e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com

REAL TIME SIGN LANGUAGE DETECTION

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DOI : https://www.doi.org/10.56726/IRJMETS36648

ABSTRACT

This project focuses on the development of a sign language detection system using computer vision techniques. Sign language is a vital means of communication for the deaf and hard-of-hearing community, and this system aims to bridge the communication gap by automatically recognizing sign language gestures and translating them into text. The proposed system uses a camera to capture images of a person signing, and then processes the image frames to detect and recognize hand gestures. The system utilizes algorithms to classify the detected hand gestures and map them to corresponding words or phrases in sign language.

Keywords: Sign language, Detection, Recognition, Computer vision, Image classification, Performance evaluation, Accuracy.

I. INTRODUCTION

Sign language is a visual language that is primarily used by people who are deaf or hard of hearing. It involves using hand gestures, facial expressions, and body language to convey meaning and communicate. While sign language is an important means of communication for the deaf and hard of hearing community, it can be challenging for those who do not know the language to understand and communicate with them. In recent years, there has been a growing interest in developing sign language detection and recognition systems using computer vision and machine learning techniques. These systems have the potential to improve accessibility and communication for the deaf and hard of hearing community, by automatically recognizing sign language gestures and translating them into text or speech.

II. MOTIVATION

The motivation behind this sign language detection project is to develop a system that can automatically detect and recognize sign language gestures in real-time. Such a system has the potential to enhance communication and accessibility for the deaf and hard of hearing community by providing an intuitive and easy-to-use interface for communication with others who do not know sign language. Additionally, the development of a sign language detection system can help to promote inclusivity and diversity by providing a tool that can bridge the communication gap between people who use sign language and those who do not. It can also facilitate learning and education of sign language for people who are interested in learning the language. Overall, the development of a sign language detection system using computer vision and machine learning techniques can have a significant impact on the lives of people who are deaf or hard of hearing, and can contribute to building a more inclusive and accessible society.

III. METHODOLOGY

1. Identify the problem: Define the specific problem you want to solve, such as detecting the letters of the alphabet in American Sign Language (ASL).

2. Collect a dataset: Gather a dataset of images or videos showing the ASL alphabet gestures. The dataset should include examples of each gesture that you want the system to recognize.

3. Preprocess the dataset: Clean and preprocess the dataset by removing any irrelevant information, normalizing the data, and converting it to a format that can be used by your machine learning model.

4. Segment the gestures: Use computer vision techniques, such as background subtraction or skin color detection, to segment the gestures from the background.

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5. Extract features: Extract relevant features from the segmented gestures, such as the position and movement of the hand, finger shape, and palm orientation.

6. Train the machine learning model: Choose a suitable machine learning algorithm, such as a Convolutional Neural Network (CNN), and train it on the extracted features from the dataset.

7. Test the machine learning model: Use a separate testing dataset to evaluate the performance of the trained model. This will help you determine the accuracy and precision of the model.

8. Deploy the system: Once you are satisfied with the performance of the model, you can deploy it to a device, such as a webcam or a smartphone camera, to allow users to input ASL alphabet gestures and receive corresponding text output.

9. Evaluate the results: After deploying the system, monitor its performance and continue to collect data to improve the accuracy and precision of the model over time.

IV. LITERATURE SURVEY

Here is a literature survey of some recent research on sign language detection:

1. "Sign Language Recognition: A Comprehensive Review" by A. Kumar et al. (2022) - This paper provides a comprehensive review of sign language recognition techniques and recent advancements in this field.

2. "Sign Language Recognition with Deep Learning: A Systematic Review" by M. Sun et al. (2021) - This paper provides a systematic review of deep learning techniques used for sign language recognition.

3. "Real-time Sign Language Detection and Recognition using Machine Learning Techniques" by S. Saha et al. (2021) - This paper proposes a real-time sign language detection and recognition system using machine learning techniques.

4. "Sign Language Recognition using 3D Convolutional Neural Networks" by K. T. Chakraborty et al. (2021) - This paper proposes a sign language recognition system using 3D convolutional neural networks.

5. "Fingerspelling Recognition in American Sign Language using Convolutional Neural Networks" by A. Subedi et al. (2020) - This paper proposes a system for recognizing fingerspelling in American Sign Language using convolutional neural networks.

