Archives available at journals.mriindia.com

International Journal on Advanced Computer Engineering and Communication Technology

ISSN: 2278-5140
Volume 14 Issue 01, 2025

Translation Assistant for Converting Sign Language to Text and Audio

Ms. Aware Divya Bhagvat[1], Ms. Sayyad Saniya Rashid[2], Mr. Shaikh Aman Hashim[3], Mr. Thombare Siddhesh Bhanudas[4], Prof. J. N. Ekatpure[5]

[1-4]Department of Computer Engineering, Savitribai Phule Pune University
[5]Assistant Professor, S. B. Patil College of Engineering
saniyasayyad158@gmail.com[1], divyaaware22@gmail.com[2], amaan03147@gmail.com[3], siddheshthombare2003@gmail.com[4]

Peer Review Information

Submission: 15 Feb 2025
Revision: 23 March 2025
Acceptance: 27 April 2025

Keywords

Sign Language
Deep Learning
Image Processing
Advanced CNN

Abstract

Sign Language Recognition (SLR) converts sign language motions into legible text or voice with the goal of assisting the hard of hearing in communicating. An outline of the most recent approaches, developments, and difficulties in SLR is provided in this abstract. It talks about how important SLR is to help the deaf and hard of hearing community be more inclusive and accessible so they can communicate with the general public more successfully. Convolutional neural networks (CNNs)this new developments in deep learning-based techniques that have demonstrated promising outcomes in SLR tasks, are also highlighted in the abstract. To improve the accuracy and practicality of SLR systems in real-world situations, it also tackles the requirement for strong datasets, effective feature extraction strategies, and model optimisation approaches.

INTRODUCTION

A Translation Assistant for converting sign language to text and audio is intended to bridge the communication gap between sign language users and non-signers, hence increasing accessibility and inclusion. This technology uses machine learning, computer vision, and natural language processing to evaluate and translate sign languagerelated hand gestures, facial expressions, and body movements into written or spoken words in real time. The major goal is to provide an effective communication tool for people with hearing and speech impairments so that they may better communicate with the rest of the community. Sign language is a complex visual language that communicates via gestures, movements, and expressions. Millions of people throughout the world use it, including those who are deaf, hard of hearing, or have communication difficulties. However, a lack of public awareness of sign language frequently causes communication breakdowns. This project aims to employ artificial intelligence and deep learning techniques to create a system capable of identifying the complexity of various sign languages and translating them into acceptable text and audio outputs.

Key Features of the System:

- Symptom Recognition (NLP) -Extracts symptoms from user input using AI.
- Disease Prediction (ML) -Suggests possible diseases based on symptoms.
- Medical Advice & Recommendations -Offers basic guidance and next steps.

LITERATURE SURVEY

Real-Time Sign Language Recognition System

According to the authors, Shreya Narang in 2024, The study addresses Real-Time Sign Language identification challenges, with a focus on improving gesture detection accuracy, processing speed, and flexibility to a wide range

of users and environments The approach recognizes motions using machine learning methods, specifically deep learning techniques. It employs computer vision to analyze videoframes in real time.

ML Based Sign Language Recognition System
According to the authors, Amruth Ke The work addresses problems with current sign language recognition systems, such as poor accuracy, sluggish processing speeds, and limited flexibility to varied signing styles The solution employs machine learning techniques, specifically convolutional neural networks(CNNs), for effectivegesturerecognition.ML-based Sign Language Recognition comprises improving model accuracy with sophisticated deep learning techniques, incorporating additional sign languages, and expanding user involvement with natural language processing.

Realtime Sign Language Detectionand Recognition
As per the authors, Aakash Deep In 2022 The paper addresses the challenges of real- time sign language detection and recognition, including low accuracy and delayed processing The system captures hand movement sand gestures, processes them in real-time, and translates them into text or speech, improving the accessibility of sign language communication

Sign Language Recognition Systemusing CNN
According to the authors, Ansh Shriwas In 2024, The paper addresses the limitations of traditional sign language recognition systems focusing on improving accuracy and efficiency. It involves preprocessing video frames, training the CNN on label datasets, and optimizing the model to enhance recognition accuracy, enabling real-time interpretation sign language gestures effectively.

