International Journal of Advanced Research and Review

www.ijarr.org

Sign Language Detection System

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ABSTRACT

The ML based Sign Language Detection System aim learn-based application designed to bridge the communication gap between hearing –impaired individually general population.This model translates the signs gestures captured into text so that the user can simply and read know what the person is trying to convey irrespective of whether the user has knowledge about sign language or not.In this projectoom,a real- time ML-based system is built using images captured with the help of webcam for sign language detection.The model uses the SSD ML algorithm, and overcomes the above problems by directly recognizing the symbols as words instead of letters.And detect sign language in real time using OpenCv.

KEYWORDS *SSD algorithm, Convolutional Neural Networks, Deaf Communication, Open-CV, Machine Learning, Gesture Recognition.*

INTRODUCTION

Using human interpreters is the most popular way to communicate with them. which, once more, is highly costly and beyond of reach for many. The world is home to numerous sign languages. The most widely used sign languages are Chinese, Spanish, Irish, American Sign Language, and Indian Sign Language, among the 200 or so sign languages used worldwide. Since sign language is not required, very few individuals are proficient in it, which makes

it challenging for those with impairments to interact with others. The purpose of the machine learning (ML)-based sign language recognition system is to enable communication with individuals with impairments without the need for costly human translators. Whether or not the user is familiar with sign language, this model converts the captured letters or gestures into text so that they may be readily read and understand what the individual is attempting to say. This project's primary goal is to create a system that makes communication with others easy for individuals with varying skills. Because cach letters need to be gestured with and it takes a long time to produce a basic sentence, the current digital translator is extremely slow. Real coloring images will be used to build the model with the aid of TensorFlow Object Detection API and Label-Img software. and use OpenCV to recognize sign language in real time.

LITERATURE SURVEY

The literature review on sign language detection highlights various research approaches developed to translate sign gestures into text or speech using technology. Early studies, such as those by Starner et al., used Hidden Markov Models (HMMs) to model the temporal patterns of American Sign Language, marking one of the first continuous recognition systems. Later, Ji et al. introduced 3D Convolutional Neural Networks (3D CNNs) to learn both spatial and temporal features directly from sign videos, enhancing accuracy in recognizing dynamic gestures. Cao et al. developed Open Pose, a framework that detects body, face, and hand keypoints, providing useful hand skeleton data for gesture recognition. These studies show the evolution from traditional statistical models to deep learning-based approaches. Techniques like image processing, feature extraction, and neural networks have improved the system’s ability to recognize complex hand movements.

RELATED WORK

In this project used SSD ML algorithms and overcomes the above problems by directly recognizing the symbols as words instead of letters. Earlier approaches used image processing techniques and models like Hidden Markov Models (HMMs) to recognize gestures based on hand shapes and movements. With the advancement of machine learning, modern systems now use deep learning algorithms such as Convolutional Neural Networks (CNNs) and Single Shot Detectors (SSD) for faster and more accurate recognition. These models can detect and translate gestures directly into text or speech in real time. The use of OpenCV has further enhanced the system’s ability to capture and process hand movements

from live video input effectively. Overall, the related works demonstrate how machine learning–based models have significantly improved the performance, speed, and accuracy of sign language detection systems.

EXISTING METHOD

This study proposes a Convolutional Neural Network (CNN) architecture for both feature extraction and classification in a sign language detection system. The model focuses on creating a real-time system capable of accurately identifying hand gestures. To achieve this, a hand locating process is first applied to detect the region of interest within the image. Once the hand is detected, the extracted region is resized to a fixed dimension suitable for model input. This processed image is then passed into the trained CNN for classification, where specific gestures are recognized and labeled accordingly. The CNN automatically learns spatial features from the image, eliminating the need for manual feature extraction. By combining image preprocessing with deep learning, the system achieves higher accuracy and faster recognition speed. Overall, this approach provides a reliable and efficient framework for real-time sign language recognition using computer vision and machine learning. problems will be solved by proposed method.