6. "Dynamic Sign Language Recognition using Spatiotemporal Features and Deep Learning" by C. Zhang et al. (2020) - This paper proposes a dynamic sign language recognition system using spatiotemporal features and deep learning.

7. "Sign Language Recognition with Hybrid CNN-HMM Model" by H. Wu et al. (2019) - This paper proposes a hybrid CNN-HMM model for sign language recognition.

V. MODELING AND ANALYSIS

1. System Architecture-

The system architecture comprises of image acquisition.After that the captured images hand detection and tracking in done ,followed by a feature extraction.The image recognition process is carried out using the trained dataset .The training dataset is taken at the time of module building.After all this process the final output in form of text is given.

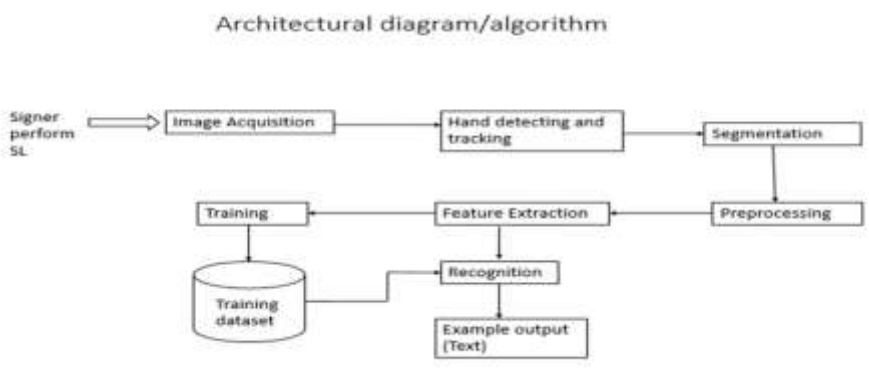

Fig -1: System Architecture

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2. Propose system

The proposed system would be a real time system wherein live sign gestures would be processed using image processing. Then classifiers would be used to differentiate various signs and the translated output would be displaying text.

3. Proposed system for sign language detection

A proposed system for sign language detection would involve multiple components working together to recognize and interpret sign language gestures. Here is a possible overview of the components: Video capture: A camera or webcam captures video footage of the signer's hand gestures and facial expressions. Hand detection: Computer vision techniques are used to identify the signer's hand(s) in the video footage, even if they are partially obscured or moving quickly. and tracking: Once the hand(s) have been detected, computer vision algorithms are used to track their movements over time, allowing the system to recognize when a sign has started and ended. Feature extraction: Features such as hand shape, hand movement, and facial expressions are extracted from the video footage and used to classify the sign being performed. Sign language recognition: Machine learning algorithms, such as deep neural networks, are trained on a large dataset of sign language videos and annotations, allowing the system to recognize signs with high accuracy. Translation: Once the sign has been recognized, the system can translate it into spoken or written language for the benefit of those who don't know sign language. User interface: The system can be designed with a user-friendly interface that displays the recognized sign and its translation, allowing the user to easily communicate with others. Overall, this system would require a combination of computer vision, machine learning, and natural language processing techniques to accurately recognize and interpret sign language gestures. It could be integrated into a variety of applications, such as video conferencing software, education platforms, and mobile apps for communication.

VI. RESULTS AND DISCUSSION

Accuracy-Model accuracy is defined as the number of classifications a model correctly predicts divided by the total number of predictions made. It's a way of assessing the performance of a model.The model accuracy for our purposed model is a average of 95%.