Sign Language Recognitionusing Machine Learning
According to the authors, Surendar K It focuses on improving gesture recognition accuracy and reducing the dependency on extensive manual feature extraction. The paper employ machine learning techniques such as support vector machines (SVM), decision trees, and k-nearest neighbors (KNN) for sign language recognition Future work involves enhancing model robustness for diverse sign languages, exploring deep learning integration for improved feature extraction.

Sign Language Recognition using Deep Learning
The paper by Friska Natalia The paper addresses the challenges of accurate sign language recognition by utilizing deep learning techniques. It focuses on improving gesture classification reducing misinterpretation rates. The paper utilizes deep learning techniques, specifically recurrent neural networks (RNNs) and convolutional neural networks (CNNs), to analyze and classify sign language gestures

Sign Language Recognitionusing Machine Learning Algorithm
The 2023 paper Charitha Vedantam The paper shows the challenge of correctly detecting sign language motions using traditional techniques, which are usually hampered by sign variability and user performance. The paper improves sign language recognition by utilizing machine learning algorithms such as convolutional neural networks (CNNs)and recurrent neural network (RNNs The paper shows the challenge of correctly detecting sign language emotions using traditional techniques, which are usually hampered by sign variability and user performance. The paper improves sign language recognition by utilizing machine learning algorithms such as convolutional neural networks (CNNs)and recurrent neural networks (RNNs)

Survey on Different Approach Used for Sign Language Recognition Using Machine Learning
The 2023 paper by Ritesh Kumar Jain the paper discusses the limitations of current sign language recognition systems, which usually rely on out mode methodologies and are inflexible to different sign languages. Future research will concentrate on increasing the robustness of sign language recognition system by including multimodal data, such as audio and visual inputs. The study look sat a number of sign language recognition algorithms, including hidden Mark models (HMMs), support vector machines (SVMs), and deep learning techniques like convolution neural network (CNNs).

Sign language recognition with long short termmemory
According to the Authors Tao Liu By utilizing long short- term memory (LSTM)networks, the study aims to improve the accuracy and efficiency of sign language recognition, enabling better real-time communication for users. LSTMs are type of recurrent neural network (RNN) specifically designed to capture temporal dependencies in sequential data, making them

ideal the dynamic nature of sign language gestures.

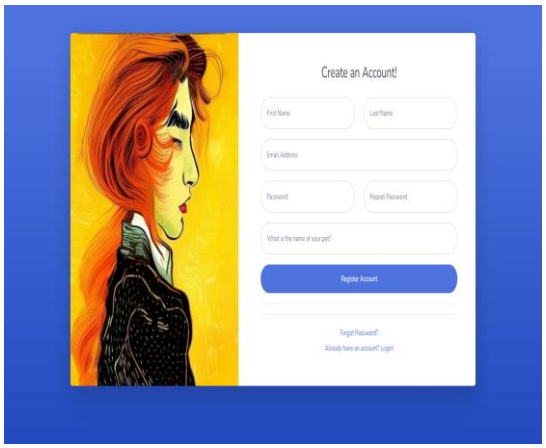
Sign talk: Sign Language and Speech Conversion

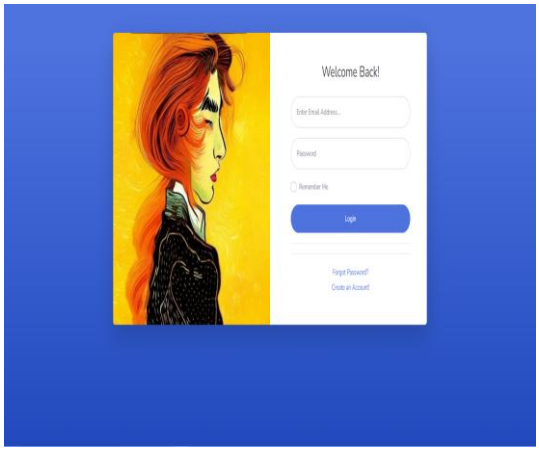
The 2021 paper by C. Uma Bharathi the existing problem involves the difficulty of accurately recognizing and translating the dynamic and expressive nature of sign language gestures into a format that can be understood by non-signers. The system likely utilizes machine learning algorithms, such as Convolutional Neural Networks (CNNs), to recognize and classify sign language gestures from video input.

