International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 05 | May - 2023 SJIF 2023: 8.176 ISSN: 2582-3930

SIGN LANGUAGE RECOGNITION

SANDU PRAVALIKA

DARGAI ANKITHA

Under the guidance of Mrs. D. Sriveni

Sreenidhi Institute of Science and Technology

ABSTRACT

Sign Language is one of the ways to establish communication with deaf people. One should have knowledge of sign language to interact with them. The process of learning sign language is difficult because there are very few study materials available for sign learning and it is a difficult task. The initial stage of sign learning is Finger spelled sign learning and moreover, are used when no corresponding sign exists or signer is not aware of it. Most of the existing tools for sign language learning use external sensors which are costly. Our project aims at extending a step forward in this field by collecting a dataset and then use various feature extraction techniques to extract useful information which is then input into various supervised learning techniques. Currently, we have reported fourfold cross validated results for the different approaches, and the difference from the previous work done can be attributed to the fact that in our fourfold cross validation, the validation set Correspond to images of a person different from the persons in the training set.

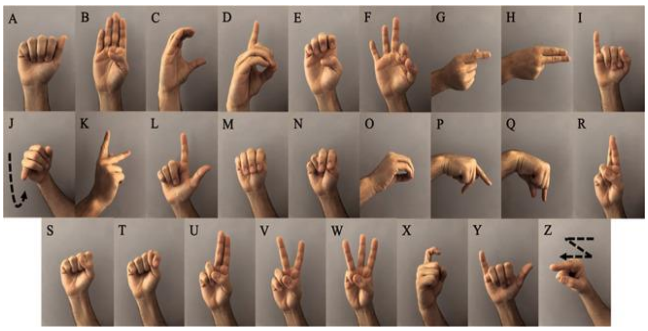
INTRODUCTION

The language that acts as a medium for communication for deaf and dumb people is sign language. A sign language consists of various gestures formed by different shapes of hand, its movements, orientations and also the facial expressions. Across the world there are around 466 million people with loss of hearing and among those 34 million are children. `Deaf' people have very little or no hearing ability. They use sign language for communication. People use different

sign languages in different parts of the world. The American Sign Language (ASL) is a visual language used by the deaf and hard of hearing community to communicate with each other. However, it can be challenging for individuals who are not familiar with the language to understand it. This project aims to develop a machine learning-based system that can detect and recognize ASL signs, thereby improving communication between deaf and hard of hearing individuals and the general public. The sign language detection can be done using various techniques, including machine learning and deep learning algorithms.

One such deep learning algorithm used for sign language recognition is the Long Short-Term Memory (LSTM) network. LSTM is a type of recurrent neural network (RNN) that is designed to handle sequential data by remembering information for long periods. LSTM has been shown to be effective in various applications, including speech recognition, image classification, and natural language processing.

In this project, we aim to use LSTM and CNN (conventional Neural Network) network for sign language recognition. The project involves collecting a dataset of sign language pictures, training an LSTM model, and evaluating the model's performance.



American Sign Language

EXISTING SYSTEM

Several existing systems use machine learning algorithms to detect and recognize ASL signs. However, most of these systems have limitations in terms of accuracy, speed, and robustness to variations in lighting and hand orientation. Those include the Microsoft Kinect sensor, which uses depth sensing and skeletal tracking to detect hand gestures; the ASL-LEX project, which uses a database of ASL signs to recognize individual signs; and the Leap Motion sensor, which captures hand motion and orientation to recognize ASL signs.

There are several disadvantages associated with existing sign language detection systems, including:

1. Limited gesture recognition
2. Limited accuracy
3. Limited real-time performance
4. Limited hardware compatibility
5. Limited portability

PROPOSED SYSTEM

The proposed system uses a convolutional neural network (CNN) for sign detection and recognition. The system also employs transfer learning to improve accuracy and speed. Transfer learning involves using a pre-trained CNN and fine-tuning it for ASL sign detection and recognition.

The proposed system of sign language recognition using machine learning techniques will have the following features:

1. Gesture recognition: The system will be capable of recognizing a wide range of ASL gestures, including letters, numbers, and commonly used phrases. This will be achieved through the use of machine learning algorithms, specifically deep learning techniques such as Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks.

