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**Department of Master of Computer Applications**

**Subject: Project Work Phase - 2 Subject Code: 22MCA44**

**Project Synopsis**

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**Title: INTELLIGENT VEDIO SURVIVALLENCE SYSTEM**

**INTRODUCTION:**

In an increasingly security-conscious world, traditional surveillance systems are no longer sufficient to monitor and respond to potential threats effectively. Conventional CCTV systems require continuous human supervision, which is not only resource-intensive but also prone to oversight and delayed reactions. With the advancement of artificial intelligence and computer vision, there has been a significant shift toward automated and intelligent surveillance solutions.

An Intelligent Video Surveillance System (IVSS) utilizes modern technologies such as deep learning, object detection, and real-time video processing to automatically monitor, analyse, and detect abnormal activities in surveillance footage. Unlike traditional systems, IVSS can identify specific objects (e.g., people, vehicles), track their movements, recognize behaviours, and generate instant alerts for suspicious activities without human intervention. These systems are increasingly deployed in critical areas such as airports, smart cities, banks, public transportation, and industrial sites to enhance safety, security, and situational awareness.

The integration of a web-based dashboard further allows centralized control and live monitoring, making IVSS a powerful tool for modern security infrastructure. This project aims to design and implement a cost-effective, real-time, AI-powered surveillance system that improves both the speed and accuracy of threat detection.

**OBJECTIVES:**

* **Automated Surveillance:** To reduce manual monitoring efforts by automatically analysing video feeds for human activities and environmental changes.
* **Real-Time Object Detection and Tracking:** To accurately detect and track people, vehicles, and other relevant objects in live video streams.
* **Suspicious Activity Recognition:** To identify abnormal behaviours such as loitering, fighting, intrusion, or falls using AI/ML algorithms.
* **Instant Alert Generation:** To trigger real-time alerts (email notifications) when security breaches or unusual activities are detected.
* **Data Logging and Storage:** To store event data, timestamps, and video evidence securely for future analysis and legal reference.
* **User-Friendly Monitoring Interface:** To develop a web-based dashboard for live video streaming, system status, and alert viewing.
* **Reduced False Alarms**: To minimize false alerts by improving detection accuracy and filtering out non-critical movements (e.g., shadows, small animals).

**TOOLS AND TECHNOLOGIES USED:**

### **Programming Languages**

* **Python** – Core backend logic, computer vision, AI models
* **JavaScript** – Frontend interactivity, face capture with webcam
* **HTML/CSS** – UI and layout design

### **Software Technologies**

* **OpenCV**: For image and video processing (face detection, fall detection, motion detection).
* **YOLO**: For object detection and real-time deep learning inference.
* **Django**: To build web interfaces for surveillance monitoring and alerts.
* **SAR (Situational Awareness Reasoning)** – Custom rule-based logic
* **FFmpeg** – Converts raw processed videos to compressed formats (used post-processing)
* **Database (SQLite)**: For storing logs, user data, alerts, etc.

**PROPOSED METHODS:**

The proposed system is designed to automatically monitor video streams, detect suspicious activities in real-time, and notify relevant authorities. It combines cutting-edge computer vision algorithms, deep learning techniques, and a web-based interface to deliver a robust and intelligent surveillance solution.

1. **Video Input Acquisition:** The system begins by capturing live video feeds from CCTV or IP cameras installed at various surveillance points. The video stream is continuously fed into the system, where it is broken down into individual frames for analysis. This process ensures real-time data processing and immediate detection of any unusual activity.
2. **Object Detection:** Each frame extracted from the live video is processed using deep learning-based object detection models, such as YOLOv5 (You Only Look Once version 5) or SSD (Single Shot MultiBox Detector). These models are trained to recognize specific objects like humans, vehicles, and other entities of interest. Detected objects are highlighted with bounding boxes, and the detection confidence score is also displayed.
3. **Object Tracking:** Once objects are detected, the system uses object tracking algorithms like Deep SORT (Simple Online and Realtime Tracking) or the Kalman Filter to assign unique IDs and track the objects across consecutive frames. This ensures that the movement path of each individual object is monitored accurately, even in crowded environments.
4. **Anomaly Detection:** In addition to recognizing known suspicious activities, the system also employs unsupervised learning techniques for detecting anomalies. Autoencoders or One-Class Support Vector Machines (SVM) are trained on normal activity data. When the system detects patterns that significantly deviate from this norm, such as unusual movement or unexpected behaviour, it flags them as potential threats.
5. **Real-Time Alert System:** Upon detecting a threat or abnormal behaviour, the system immediately triggers an alert. Real-time notifications can be sent via SMS, email, or web push notifications to security personnel. The alert includes details such as the type of event, time of occurrence, and a snapshot or short video clip of the incident. This ensures a prompt response and minimizes the impact of potential security breaches.

**CONCLUSION:**

The Intelligent Visitor Screening System (IVSS) is an innovative and AI-powered surveillance solution designed to enhance safety, security, and visitor management in institutional environments. It combines state-of-the-art technologies such as YOLOv5 for real-time object detection, OpenCV for image processing, MediaPipe for human pose estimation, and Situational Awareness Reasoning (SAR) to detect critical events like vehicle crashes and human falls with improved accuracy.

The system also features face recognition capabilities using webcam integration, allowing it to match real-time images against stored user data. This functionality helps in monitoring registered individuals and prevents duplicate or unauthorized entries. The use of SAR further boosts crash detection by analyzing vehicle behavior across frames—including sudden halts and abnormal angular shifts—to distinguish between actual crashes and simple overlaps or traffic congestion. Additionally, the fall detection module tracks human posture and sudden changes in orientation to accurately identify incidents where a person collapses.

The Django web framework supports the backend, providing a robust platform for handling user data, visitor logs, and live notifications. Faculty members receive real-time alerts when a visitor arrives, with the option to approve or deny meetings, enhancing both security and convenience. The entire system is modular, allowing seamless integration of multiple AI models and real-time video analytics.

In conclusion, IVSS stands out as a reliable, intelligent, and scalable solution that uses AI and computer vision to automate surveillance and visitor tracking, reduce manual oversight, and improve the overall safety infrastructure of institutions or controlled-access areas.