Mini-Project

Report On

"Computer vision and control using Python"

Submitted in partial fulfilment requirements for the award of the degree

BACHELOR OF ENGINEERING

IN

INFORMATION SCIENCE AND ENGINEERING

Submitted By

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NMAM Institute of Technology, Nitte 2022– 2023

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CERTIFICATE

This is to certify that **SUBRAHMANYA 4NM20IS159**, **SHRIRAJ KULAL 4NM20IS147, RAKSHITHA 4NM20IS113,** a bonafide student of NMAM Institute of Technology, Nitte has submitted the seminar report for the mini-project entitled "**Computer vision and control using Python**" in partial fulfillment of the requirements for the award of Bachelor of Engineering in Information Science and Engineering during the year 2022-23. It is verified that all corrections / suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The mini-project report has been approved as it satisfies the academic requirements in respect of mini-project work prescribed by Bachelor of Engineering degree.

Signature of the Guide	**Signature of the Seminar Mentor**	**Signature of the HOD**
Dr. Manjula Gururaj	Dr. Manjula Gururaj	Dr. Karthik Pai B H

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DECLARATION

I hereby declare that the entire work embodied in this Seminar report titled "**Computer vision and control using Python**" has been carried out by us at NMAM Institute of Technology, Nitte under the supervision and Guidance of **Dr. Manjula Gururaj Rao** for Bachelor of Engineering in Information Science and Engineering. This report has not been submitted to this or any other University for the award of any other degree.

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ABSTRACT

Computer vision and control using Python is a project that involves the use of computer vision techniques to control a physical system. The project aims to develop a system that can detect and track objects in real-time using a camera and then use this information to control the movement of a robot or other physical system.The project will use the OpenCV library, which is a popular computer vision library that provides a wide range of functions for image and video processing. The system will use a camera to capture images of the environment and then use OpenCV to detect and track objects in the images. The position and movement of the objects will then be used to control the movement of the robot or other physical system.

CHAPTERS

1.INTRODUCTION

1.1 General Introduction:

Computer vision is a field of artificial intelligence that involves the automatic extraction, analysis, and understanding of useful information from digital images or videos. Python is a popular programming language for computer vision and provides various libraries such as OpenCV for image processing and computer vision tasks.
With Python, you can write code to perform tasks such as face detection, object recognition, and image segmentation. There are many resources available to learn computer vision with Python, including tutorials, books, and online courses. Additionally, Python can also be used for control tasks, such as robotics and automation, making it a versatile language for a wide range of applications.

1.2 Regarding the Topic:

Computer vision is a field of study that focuses on enabling computers to interpret and understand the visual world. Python is a popular programming language for computer vision and control due to its simplicity, ease of use, and the availability of powerful libraries and frameworks.Computer vision and control using Python is a field of computer science that involves the use of algorithms and mathematical models to analyze and interpret visual information from the world around us. Python is a

popular programming language for computer vision and control due to its simplicity, ease of use, and availability of powerful libraries such as OpenCV and Mediapipe.

Python can be used for a wide range of computer vision applications, including object recognition, face detection, hand tracking, pose estimation, and more. Additionally, Python can be used for controlling robots and other devices, making it a versatile language for computer vision and control applications. Python's strong attributes include ease of coding, shorter and more straightforward code, and a wide range of libraries and tools that make it easy to work with images and videos

1.3 How this topic is related:

Computer vision and control using Python are related in that Python is a popular programming language used for computer vision and control applications. Python has several libraries and frameworks that are commonly used for computer vision, such as OpenCV.Additionally, Python can be used for controlling hardware devices such as robots and drones, making it a popular choice for vision-based control application. There are also specific Python packages available for computer vision and control, such as the Azure Cognitive Services Computer Vision SDK for Python and the Machine Vision Toolbox for Python.Computer vision and control using Python are related because Python is a popular programming language for computer vision and control due to its simplicity, ease of use, and availability of powerful libraries such as OpenCV and Mediapipe. Python can be used for a wide range of computer vision applications, including object recognition, face detection, hand tracking, pose estimation, and more. Additionally, Python can be used for controlling robots and other devices, making it a versatile language for computer vision and control applications. Python's strong attributes include ease of coding, shorter and more straightforward code, and a wide range of libraries and tools that make it easy to work with images and videos. Therefore, Python is an ideal language for developing computer vision and control applications.

