ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research

Vol. 17, Issue, 01, pp.31630-31632, January, 2025
DOI: https://doi.org/10.24941/ijcr.48316.01.2025

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

REAL TIME SIGN LANGUAGE DETECTION

[1]Pavithra, V. and [2]Dr. Raja, S.R.

[1]Master of Computer Applications, Center for Open and Digital Education, Hindustan Institute of Technology and Science, Chennai, India; [2]Associate professor, Master of Computer Applications, Center for Open and Digital Education, Hindustan Institute of Technology and Science, Chennai, India

ARTICLE INFO

Article History:
Received 20th October, 2024
Received in revised form
17th November, 2024
Accepted 24th December, 2024
Published online 31st January, 2025

Key Words:
Complex Open Bite, Camouflage Non-Extraction, Fixed Orthodontic Appliances.

Corresponding author:
Dr. Raja, S.R.

ABSTRACT

A real time sign language detector is a significant step forward in improving communication between the deaf and the general population. Real-time sign language detection is a critical tool for enhancing communication between individuals with hearing impairments and others. This research investigates the use of YOLOv3 (You Only Look Once version 3), a highly efficient object detection model, for real-time sign language recognition. YOLOv3 is known for its speed and accuracy, making it an ideal candidate for processing video frames in real-time to detect sign language gestures. The proposed system uses YOLOv3 to identify and classify hand gestures captured in video streams. A custom dataset of hand gesture images associated with specific sign language words or phrases is used to train the YOLOv3 model. The system performs real-time detection by applying the trained model to video frames, providing translations of sign language gestures. The implementation of YOLOv3 enables a fast and scalable solution for recognizing different sign language gestures, while maintaining a low processing delay suitable for real-time applications. The system's performance is evaluated based on accuracy, speed, and the ability to handle dynamic gestures. Results demonstrate the potential of YOLOv3 for efficient, real-time sign language detection, contributing to better communication in diverse settings, particularly for accessibility applications.

Citation: Pavithra, V. and Dr. Raja, S.R. 2025. "Real time sign language detection*". International Journal of Current Research*, 17, (01), 31630-31632.

INTRODUCTION

Sign language is a communication tool that deaf and dumb people use to convey their feelings, thoughts, desires etc. to the outside of their world. It has a nonverbal form of communication that uses hands, arm, head, facial gestures and body posture. According to the data of the world health organization in 2021, there are around 466 million people suffering from hearing loss around the world including 34 million children. It is estimated that this number will exceed 700 million by 2050 Word (Health Organization, 2021). Sign language has a key role in communication for hearing-impaired people and the rest of society. Although sign language is not prevalent between normal people, there are very few people who can interpret it. This creates a communication barrier between the deaf-mute and other people, causing them to be unable to express themselves and to experience difficulties in daily life such as communicating with other people, learning at school, shopping etc. In order to create a common communication base between these disabled people and the rest of the world, sign language recognition (SLR) platforms that track and identify signs performed by signers and convert them into meaningful letters, numbers, words and expressions has been developed.

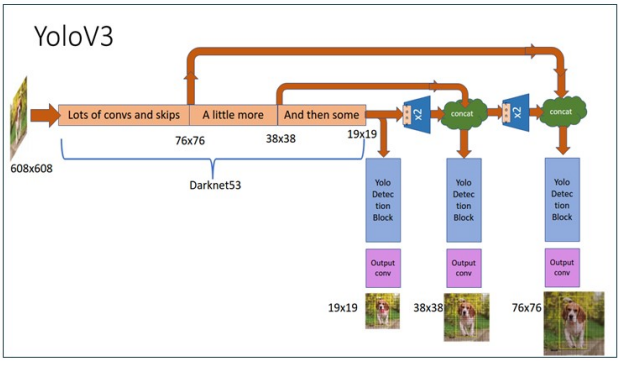
The YOLO (You Only Look Once) algorithm, known for its speed and accuracy in object detection, has emerged as a powerful tool in the realm of sign language recognition. YOLO is designed to perform object detection in real time, making it suitable for applications where quick responses are critical, such as in video streams. In the context of sign language recognition, YOLO can be used to detect hand gestures and positions, which are then mapped to specific signs or words. Real-time sign language recognition powered by YOLO involves detecting and interpreting the gestures of the hands and body, transforming these into meaningful outputs like text or speech. The YOLO model is trained to recognize the key features of sign language gestures, identifying them within video frames or images. The real-time capabilities of YOLO make it a promising solution for applications such as communication aids, educational tools, and accessibility services for deaf and hard-of-hearing individuals. This process typically involves capturing video input, using YOLO to detect and classify sign language gestures, and then translating these gestures into human-readable outputs. The model's ability to detect multiple objects in a single frame with high accuracy and speed allows for seamless interaction and communication.

As a result, YOLO's use in sign language recognition represents a significant step toward bridging communication gaps and fostering greater inclusivity for sign language users.
By combining YOLO's real-time object detection with sign language recognition, this technology has the potential to revolutionize communication for the deaf and hard of hearing, enabling them to interact with others more easily and naturally, regardless of the language barrier

LITERATURE REVIEW

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

- "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.
- "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.
- "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.
- "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.
- "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.
- "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.
- "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
- Agrawal SC, Jalal AS, Tripathi RK (2016) A survey on manual and non-manual sign language recognition for isolated and continuous sign.
- Cheok MJ, Omar Z, Jaward MH (2019) A review on hand signs and sign language dectection techniques.



