Moving Object Detection Using OpenCV

Abstract

This project presents a real-time moving object detection system using Python and OpenCV. The system captures live video from a webcam, preprocesses frames, detects motion using frame differencing techniques, and highlights moving objects using bounding boxes.

Problem Statement

To design and implement a real-time system capable of detecting and highlighting moving objects from a live video stream using computer vision techniques.

Objectives

• Capture real-time video using a webcam
• Detect motion between frames
• Reduce noise and background interference
• Identify and highlight moving objects

Technologies Used

Python, OpenCV, imutils, Webcam

Methodology

The system captures video frames, converts them to grayscale, applies Gaussian blur, uses the first frame as background, computes frame differences, applies thresholding and dilation, detects contours, filters noise, and highlights moving objects.

Algorithm

1. Start video capture
2. Read frame
3. Resize frame
4. Convert to grayscale
5. Apply Gaussian blur
6. Store background frame
7. Compute frame difference
8. Apply thresholding
9. Dilate image

10. Detect contours
11. Draw bounding boxes

Results

The system successfully detects moving objects in real time, filters noise effectively, and displays motion alerts with bounding boxes.

Applications

• CCTV Surveillance
• Security Systems
• Traffic Monitoring
• Smart Homes

Limitations

• Works best with static background
• Sensitive to lighting changes

Future Enhancements

• Dynamic background updating
• Object classification using deep learning
• Motion tracking and logging

Conclusion

This project demonstrates an effective approach to real-time motion detection using computer vision techniques and OpenCV.