2. PROBLEM DEFINATION

Developing system to trigger certain actions upon the movement of specified object,colour,hand gesture etc without any manual interactions.

3. LITERATURE SURVEY

3.1 Description of base paper:

"Transformers in Vision: A Survey": This survey covers recent progress on transformers in the computer vision domain. It discusses the use of transformer models and their variants for various computer vision tasks such as image recognition, object detection, segmentation, image super-resolution, video understanding, image generation, text-image synthesis, and visual question answering. The survey also provides an analysis of open research directions and possible future works.

3.2 Scope of the survey:

A literature survey on computer vision and control using OpenCV could cover a range of topics. Some potential areas of focus include:

- A review of OpenCV and its applications in image processing tasks
- Computer vision techniques for data analysis, such as deep learning
- Face detection using OpenCV and related techniques
- Machine learning styles in computer vision
- Hand gesture recognition based on computer vision

The scope of the literature survey would depend on the specific research question and objectives.

3.3 Objectives:

The objectives of this literature survey are as follows:

- To detect the abstract objects and its movement
- To perform the transformation action on detected object

METHODOLOGY

Defining the task: Consists of defining the task to performed with computer vision and control.This involves identifying objects,trackinmovement,recognizing faces or any other number of tasks.

Gathering data:Collecting data that will be used to train computer vision model. This can be include images,videos, or other types of data.

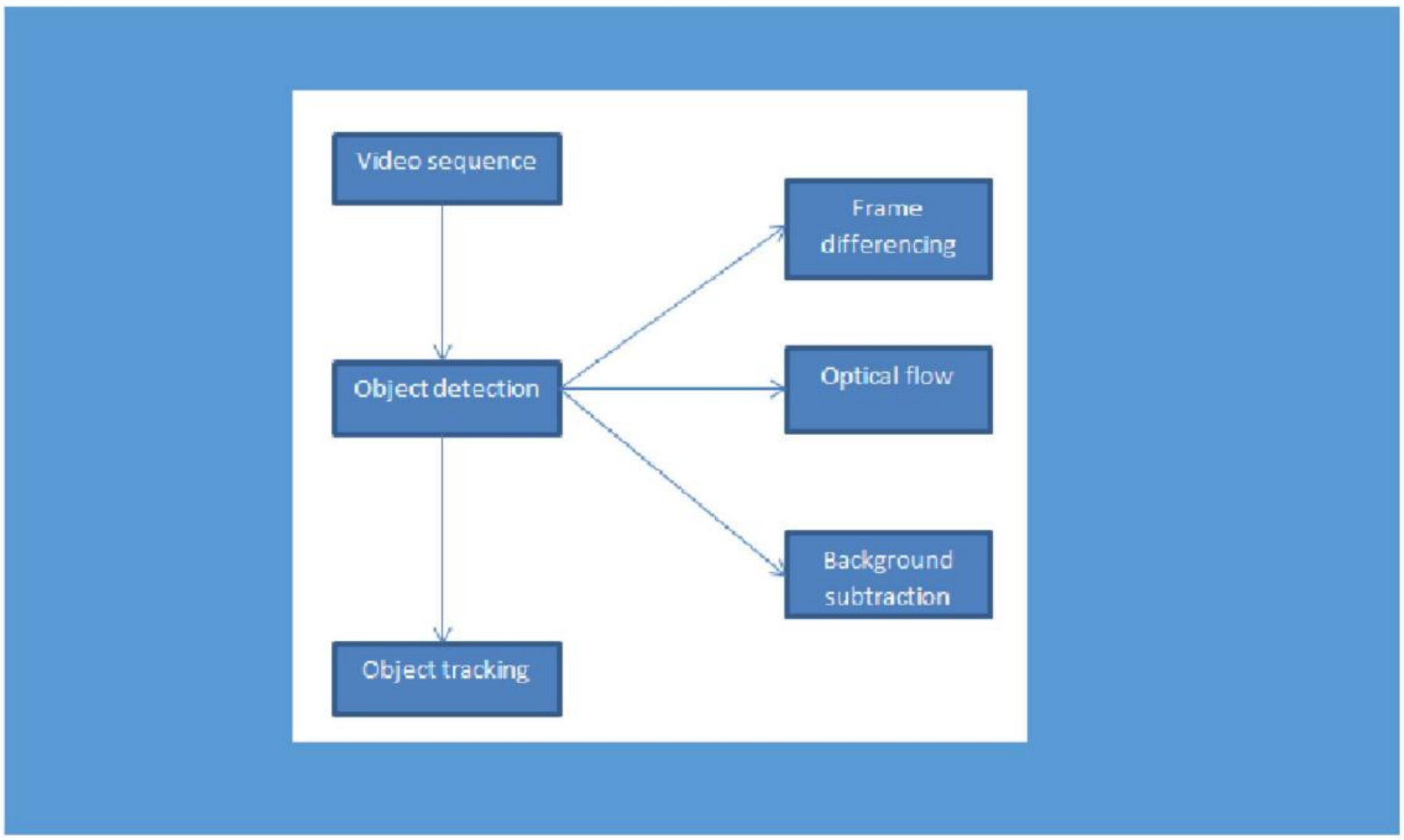
Preprocessing data: Before training the model,preprocessing the data to ensure that it is consistent and ready for analysis.This might involve resizing images, adjusting color balance,noice reduction or other techniques.