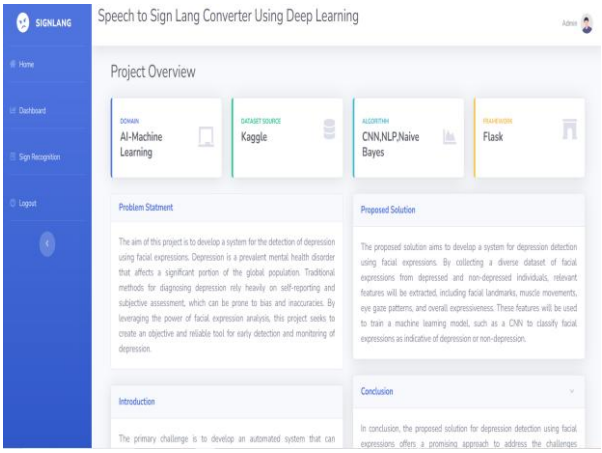
Limitations of Existing Work

1. Sign language is rich in cultural background and emotions, which may not be correctly expressed in text or audio translations, leading in miscommunication.
2. Different regions have different sign languages (for example, American Sign Language vs. Indian Sign Language), making it challenging to create a global translation system.
3. Achieving accurate real-time translation can be difficult due to the speed of signing and the need for immediate processing, which may result in delays or errors.

RESULTS/ OUTPUTS







CONCLUSION

In conclusion, a translation tool that converts sign language to text and audio can help the deaf and hard-of-hearing communicate more effectively. This assistant uses advanced technologies such as computer vision and machine learning to accurately read sign language motions and transform them to written text or speech. This not only improves accessibility, but also promotes diversity by enabling for seamless interactions in a variety of situations, including educational institutions, businesses, and social gatherings. The creation of such tools is critical for fostering understanding and respect for various modalities of communication, resulting in a more inclusive society in which everyone can fully engage in conversations and activities.

References

Mohammedali, Atyaf Hekmat, Hawraa H. Abbas, and Haider Ismael Shahadi." Real-time sign language recognition system." Int J Health Sci 6, no. S4(2022): 10384-10407.

Amrutha, K., and P. Prabu. "ML based sign language recognition system." In 2021 International Conference on Innovative Trends in Information Technology (ICITIIT), pp. 1-6. IEEE, 2021.

Pigou, Lionel, Sander Dieleman, Pieter-Jan Kindermans, and Benjamin Schrauwen. "Sign language recognition using convolutional neural networks." In Computer ECCV 2014 Workshops: Zurich, Switzerland, September 6-7 and 12, 2014, Proceedings, Part I 13, pp. 572-578. Springer International Publishing, 2015.

Tolentino, Lean Karlo S., RO Serfa Juan, August C. Thio-ac, Maria Abigail B. Pamahoy, Joni Rose R. Forteza, and Xavier Jet O. Garcia. "Static sign language recognition using deep learning."

International Journal of Machine Learning and Computing 9, no. 6 (2019): 821-827.

Deep, Aakash, Aashutosh Litoriya, Akshay Ingole, Vaibhav Asare, Shubham
M. Bhole, and Shantanu Pathak. "Realtime sign language detection and recognition."
In 2022 2nd Asian Conference on Innovation in Technology (ASIANCON),pp. 1-4. IEEE, 2022.

N. Rajasekhar, M. G. Yadav, C. Vedantam, K. Pellakuru and C. Navapete,
"Sign Language Recognition using Machine Learning Algorithm," 2023 International
Coimbatore, India, 2023, pp. 303-306, doi: 10.1109/ICSCSS57650.2023.10169820.