METHODOLOGY

Real-time sign language recognition using the YOLO (You Only Look Once) algorithm combines computer vision and deep learning to interpret hand gestures in sign language. YOLO is a state-of-the-art object detection model known for its speed and accuracy, making it suitable for real-time applications. Here's an overview of how YOLO can be used for real-time sign language recognition

Dataset Collection: For a real-time sign language recognition system based on the YOLO (You Only Look Once) algorithm, the first and most crucial step is the collection and preparation of a dataset that contains labeled images or videos of sign language gestures. The quality and diversity of the dataset directly influence the accuracy and effectiveness of the trained model. Below is an outline of the dataset collection process, including the key considerations and popular datasets used for sign language recognition

Key Considerations for Dataset Collection

- Gesture Variety
- Variability in Gesture Performance
- Real-time Recognition
- Bounding Box Annotation
- Realistic Scenario

Model Preparation (YOLO Architecture): YOLO has evolved through various versions, with each version offering improvements in performance and speed. The choice of YOLO version depends on the trade-off between accuracy and real-time performance requirements. Some common YOLO versions include:

- **YOLOv3**: A widely-used version that balances accuracy and speed, suitable for real-time applications on moderate hardware.
- **YOLOv4**: An improved version of YOLOv3, known for better accuracy and performance, especially on larger datasets.
- **YOLOv5**: A PyTorch-based version that has been highly optimized for ease of use and training flexibility.
- **YOLOv7**: The latest version (as of 2024), which offers even better performance, especially for smaller objects and high-resolution inputs.

Sign Language Gesture Detection: The core of our methodology is the generation of readable, coherent narratives that explain the results of the AI-driven analysis. We utilize advanced NLP models, such as OpenAI's GPT-3 or similar transformer-based architectures, to automatically convert data insights into human-readable text. These models are fine-tuned to ensure that the generated narratives are contextually relevant, informative, and engaging. For example, in a dataset containing sales figures for the past year, the AI might detect a seasonal pattern of increased sales in December. The narrative generation module would then produce a story like: "Sales for the year peaked in December, with a 15% increase compared to the previous month, likely due to holiday demand. This increase follows a similar pattern observed in previous years." By combining statistical insights with natural language

generation, our framework produces narratives that are easy to understand, even for non-technical stakeholders.

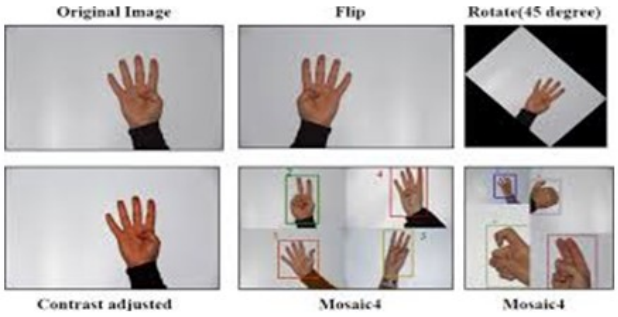
Challenges in Sign Language Gesture Detection: While YOLO's real-time object detection capabilities make it an excellent choice for sign language gesture detection, there are several challenges that need to be addressed:

Hand Detection and Occlusion: Sign language gestures often involve dynamic hand movements, which may be partially occluded by the body or other objects. YOLO must be trained to detect and handle occlusions and partial gestures effectively.

Variation in Hand Shape and Size: People may perform the same gesture with different hand shapes, sizes, or positions, which can make detection challenging. YOLO must learn to recognize different variations of the same gesture to be robust in real-world scenarios.

Environmental Factors: Lighting conditions, background clutter, and camera angles can all affect the model's ability to detect gestures. Data augmentation during training can help the model generalize across different environments, but these factors still pose a challenge in real-time applications.

Gesture Speed: Real-time sign language recognition must detect fast-moving gestures and sequences of gestures in video streams. YOLO is well-suited for this task due to its high inference speed, but the model must still be fine-tuned to recognize fast and fluid hand movements



DFD / ER DIAGRAM / ARCHITECTURE DESIGN:

CONCLUSION

Real-time sign language detection is a transformative technology that has the potential to bridge communication gaps between deaf or hard-of-hearing individuals and those who do not understand sign language. This field leverages advanced techniques in computer vision, machine learning, and deep learning to recognize and interpret sign language gestures and convert them into text or speech in real-time.

REFERENCES

Aloysius N, Geetha M (2020) Understanding vision-based continuous sign language recognition. Multimedia Tools Appl 79(31):22177–2220

World-wide deep sign La.nguage detection from Video: a large datasets and Methods comparision by Dongxu Li, Cristian Rodrigues (2019)

Ghanem S, Conly C, Athitsos V (2017) A survey on sign language recognition using smartphones. In: Proceedings of the 10th ınternational conference on pervasive technologies related to assistive environments

Elakkiya R (2021) Machine learning based sign language recognition: a review and its research frontier. J Ambient Intell Humaniz Comput 12:7205–7224

Shukor AZ, Miskon MF, Jamaluddin MH, Bin Ali F, Asyraf MF, Bin Bahar MB (2015) A new data glove approach for Malaysian sign language detection. Proc Comput Sci 76:60–67

Ren Z, Yuan J, Meng J, Zhang Z (2013) Robust part-based hand gesture recognition using Kinect. IEEE Trans Multimed 15(5):1110–1120

Naglot D, Kulkarni M (2016) Real time sign language recognition using the leap motion controller. In: International conference on inventive computation technologies (ICICT)

Almeida SGM, Guimarães FG, Ramírez JA (2014) Feature extraction in Brazilian sign language recognition based on phonological structure and using RGB-D sensors. Expert Syst Appl Int J 14(6):7259–7271