Training the model: Use OpenCV to train the computer vision model on the preprocessed data.This might involve using machine learning techniques like deep learning or image processing algorithms.

Evaluating the model:Once model is trained,evalute its performance on a seperate set of data.This will help in determining how accurate the model is and whether any adjustments need to be made.

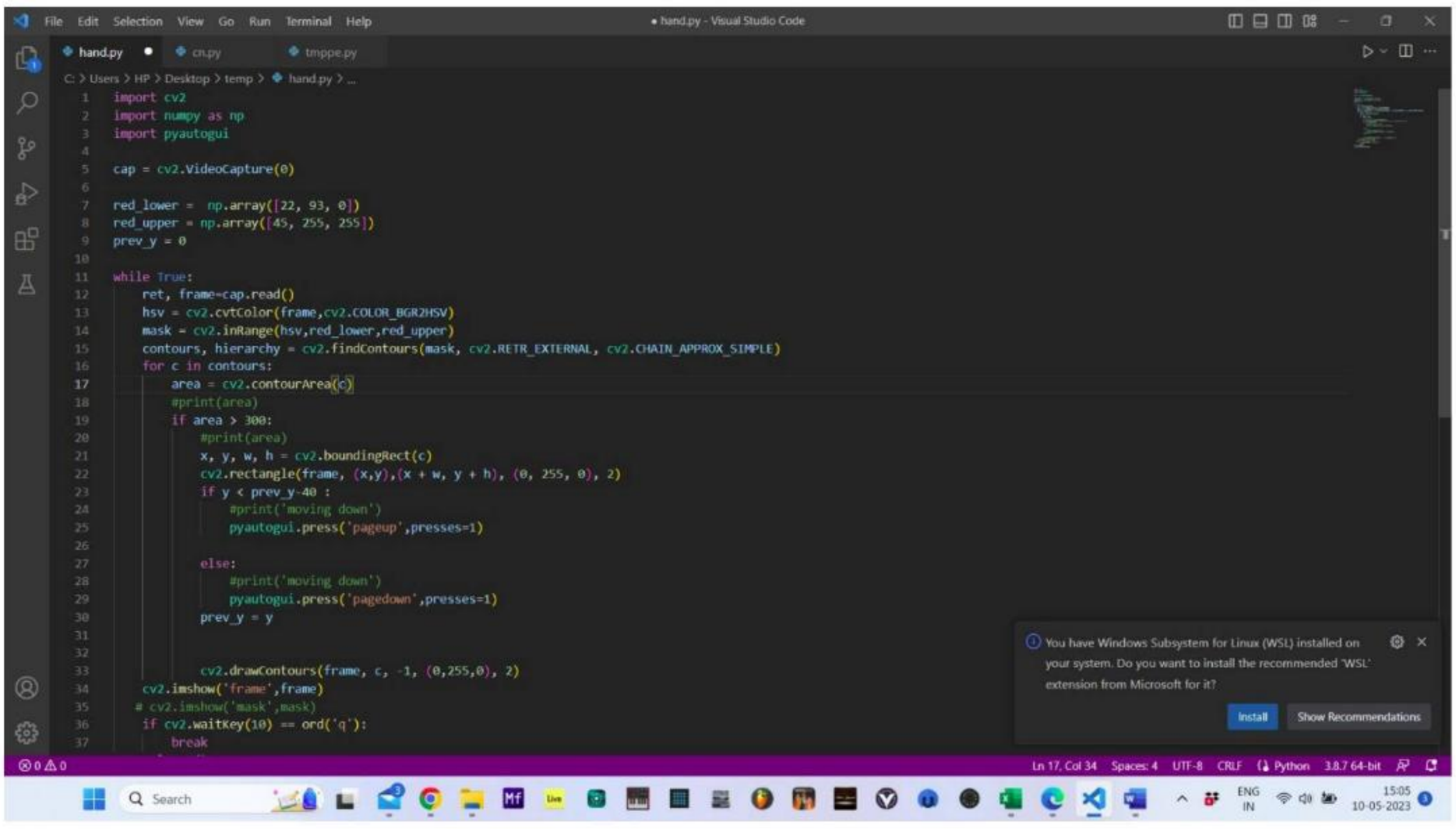
Implementing the model:Once your model is trained and evaluated,implement it in the control system.This might involve using OpenCV to detect objects, track movement,or recognize faces in real time.

Testing and optimization:Finally,testing system in a real-world enviornment and optimize it for performance.This might involve tweaking parameters or adjusting your model based on feedback from users.