2. Real-time performance: The proposed system will be designed to process video streams in real-time, providing instantaneous feedback and reducing delays in communication.

3. Accuracy: The system will be trained on a large dataset of ASL gesture videos, ensuring high accuracy in recognizing and interpreting ASL gestures.

4. User-friendly interface: The system will have a user-friendly interface that displays recognized gestures in real-time. This will make it easier for non-ASL speakers to communicate with ASL users.

5. Portability: The proposed system will be designed to be portable, allowing it to be used in a variety of settings and locations. It will not require specialized hardware or sensors, making it more accessible and cost-effective.

Overall, the proposed system will be more advanced and accurate than existing sign language recognition systems, providing a reliable and accessible tool for communication between ASL users and non-ASL speakers.

SYSTEM ARCHITECTURE

The system architecture consists of three main components: the video capture module, the feature extraction module, and the classification module. The video capture module captures video of ASL signs using a webcam or camera. The feature extraction module extracts relevant features from the video, such as hand shape and motion. The classification module uses a pre-trained CNN to classify ASL signs based on the extracted features. The gestures will be analysed and the text will be generated.

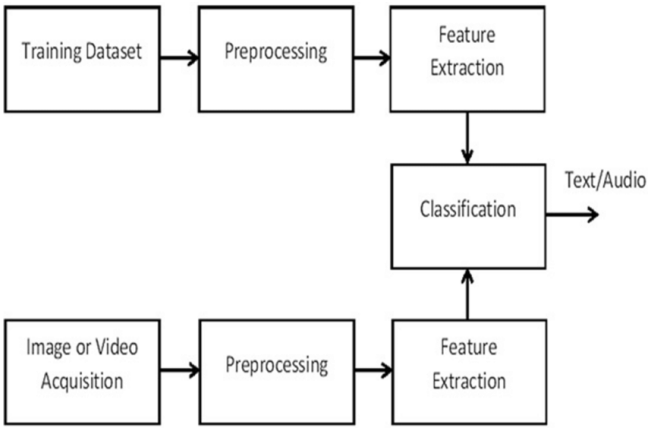


Fig 1: System Architecture

PYTHON LIBRARIES

Open cv

OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. It was originally developed by Intel in 1999 and is now maintained by the OpenCV community. OpenCV can be used with various programming languages such as C++, Python, Java, and MATLAB.

OpenCV provides a wide range of functionalities for image and video processing, such as loading and saving images and videos, transforming and filtering images, detecting edges, lines, and corners, recognizing faces and objects, performing feature detection and matching, and more.

Cvzone

CVZone provides a comprehensive set of computer vision functions that can be used to detect and recognize different aspects of sign language.

Hand detection: CVZone provides easy-to-use functions for hand detection, which can be used to detect the hand movements in sign language. Once the hand is detected, it can be tracked and analyzed to recognize the different signs.

Pose estimation: CVZone also provides pose estimation functions, which can be used to estimate the 3D pose of the human body. This can be useful for detecting the overall posture of the person making the signs, which can provide additional context for sign language recognition.

Gesture recognition: CVZone provides gesture recognition functions, which can be used to recognize hand gestures made during sign language. These functions can recognize different hand shapes and movements, which can be used to recognize different signs.

Object detection: CVZone also provides object detection functions, which can be used to detect objects related to sign language, such as sign language books or posters. This can help to provide additional context for sign language recognition.

DATA FLOW DIAGRAM

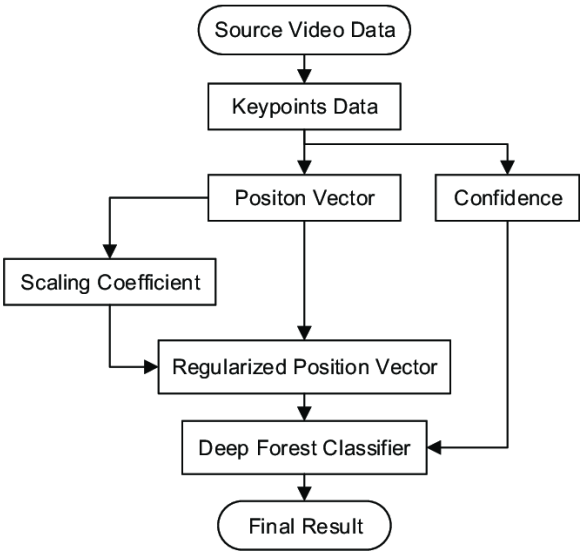


Fig 2: Data flow diagram

The DFD shows the different stages of processing involved in recognizing sign language gestures.

