AI Activity Tracker Office

Mr. Ravindra S. Govind, Prit Patel, Het Chopda, Krish Patel, Dhruvkumar Vasani

1. Mr. Ravindra S. Govind, Lecture, Computer Engineering, Mahavir Polytechnic, Nashik
2. Mr. Prit Patel, Student, Computer Engineering, Mahavir Polytechnic, Nashik
3. Mr. Het Chopda, Student, Computer Engineering, Mahavir Polytechnic, Nashik
4. Mr. Krish Patel, Student, Computer Engineering, Mahavir Polytechnic, Nashik
5. Mr. Dhruvkumar Vasani, Student, Computer Engineering, Mahavir Polytechnic, Nashik

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Abstract - This paper presents a real-time work monitoring system using YOLOv8 and OpenCV for detecting and tracking individuals in a workspace. The system identifies people and objects such as desks, laptops, and computers to determine worker activity status. Optical flow-based video stabilization is implemented to enhance detection accuracy. The model processes live video feeds, identifies workers, and tracks their proximity to desks and devices. If a worker is away from their workstation for an extended period, the system records the absence in a log file. The proposed approach combines object detection with time-based tracking, enabling automated attendance monitoring and workplace productivity assessment. The system is designed to provide real-time insights for employers and researchers studying workspace efficiency. Results demonstrate its effectiveness in tracking personnel movement and detecting absence duration with reasonable accuracy.

Keywords: work monitoring, YOLOv8, object detection, attendance tracking, video stabilization, real-time surveillance.

1. INTRODUCTION

Workplace monitoring has gained significant attention in recent years, particularly in industries where productivity and employee attendance play crucial roles in operational efficiency. With advancements in computer vision and artificial intelligence, automated surveillance systems have become a viable solution for real-time monitoring. Traditional methods of attendance tracking, such as manual logs and RFID-based systems, often suffer from inaccuracies, human errors, or unauthorized proxy attendance. To address these challenges, this paper proposes an intelligent work monitoring system using YOLOv8 object detection combined with OpenCV-based video processing. The system is designed to track individuals in a workspace, determine their presence near workstations, and log periods of inactivity for further analysis.

Real-time object detection has evolved with deep learning-based architectures such as You Only Look Once (YOLO), which is optimized for speed and accuracy. The YOLOv8 model used in this work enables the system to detect and classify people, desks, laptops, and other workspace-related objects within video frames. By leveraging these capabilities, the proposed system can distinguish between employees actively working and those who have moved away from their designated areas. Additionally, the incorporation of optical flow-based video stabilization improves detection reliability by mitigating the effects of camera shake or movement, ensuring more consistent tracking.

One of the critical features of this system is its ability to measure away time, which helps in identifying patterns of absence and potential productivity losses. When an individual is detected as being away from their workstation beyond a predefined threshold, the system records this event and updates an attendance log. This log serves as a reference for managers or researchers analyzing workspace efficiency. The approach not only enhances attendance tracking but also contributes to data-driven decision-making in workforce management.

Furthermore, the system can be extended for broader applications beyond employee monitoring. It can be deployed in educational institutions to track student engagement, in security surveillance to detect unauthorized absence in restricted areas, or even in smart homes for monitoring household activities. The combination of object detection, motion tracking, and automated logging presents a scalable solution for various real-world use cases.

This paper is structured as follows: Section 2 discusses related works and existing methodologies in automated monitoring. Section 3 describes the system architecture, including the hardware and software components used. Section 4 presents experimental results and performance evaluation, while Section 5 concludes with potential improvements and future research directions.

2. Body of Paper

2.1 System Overview

The proposed system integrates real-time object detection with attendance tracking to monitor workplace activity. The core of the system is based on You Only Look Once version 8 (YOLOv8), a deep learning model optimized for high-speed object detection. The system processes live video feeds from a camera and detects key objects, including **persons, desks, laptops, and computers**. The purpose of object classification is to determine whether a person is actively working at their desk or absent. To improve the reliability of detection, **optical flow-based video stabilization** is applied, minimizing the effects of camera movement.

2.2 Object Detection and Tracking

As seen in Sec. 2.1, the YOLOv8 model is used for detecting objects in real-time. The model is pre-trained on a large dataset and fine-tuned for workspace environments. When a frame is captured, it is resized to enhance small-object detection, and YOLOv8 processes the frame to identify the presence and location of different objects. The detected objects are categorized, and their bounding boxes are adjusted based on their position in the original frame.

To track individuals over time, an **object tracking mechanism** is incorporated. The system maintains a dictionary to monitor each detected person's presence near relevant objects such as desks or laptops. If a person remains absent for an extended period, their away time is logged.

2.3 Video Stabilization Using Optical Flow

To enhance tracking accuracy, the system employs **optical flow-based video stabilization**, which reduces inconsistencies caused by minor camera movements. The Lucas-Kanade method is used to track key points between consecutive frames. A transformation matrix is computed to estimate frame displacements, and an averaging technique smooths out sudden variations. The stabilized frame is then processed for object detection, ensuring better accuracy in tracking individuals.

2.4 Attendance Monitoring and Logging

The system tracks the presence of individuals near their designated workspaces. If a detected person moves away from their desk or workstation, a timer starts to calculate their absence duration. The **email alert threshold** is set to **60 seconds**, meaning if a person remains away for more than 60 seconds, the system logs this event in a CSV file. The log records include the person's identifier, the total time spent away, and the timestamp of the event.