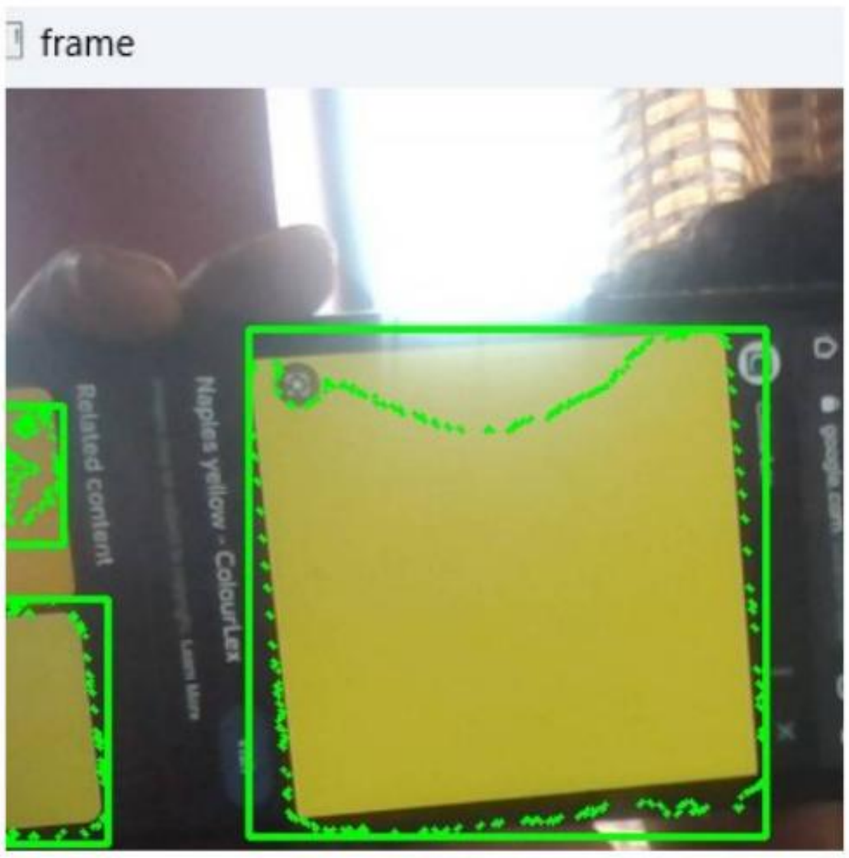
5. IMPLEMENTATION

Pseudocode:



Computer vision and control using Python are related because Python is a popular. programming language for computer vision and control due to its simplicity, ease of use,and availability of powerful libraries such as OpenCV and Mediapipe. Python can be used for a wide range of computer vision applications, including object recognition, face detection, hand tracking, pose estimation, and more. Additionally, Python can be used for controlling robots and other devices, making it a versatile language for computer vision and control applications. Python's strong