The video input stage captures the video of the signer's hand gestures, which is then pre-processed to remove noise and adjust for lighting conditions.

The pre-processed data is then passed through the feature extraction stage, which extracts relevant features such as the shape, orientation, and movement of the hands, as well as the position of the fingers.

The extracted features are then used by the sign recognition algorithm to identify the sign language gesture being performed.

FUNCTIONAL REQUIREMENTS

The system should be able to perform the following functions:

- Capture video of ASL signs
- Extract relevant features from the video
- Classify ASL signs using a machine learning algorithm
- Recognize multiple signs in a sentence and interpret them in the correct order.
- Ability to handle variations in sign size and position
- Ability to handle different signers with varying hand shapes and sizes
- Ability to recognize signs in different ASL dialects and variations

PERFORMANCE REQUIREMENTS

The system should be able to detect and recognize ASL signs accurately, with a high accuracy rate. The system should also be able to handle variations in lighting, hand orientation, and sign speed. The system should be able to process video in real-time and provide results within a few seconds.

- Low latency for real-time sign recognition
- High accuracy for reliable sign recognition
- Ability to recognize signs in various lighting conditions and backgrounds

FUTURE SCOPE

Sign language recognition technology has a promising future, with the potential to improve communication and accessibility for the deaf and hard of hearing community. Continued research and development in this field will lead to more accurate, real-time, and multi-lingual sign language recognition systems that can be integrated into various assistive technologies.

Future research will focus on developing systems that can recognize a broader range of sign languages. With the widespread use of smartphones and tablets, there is a need for mobile applications that can recognize sign language. The development of mobile applications that can recognize signs in real-time will provide a more accessible and convenient way for deaf and hard of hearing individuals to communicate. Sign language recognition systems can be integrated into assistive technology devices such as hearing aids, cochlear

implants, and communication devices. This integration can provide a more comprehensive solution to communication for individuals with hearing disabilities.

ACKNOWLEDMENTS

We would like to express our special gratitude to our mentor Mrs. D. Sriveni who gave us a golden opportunity to do a wonderful project on this topic. It makes us to learn new things by doing various research on it Apart from that, we would also thank my friends who contributed a lot in finalizing this crucial project within the given limited time frame.

CONCLUSION

Sign language recognition is a crucial technology that has the potential to improve communication and accessibility for the deaf and hard of hearing community. Over the years, various approaches have been developed for sign language recognition, including computer vision-based approaches, data glove-based approaches, and deep learning-based approaches.

Deep learning-based approaches have shown promising results in recent years, especially with the availability of large sign language datasets and powerful computing resources. These approaches have demonstrated high accuracy and robustness in recognizing signs, even with variations in signing speed, lighting conditions, and signer perspective.

REFERENCES

[1] JOYEETA SINGH, K. D. Indian sign language recognition using eigen value weighted euclidean distance based classification technique.International Journal of Advanced Computer Science and Applications 4, 2 (2013). NEHA V. TAVARI, P. A. V. D. Indian sign language recognition based on histograms of oriented gradient. International Journal of Computer Science and Information Technologies 5, 3 (2014), 3657–3660.

[2] NMANIVAS. Gesturerecognition system. https://github.com/nmanivas/Gesture-RecognitionSystem.

[3] PADMAVATHI. S, SAIPREETHY.M.S, V. Indian sign language character recognition using neural networks. IJCA Special Issue on Recent Trends in Pattern Recognition and Image Analysis, RTPRIA (2013).

[4] SAKSHI GOYAL, ISHITA SHARMA, S. S. Sign language recognition system for deaf and dumb people. International Journal of Engineering Research Technology 2, 4 (April 2013).

[5] SCHAKENBERG Schakenberg code for bag of visual words on github.https://github.com/shackenberg/MinimalBag-of-Visual-Words-Image- Classifier.

[6] XIAOLONG TENG, BIANI WU, W. Y., AND LIU, C. A hand gesture recognition system based on local linear embedding, April 2005.