PROPOSED SYSTEM

It leverages computer vision and machine learning techniques to recognize hand gestures captured through a camera in real time. These gestures are processed using image recognition algorithms and matched against a predefined dataset of sign language symbols. Future developments may include support for multiple sign languages and integration of emotion recognition to further enrich interactions. overall, the proposed system provides a reliable and user-friendly approach to recognizing sign language gestures, promoting better accessibility and inclusivity for the hearing-impaired community.

SYSTEM ARCHITECTURE

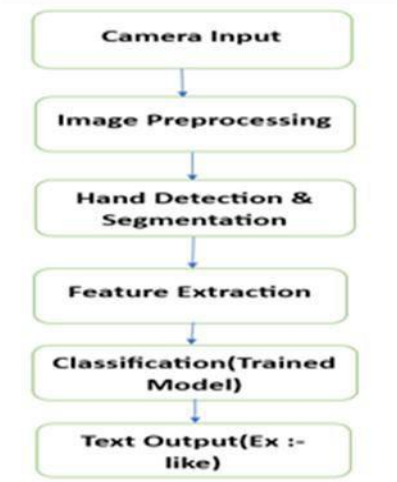

Fig 1: Block Diagram of Sign Language

METHODOLOGY DESCRIPTION

By using the block diagram, we can generate how the gestures capture the webcam and processing as the image after the image hand landmarks it will be correct give as a text output otherwise it cannot be displaying text. It is the final step of gestures show as a word instead of letters.

Camera input: - Camera input plays a crucial role in sign language detection systems by serving as the primary method for capturing hand gestures and movements

Image preprocessing: User performs hand gestures and video processing is active.

Capture Video: User must have a webcam. Live feed is captured and operations are performed.

Process Video: Webcam captures live video which is converted into images. Operations are performed to enhance related features and gesture movements. Display Gesture meaning: Display the meaning according to tracking and gesture recognition. The sign is recognized.

RESULTS AND DISCUSSION

Fig 2: Sign Language Translator

Sign Language Translator interface designed to help users communicate using hand gestures. The system uses a webcam to capture hand signs, which are then processed and translated into text/speech.

Fig 3: Like Symbol

This the Sign Language Translator for the Like Symbol. The system uses a webcam to capture hand signs, which are then processed and translated into text or speech.

Fig 4: Dislike Symbol

This the Sign Language Translator for the Dislike Symbol. The system uses a webcam to

capture hand signs, which are then processed and translated into text or speech.

Fig 5: Rock Symbol

This the Sign Language Translator for the Rock Symbol.The system uses a webcam to capture hand signs, which are then processed and translated into text or speech.

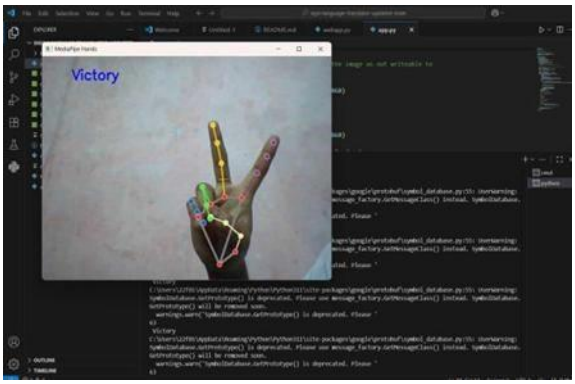

Fig 6: Victory Symbol

This the Sign Language Translator for the Victory Symbol. The system uses a webcam to capture hand signs, which are then processed and translated into text or speech.

CONCLUSION

The Sign Language Detection System successfully translates hand gestures into text or speech, helping bridge the communication gap between hearing and speech-impaired individuals. It provides an efficient, real-time, and user-friendly solution using image processing and machine learning techniques.

FUTURE SCOPE

In the future, the system can be improved by adding support for more gestures and multiple

sign languages. Integration with mobile applications and AI-based voice assistants can make it more accessible and useful in daily communication.

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