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(Approved by AICTE, Affiliated to University of Mumbai, & Accredited by NAAC)

Mini Project-2A
Presentation I I
T.E. (Computer Engg.) Sem - V

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(Sign Language Detection)

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Presentation Outline

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Abstract

"Elevating Communication: Sign Language Detection"

- The ability to express themselves through gestures is made possible for hearing-impaired people using sign language
- This study increases real-time sign language detection by utilizing computer vision and machine learning
- The project is able to capture the minute details of the hand that are unique to sign language by using deep learning models like YOLOv5
- Beyond technological difficulties, this project fills in communication gaps and enables the hearing-impaired community to communicate with their environment without difficulty.

Introduction

- Sign Language Detection (SLD) is a computational task that involves recognizing actions from sign languages. Our project "Sign Language Detection" stands at the forefront of innovation, merging the realms of Python, Machine Learning, and Computer Vision including the formidable YOLOv5 to capture the subtleties and uniqueness of these gestures and transform the lives of individuals with hearing impairments

- SLD aims to empower the hearing-impaired, bridging communication gaps and enabling effortless expression

- SLD stands as an innovative solution, breaking down barriers and ensuring each gesture and message is understood and valued

Literature Survey

Sr. No	Authors	Title of the paper & year of publication (Recent to Older)	Paper Description
1)	Dr. Aman Pathak Prof. Avinash Kumar Prof. Priyam Dr. Priyanshu Gupta Dr. Gunjan Chugh	**"Real Time Sign Language Detection" (31 December 2021)**	"Enhancing communication with a real-time sign language detector. Our CNN model, based on SSD Mobile Net V2 and transfer learning, accurately recognizes sign language gestures. With 60-70% accuracy in diverse conditions, this benefits learners and users alike. Combining image processing and human movement classification optimizes the interface."

Literature Survey

Sr. No	Authors	Title of the paper & year of publication (Recent to Older)	Paper Description
2)	Dr. Sharvani Srivastava Dr.Amisha Gangwar Dr. Richa Mishra Prof. Sudhakar Singh	**“Sign Language Recognition System using TensorFlow Object Detection API ”** **(2022)**	"Deaf and mute people use sign language for communication, but others often lack understanding. To address this, a real-time sign language recognition model can be created using machine learning. This model can bridge the communication gap and enable better interaction. Our approach uses webcam data and transfer learning in TensorFlow, achieving accuracy with a small dataset."

Objective & Scope

Real-Time Detection: Develop a system for real-time sign language detection, ensuring minimal delay in translating gestures.

Diverse Gesture Recognition: Train machine learning models to accurately identify a comprehensive range of sign language gestures, encompassing both common expressions and specialized vocabulary.

Precise Gesture Detection: Focus on achieving precise and accurate detection of hand gestures, forming the foundation of effective sign language communication.

Visual and Clear Translation: Translate detected gestures into visually clear representations, facilitating understanding and effective communication without ambiguity.

Problem Definition

- Many people who use sign language for communication face challenges because there aren't many automated systems that can understand their gestures in real time
- Even when technologies like YOLOv5 are used, current solutions struggle to really 'get' the details of these gestures, which can lead to misunderstandings
- This shows that we need a better solution that uses smart learning methods like deep learning and machine learning, especially with things like YOLOv5
- This way, we can quickly and correctly catch and understand sign language gestures
- Our goal is to help those who use sign language talk easily and inclusively, breaking down barriers that get in their way"

Algorithm and Process Design details

Data Collection:

Collect a diverse dataset of sign language gestures, captured from various angles, lighting conditions, and backgrounds.

YOLOv5 Training:

Train the YOLOv5 model using the preprocessed dataset.

