

# **SMART GLOVE FOR RECOGNITION OF SINHALA SIGN LANGUAGE**

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June 2022

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## **DECLARATION OF THE CANDIDATE & SUPERVISOR**

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date: 30/06/2022

The above candidate has carried out research for the Masters thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of the supervisor:

Signature of the supervisor:

Date: 30/06/2022

## **DEDICATION**

To my mother and grandmother  
who made all of this possible,  
for making me who I am

## **ACKNOWLEDGEMENTS**

I would like to express my utmost gratitude to my MSc research advisor Prof. D.P Chandima for the incessant support of my MSc study and related research, for his patience, motivation, and immense knowledge helped me to successfully complete the research and writing of this thesis.

Next, I would like to thank my friends and colleagues for their support, encouragement, and insightful comments. Their hard questions lead me to widen my research from various perspectives.

My sincere thank goes to my mother, husband, and aunt(mamma) who provided me support, and encouragement. It would not be possible to carry out this research successfully without their precious support and encouragement.

Finally, I should thank each and every friend and colleague whose names have not been mentioned here, for the support, encouragement and guidance provided to make the educational process a success.

## **ABSTRACT**

Speech and hearing-impaired people used sign language to communicate with each other. Sign languages are made of gestures. The language consists of different gestures instead of letters or words.

The purpose of this research work is to reduce the communication gap between normal people and hearing and speech impaired people. The research incorporates a system comprising of a glove-based mechanism, consisting of sensors to recognize the hand gestures for Sinhala sign language (SSL) alphabet.

The solution combines electronics, sensors, embedded systems, machine learning algorithms, and natural language processing. The research based on a data glove with flex sensors that measure finger bending and an Inertial Measurement Unit (IMU) to recognise palm-turning gestures of the alphabet. Further, sample data with eleven independent variables and hundred data samples per gesture was used for the purpose. In the proposed system, data is trained and classified using Random Forest machine learning algorithm. And natural language processing (NLP) is completed using a newly developed Application Programming Interface (API) to make Sinhala words.

The results show that the proposed algorithm has a better recognition effect on gestures, and is capable of making words and sentences. The accuracy of the model on the prepared dataset was founded as 99% for the target user with regard to random forest classification.

Complete training for all possible combination of letters and preparation of words is necessary to continue NLP. Also, the system can customise as an education platform for sign language learners. Further, the developed smart glove can use separately for any other hand gesture base applications, the developed ML base system can use or customize separately for feature extraction of any smart wearable item, and finally, the newly developed Sinhala API can use separately for any Sinhala sign language base NLP research work.

**Keywords:** Sinhala sign language, Hand gesture, Machine learning, Data glove

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## LIST OF ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
API	Application Programming Interface
ASL	American Sign Language
EGALE	Easily Applicable Graphical Layout Editor
EMG	Electromyography
FN	False Negative
FP	False Positive
HRI	Human-Robot Interaction
IDE	Integrated Development Environment
IMU	Inertial Measurement Unit
ML	Machine Learning
NLP	Natural Language Processing
PCB	Printed Circuit Board
SSL	Sinhala Sign Language
TP	True Positive
TN	True Negative
WHO	World Health Organization

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