people from normal and disordered is more complex than it seems. According to the researches they have found that only 5% - 10% of the total population has a complete normal manner of speaking (with all the parameters completed) with a healthy voice. All others suffer from one or another disorder. There are many ways of classification when considering the magnitude and the type of the disorder and the treatment ways.

1. Sounds the patient can produce

* Phonemic – can be produced easily, used in a meaningful manner and effectively
* Phonetic – produced only when requested, not using consistently, meaningfully, or effectively, not constructed and not used in connected speech

1. Stimulate sounds

* Easily stimulated
* Stimulate after a demonstration and probing (With a tongue depressor)

1. Cannot produce the sound

* Can’t produce sound voluntarily
* No sound ever acquired.

And, there are many negative social effects to the people who suffer from talking disorders specially among young children. They can be the targets of bullying because of their disorder so that can result in the decreased self-esteem of them. So, in the sense of solving the problem of making engagements between normal people and muted people sign language was introduced.

Sign language is the primary method of communication by the aurally handicapped people. Most of the times, an sign gesture is mapped to a word or a phrase in spoken language and named is as conversational sign. Sign languages use visual method to pass the message that means basically a visual manual modality. Sign languages are expressed through manual elements as well as non-manual elements such as eyes, face expressions etc. Sign languages has their own grammar and lexicon. Sign languages are not universal and are not mutually intelligible with each other sign languages. And the main thing is sign languages should be not confused with the body languages, a type of nonverbal language. It is not possible to say that this much of sign languages are there in the world. Most countries have their own sign language which goes along and relates with their native language. According to Ethnologue (www.ethnologue.com) there are over 137 sign languages around the world. Each language differs from syntaxes and grammar. American sign language (ASL) which is considered as the standard sign language, but it is engaged only if the signers are talking in English. In India they have Indian Sign Language (ISL) , and in Srilanka we have Srilankan Sign Language(SSL).

## Sinhala Sign Language

According to the stats given by the Srilankan Federation of Deaf (www.slcfd.lk)

There are over 300,000 deaf people living in Srilanka. Moreover, the WHO (World Health Organization) has found that 9% of the people in Srilanka has some sort of loss of hearing. Accordingly, unmistakably non-settlement of Deafness is responsible for separating a huge fragment of the general public who might somehow have had a significant effect on the financial improvement of the nation had there been a method for them to speak with different portions of the general public viably. Apart from the main sign language separations SSL can be divided into 2 main parts.

1. Conversational Gestures
2. Finger spellings

Conversational sign presents a whole word or a sentence in Sinhala language while fingerspelling shows a letter in the language. Finger spellings are mainly used to express the words of the language which are not clearly defined such as names of the people. Sample of fingerspelling is shown in figure 1.1 and sample of how a name is interpreted is shown in figure 1.2 and a sample of conversational sign is shown in figure 1.3

A picture containing keyboard

Description automatically generated

Figure 1.1 - Finger Spelled Signs

A screenshot of a cell phone

Description automatically generated

Figure 1.2 - Interpreting a Name using signs

A close up of text on a white background

Description automatically generated

Figure 1.3 - Conversational Signs