attributes include ease of coding,shorter and more straightforward code, and a wide range of libraries and tools that make it easy to work with images and videos. Therefore, Python is an ideal language for developing computer vision and control applications.

Object detection:



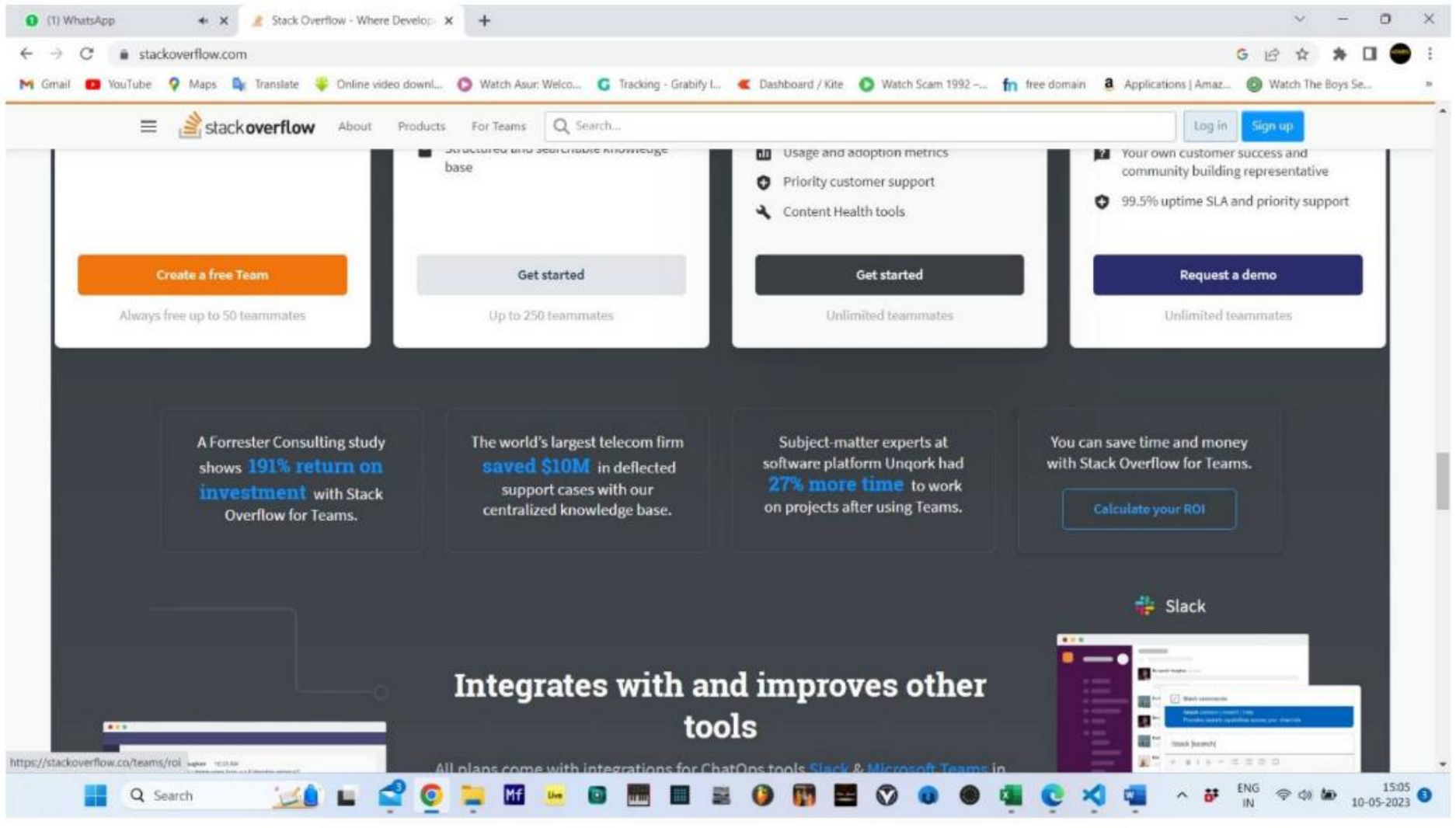
Object detection is a modern computer technology related to image processing, deep learning, and computer vision to detect the objects present in the image or video. OpenCV is a huge and open-source library for image processing, machine learning, and computer vision, and it is playing an important role in real-time

