

shanu

by S.U. WEDAGE

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1.0 Introduction

1.1 What is sign language?

Sign language is a unique system of conventional gestures, mimic, hand signs and finger spelling, plus the use of hand positions to represent the letters of the alphabet, ideas or phrases. The [visual](#) recorded history of sign language in Western societies starts in the 17th century, as a [language](#) or method of communication.

Sign language may be categorized into two types. "The first is used by individuals who have auditory/oral language and the signs are used for special situations, such as communication in a monastery in which there is a vow of silence or in military purposes. The second is used by those who do not have access to auditory/oral language, namely the deaf" (Ruben, 2005) and deaf-mute people. Deaf-mute is a term which was used historically to identify a person who was either deaf using a sign language or both deaf and could not speak. Many natural languages have created their own sign language system with different grammar, syntax, and vocabulary. **Sign Language and its signs and gestures are unique to region/country. Many natural languages have created their own sign language system. Some of them are American Sign Language (ASL), British Sign Language (BSL), French Sign Language (LSF).**

Among those Sinhala Sign Language is a [visual language](#) used by [deaf](#) people in Sri Lanka. Sri Lankan Sign Language was fully built on the foundation of British Sign Language but have lots of variations. Sri Lankan Sign Language currently consists of more than 2000 sign based words.

Letter Based Sign Language

Spelling out words through fingers by using signs for corresponding letters of the manual alphabet. Among deaf and mute individuals, finger spelling is more often used in conjunction with sign language for proper names and terms for which there are no signs.

1.2 Importance of learning sign language

According to Sri Lankan Federation of the Deaf, there are over three hundred thousand plus (300,000+) Deaf people in Sri Lanka. Moreover, the World Health Organization has revealed that approximately 9% of the population in Sri Lanka have speaking and hearing impairments. The

4 reasons for these disabilities are not mere due to birth issues. According to Department of Census and Statistics Sri Lanka road accidents, riots and violence and war and terrorism are also among major reasons which creates speaking and hearing impairments.

9 Article Error (ETS) As a result of that Sign language is an extremely important communication tool for deaf and hard-of-hearing people. There are only few number of people who are competent on Sinhala sign language and hence create a great difficulty for deaf people to engage in their social life and endeavors. Other people have to learn the sign language to communicate with deaf people and same might be useful to themselves due to other unfortunate factors which create speaking and hearing impairments as mentioned above.

Article Error (ETS) There is a lack of interest in the natural persons to learn SSL. And because of that deaf and mute people cannot interact with the normal people and eventually the deaf people get isolated in the society.

1.3 Barriers to learn sign language

6 It simply takes time to learn sign language when compared to a natural language since it takes communications to a completely different level and demands that you master eye gazing to better navigate the give-and-take of communal interactions. Additionally, there is only few number of people who can teach the Sinhala sign language best.

Missing "," (ETS) Wrong Article (ETS) It is much convenient to both normal persons and deaf and mute people if there is an effective device based real-time translator.

2.0 Problem Definition

The existing applications on the topic are standalone learning applications of sign language for a beginner and does not support real time applications. The real time sign language translating applications are still in the research levels for English languages and many other languages. Also for Sinhala sign language. Majority of them are focusing on developing electronic devices. But it require more power supply and it is very costly. So some researches use the static hand gesture recognition system using digital image processing.

Hand gestures can be different from person to person. The length, size can be different. So have to use machine learning to identify similar hand gestures when using image processing for identify

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the hand gestures allocated for a particular sign. other applications that are converting Sinhala sign language into text did not use machine language.

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The systems that are translating Sinhala sign languages translate words and phrases into text only. There are no systems that are translating Sinhala sign language for Sinhala letters into Sinhala letter texts. Current systems are only capable of identifying few number of words and sentences among 500+ Sinhala sign language. To identify the rest, each word have to be inserted to their system.

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S/V (ETS)

Alphabet of Sinhala language only consist of 60 letters. Since letters are the building blocks of any language, converting signs based on letters to text can increase the horizons to identify and translate almost any word.

Therefore this research is based on creating real time Sinhala sign language translator based on letter based signs using image processing and machine learning with the intention of achieving effective communication platform for people with visual and verbal impairments.

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1.4 Motivation

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Finding and treating diabetic retinopathy early can help prevent total blindness. Therefore early detection of diabetic retinopathy is very important. If diabetic retinopathy is diagnosed successfully at the early stage, ophthalmologist would be able to treat the patients by laser treatments.

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There are large numbers of researches done to develop diabetic retinopathy systems using retinal images incorporating with image processing techniques and other related technologies. This research is incorporating with digital image processing techniques and fuzzy logic to obtain more reliable solution.

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Deaf and hard-of-hearing people face difficulties when communicate with the outer world. Finding Solutions to the communication between those people and normal people can help to reduce the gap between them and (asarana minissunta pihita wenna puluwan). Therefore finding a method to (degollantama understand wena widihata bicomunication karanna method 1k) is very important. If there is a way to communicate easily between

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these two kind of people, deaf and hard-of-hearing people not be face difficulties because of their (abadiha thathwe)

There are large numbers of researches done to develop sign language translating systems using image processing techniques and other related technologies. This research is incorporating with digital image processing techniques and machine learning technique to get a better solution

4.0 Objectives of the Study

Objective of this project is to develop an application which is embedded with the capability of Translating Sinhalese Sign Language into text through recognition of alphabet based signs. End product may be capable of tracking the hand gestures of Sinhala sign language for letters and print it in a text field on the user's device.

1.5 Limitations

There are 60 letters in sinhala alphabet. And there are relevant hand signs for those 60 letters. There are 2 types of hand signs. They are static hand signs and dynamic hand signs. This research has been limited only to recognition of static hand signs.

1.6 Major Achievements

This research proposes a method for exudates detection and these exudates are classified into hard exudates using fuzzy set and membership functions. Finally it computes a value to indicate the presence of diabetic retinopathy hard exudates.

This research proposes a method to convert letter based hand signs into text using combination of image processing techniques and machine learning techniques

1.7 Structure of the Dissertation

Chapters of this dissertation consist of information to understand the project with required figures and tables. The first chapter helps to obtain basic idea of this research.

The second chapter includes the previous works for the identification of sign language. It contains the techniques for image preprocessing.

The third chapter describes the theoretical concepts of image processing and fuzzy logic behind on the research. Then it explains method of the project which is carried out to perform hard exudates detection successfully. It contains three stages for image preprocessing, exudates detection and hard exudates detection.

The forth chapter is about results and discussion. It includes the result and performance measurement of the proposed method.

The fifth chapter includes conclusion, limitation and future works for this research.

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