Mini Project Report

Project Title:

Vision: Real-Time Motion Detection and Analysis

Team Members

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Project Description

This project implements a real-time motion detection and analysis system using computer vision techniques in Python. It utilizes live video feed from a webcam to detect and analyze motion events. When motion is identified, the system records essential data such as the intensity, direction, zone, and timestamp of motion. It also classifies motion events into four levels: Small, Medium, Big, and Extreme, and stores snapshots accordingly.

Designed with surveillance and monitoring in mind, this lightweight system combines OpenCV's image processing capabilities with automated logging and snapshot generation, offering a comprehensive and efficient solution for motion analysis.

Problem Statement

In many surveillance systems, continuous video recording results in redundant data and inefficient storage. Additionally, such systems often lack intelligence to:

- Detect and differentiate motion intensity.
- Identify the direction or region of motion.

- Maintain structured records for future review.

The absence of automated feedback mechanisms hinders fast response and efficient monitoring. Our system resolves these limitations by offering intelligent, zone-aware, and intensity-based motion detection.

Technologies Used

Language:

- Python 3.x

Libraries & Modules:

- OpenCV: for video capture, image processing, and contour detection
- NumPy: used indirectly via OpenCV
- Winsound: (Windows only) for optional motion alert beeps
- Datetime: for real-time timestamping
- OS & Threading: for file and system operations
- File I/O: to log motion events

Current Working Model

The system is capable of:

- Live Video Analysis via webcam
- Motion Detection using frame differencing and contour detection
- Motion Classification:
  - Small (<1500 px area)
  - Medium (<4000 px area)
  - Big (<8000 px area)

  - Extreme (>=8000 px area)

- Snapshot Saving: Categorized folder storage

- Direction Detection: Left, Right, Up, Down

- Zone Detection: Screen divided into 9 zones

- Timestamp Logging: All events logged in text file

- Real-time GUI Overlay: Date/time, count, intensity, direction, and zone

Future Scope

To enhance its utility and scope, the following features can be added:

- Sound Alert Integration

- Email/Telegram Notifications

- Cloud Storage

- Multi-Camera Support

- Object Detection & Classification using deep learning

- Web Dashboard for live view and logs

- Scheduling Feature for time-based monitoring