operation. With the help of the OpenCV library, we can easily process the images as well as videos to identify the objects, faces, or even handwriting of a human present in the file. Python is a popular programming language for computer vision and control due to its simplicity, ease of use, and availability of powerful libraries such as OpenCV and Mediapipe. Python can be used for a wide range of computer vision applications, including object recognition, face detection, hand tracking, pose estimation, and more. Therefore, object detection in computer vision and control using Python and OpenCV is a popular and powerful technique.

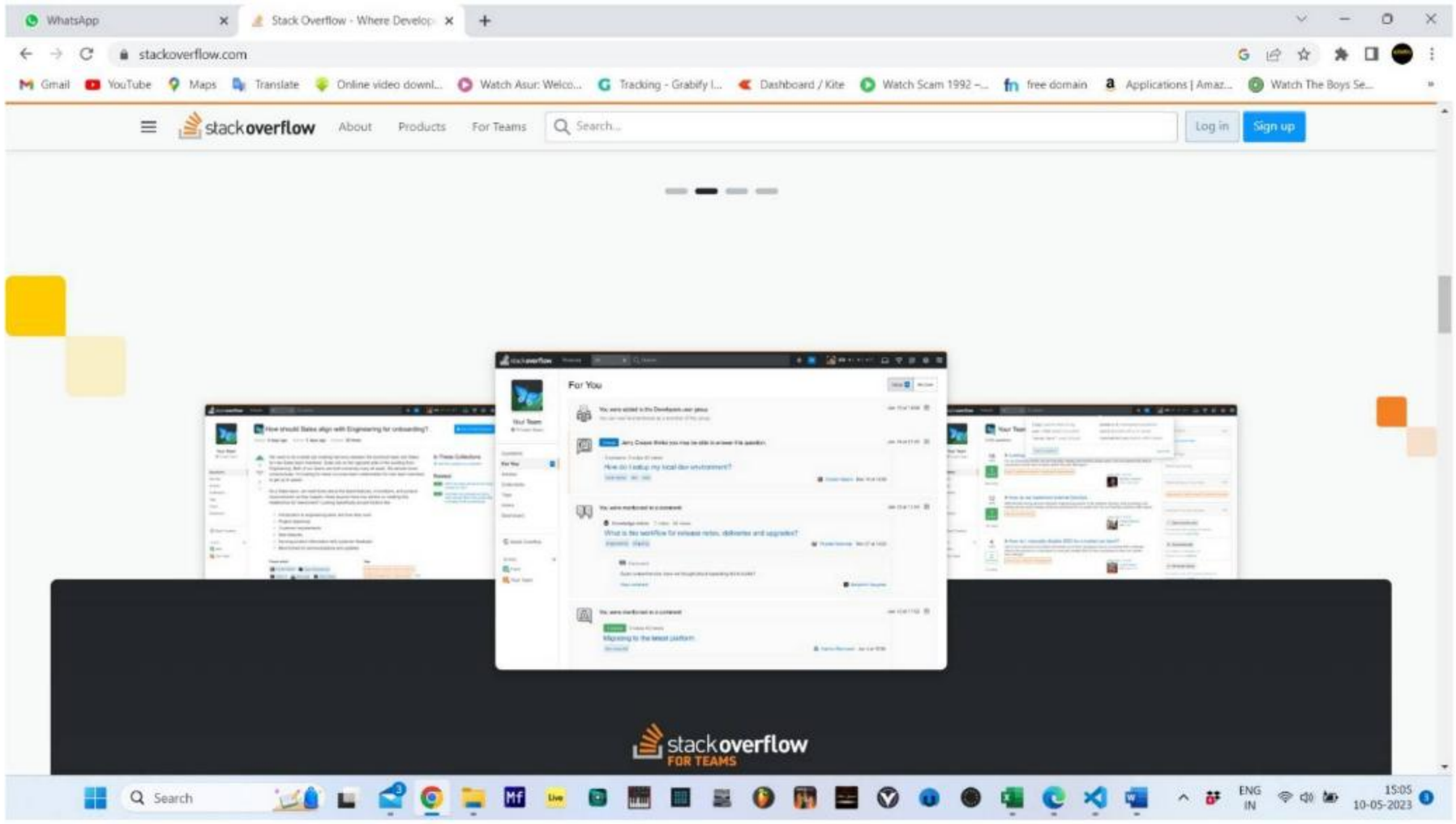
6.RESULT:

Transformation action on detected Object:

- **Up Movement:**



- **Down Movement:**



7.CONCLUSION AND FUTURE ENHANCEMENT

OpenCV is a powerful open-source library that provides a wide range of tools and functions for image and video processing, including object detection, recognition, and tracking. OpenCV can be used with Python to create computer vision applications that can understand the content in images and videos as they are perceived by humans. Flowcharts can be used to chain different computer vision operations and execute the flow to visualize the effect produced in a certain video or image. By following best practices for creating flowcharts, such as identifying the main steps involved in the program, using clear and concise labels, and testing the flowchart, it is possible to create a clear and concise representation of the logic of the program. Overall, Python and OpenCV are a powerful combination for computer vision and control applications, and they can be used to create a wide range of applications.

Computer vision and control using Python is a rapidly evolving field, and there are several future enhancements that can be expected. Some of the possible future enhancements in computer vision and control using Python include:

1. Integration with deep learning techniques: Deep learning techniques such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs) can be integrated with computer vision and control applications to improve their accuracy and performance.
2. Real-time processing: Real-time processing of images and videos can be achieved by optimizing the algorithms and using parallel processing techniques.
3. Edge computing: Edge computing can be used to perform computer vision and control tasks on edge devices such as smartphones, drones, and robots, without the need for a centralized server.
4. Augmented reality: Augmented reality can be used to enhance the user experience by overlaying digital information on the real world.
5. 3D vision: 3D vision can be used to create more realistic and immersive computer vision and control applications.

Overall, the future of computer vision and control using Python is bright, and there are many exciting developments on the horizon that will continue to push the boundaries of what is possible

8.REFERENCES:

1.https://www.youtube.com/watch?v=xumx-_FGLaU

2.https://github.com/ProgrammingHero1/webcamfun