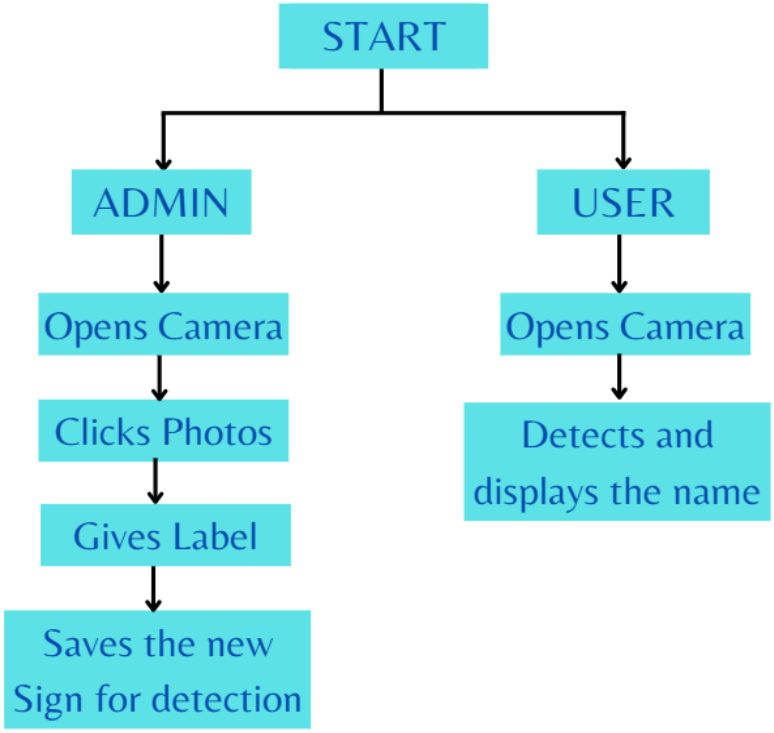
Real-Time Detection:

Capture video frames from the camera feed.

Capture frames from the camera feed.

Translation and Display:

Proposed system Architecture / Framework



Working of proposed system with entire explanation of code

DATA INPUT
The file capture_image.py is utilized for data input. On executing Capture.py, the camera will activate, capture photos, and collect data.

DATA COLLECTION
The Data collection involves storing the collected images in a directory named "CollectedImages" with the images organized into distinct files like "Hello" and "ThankYou."

DATA PREPARATION
In training data, annotation tools are used to mark objects in images with rectangular bounding boxes. This labeling method helps machine learning models learn to recognize and locate objects, essential for tasks like object detection and classification.

TRAINING DATA
Training with YOLOv5 involves preparing annotated image data, selecting the appropriate model variant, and configuring training parameters. The model learns to detect objects and their classes, making it suitable for real-time object detection applications.

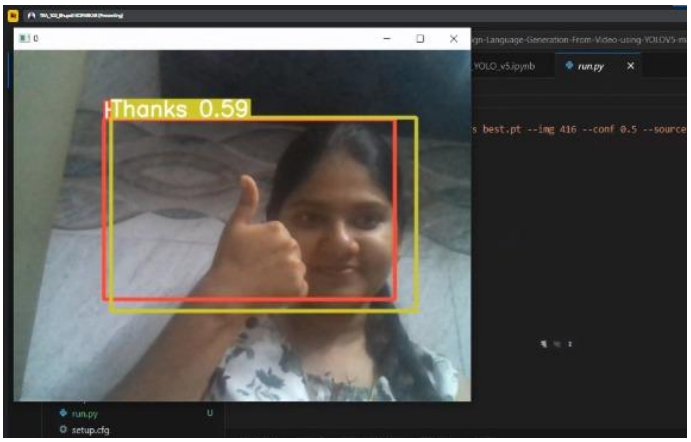
USER INPUT
On Executing "run.py," the camera becomes operational for real-time detection. This means that the code inside "run.py" enables the camera to capture live video or frames, which are then processed on-the-fly to identify and analyze objects or features as they appear in the camera's view.