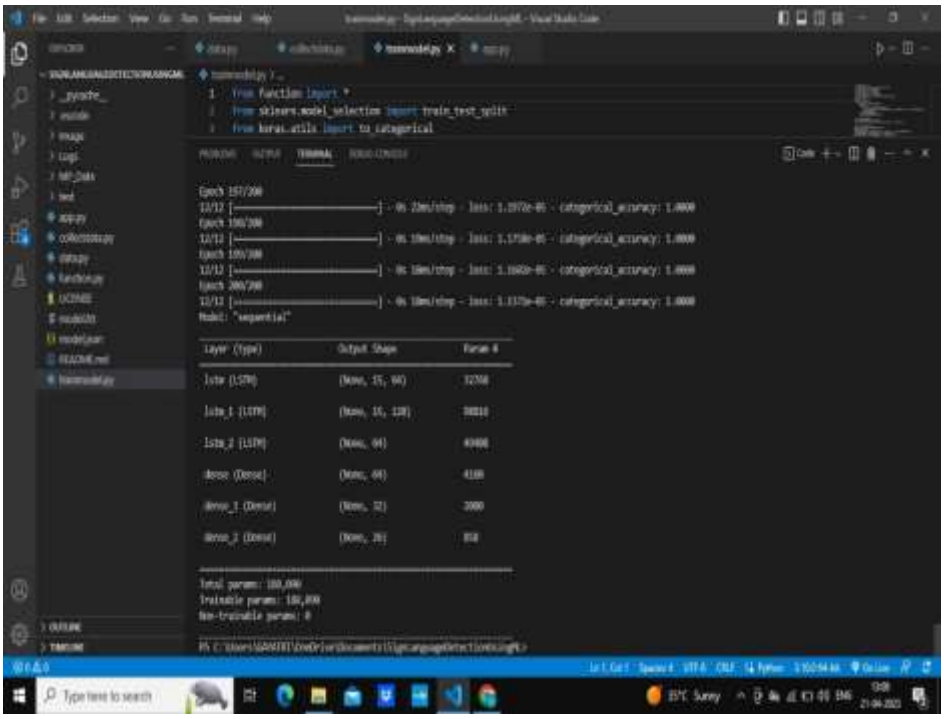

Fig -2: Accuracy of model's

Training module-A machine learning training model is a process in which a machine learning (ML) algorithm is fed with sufficient training data to learn from.For our purposed system we have used a training module which takes 30 images in total out which 6 images used for testing and 24 images used for training.

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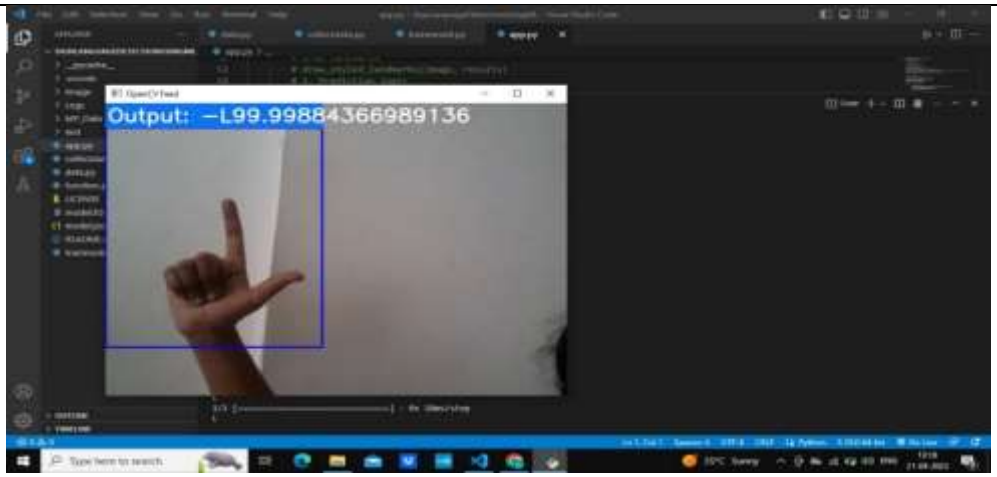

Fig -3: Image Detection

VII. FUTURE SCOPE

Sign Language Recognition has another segment which is known as Continuous Sign Language Recognition as it deals with taking successive frames in real-time and predict the word by detecting a continuous gesture. Hence, this project can be further extended in this direction and words and after that sentences can be formed according to the continuous gestures performed. Further dataset having images from people with different skin tones and in different lighting conditions is required in order to develop a robust algorithm that can serve the purpose for any kind of people.

VIII. CONCLUSION

Gesture recognition is a field of study with numerous operations, including sign language recognition, remote control robotics, and virtual reality mortal- computer interface. nevertheless, the occlusion of the hand, affine metamorphosis, database scalability, different background illumination, and high computing cost remain challenges to establishing an accurate and flexible system. We can enhance the lives of numerous impaired individualities by allowing them to speak freely, work in different services without the need for an practitioner, and live their life without having to calculate on others to restate for them so that others can understand them with the aid of this technology.

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