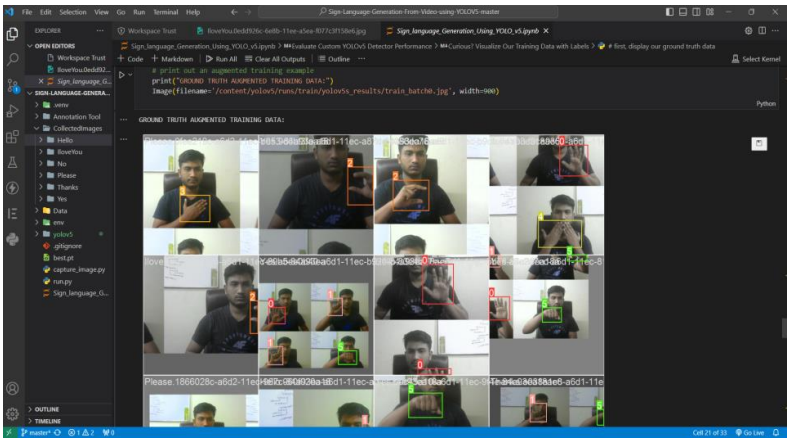
Real Time Detection
It refers to the immediate recognition and analysis of gestures or signs as they are performed, without any noticeable delay. This typically involves computer vision or machine learning algorithms that continuously monitor and interpret the input, enabling rapid and responsive interactions with the system.

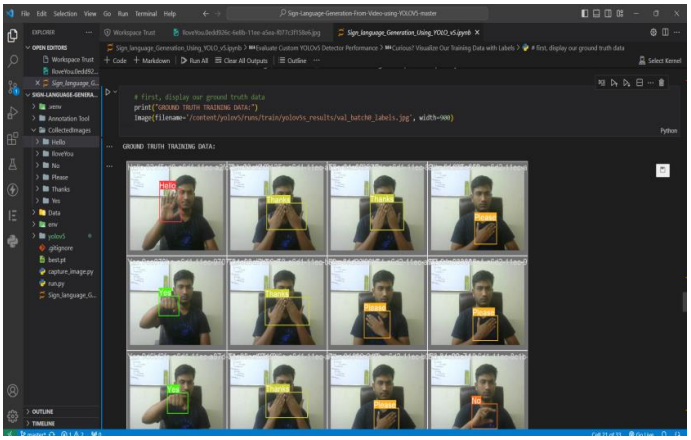
FlowTech-Stack

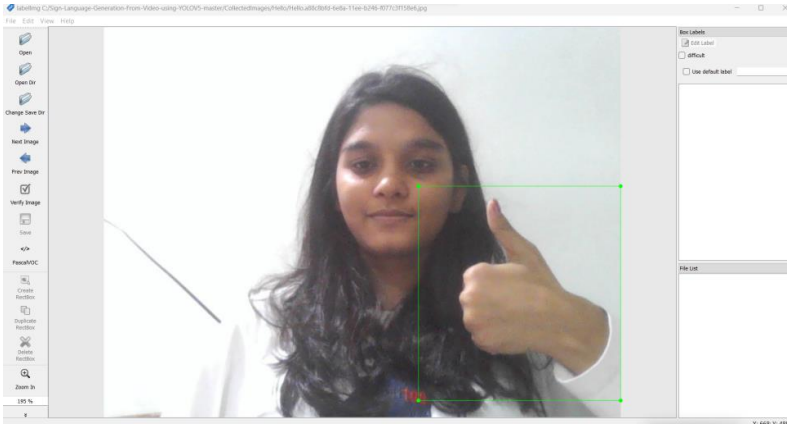
- Python for coding
- YOLOv5 for object detection
- PyTorch for deep learning
- OpenCV for computer vision
- Jupyter Notebook for experimentation and prototyping

Results of Validation and Verification









Analysis

- Our project provides a clear and detailed analysis of the project significance and objectives
- It emphasizes the role of Deep learning, computer vision, and YOLOv5 in the project
- Important considerations including data collection, ethical aspects, and testing requirements, are addressed
- Communication Improvement

Conclusion

- Aims to create inclusivity for sign language users
- Addresses misunderstandings and communication barriers
- Promoting equal participation in society.
- Focuses on clear visual representations for effective communication.

References

- YOLOv5 Algorithm to Detect and Recognize American Sign Language
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- Sign language recognition
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- Using YOLOv5 Algorithm to Detect and Recognize American Sign Language
https://www.researchgate.net/publication/353489194_Using_YOLOv5_Algorithm_to_Detect_and_Recognize_American_Sign_Language