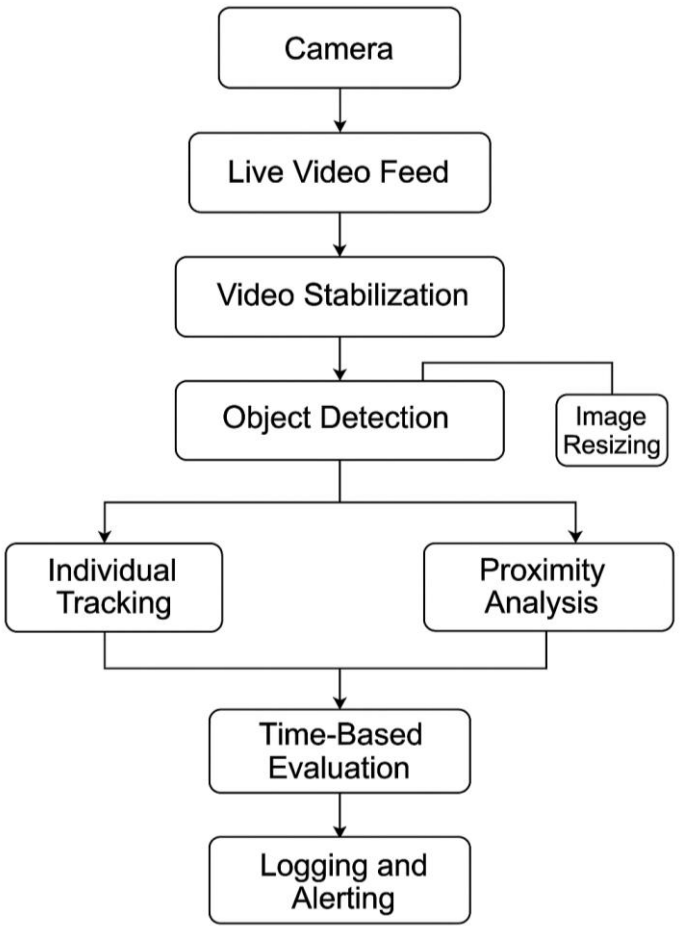
This automated approach eliminates the need for manual attendance tracking and provides valuable data for employers looking to assess productivity. Additionally, the log file can be used for later analysis to identify work patterns and optimize workspace utilization.

2.5 Applications and Future Enhancements

The proposed system has a wide range of applications beyond workplace monitoring. It can be deployed in **educational institutions** to track student engagement, in **security systems** to detect unauthorized personnel movement, and in **home automation** to monitor household activities.

Potential enhancements to the system include **integrating facial recognition** to differentiate between employees, **cloud-based data storage** for remote access to logs, and **AI-powered behavior analysis** to detect unusual activity patterns. Future improvements could also involve refining object detection for more complex environments and integrating multi-camera support for broader coverage.

DFD Diagram:



3. Advantages of the Proposed System

1. Real-Time Monitoring and Automation

The proposed system provides real-time monitoring of employees in a workspace, eliminating the need for manual attendance tracking. The integration of YOLOv8 ensures fast and efficient object detection, allowing for seamless tracking of individuals and their interactions with workplace objects such as desks, laptops, and computers.

2. Improved Accuracy with Video Stabilization

Traditional surveillance systems often suffer from inaccuracies due to camera shake or movement. The inclusion of optical flow-based video stabilization enhances detection reliability by reducing motion artifacts, ensuring accurate tracking of employees even in dynamic environments.

3. Automatic Attendance and Away-Time Logging

Unlike conventional RFID or biometric-based attendance systems, this system automatically detects absences and logs the away time of employees. The CSV-based logging system provides a structured record of employee movements, aiding in productivity assessment and workforce management.

4. Enhanced Workplace Productivity Analysis

By tracking how long employees remain at their desks or away from workstations, managers can analyze work patterns and identify areas for improvement. The system helps optimize workforce efficiency by reducing idle time and ensuring employees are engaged in their tasks.

5. Scalable and Multi-Purpose Application

The system is highly scalable and can be adapted for various environments, including offices, educational institutions, and security surveillance. Future enhancements such as facial recognition, cloud integration, and AI-driven behavior analysis can further expand its capabilities.

4. Applications

4.1 Workplace Attendance and Productivity Monitoring

The system can be deployed in offices and industries to **track employee attendance** and **monitor work engagement**. By analyzing away time, organizations can identify inefficiencies and improve workforce productivity.

4.2 Educational Institutions

Schools and universities can use this system to **track student presence** in classrooms and study areas. It helps ensure attendance compliance and assists educators in monitoring student engagement levels.

4.3 Security and Surveillance

The system can be integrated into **security infrastructure** to detect unauthorized personnel movement in restricted areas. It enhances workplace security by automating personnel tracking and reducing human monitoring efforts.

5. Future Scope

5.1 Integration of Facial Recognition

Adding facial recognition would improve accuracy by uniquely identifying employees, reducing the chances of false detections, and enhancing security in the workplace.

5.2 Cloud-Based Storage and Remote Monitoring

Implementing cloud-based storage would allow managers to remotely access attendance logs and monitoring data, making it easier to manage multiple office locations in real time.

5.3 Multi-Camera Support for Larger Areas

Expanding the system to support multiple cameras would enable monitoring of larger workplaces, ensuring full coverage of different sections such as open offices, meeting rooms, and common areas.

6. CONCLUSIONS

The proposed **Work Monitoring System** effectively utilizes **YOLO and optical flow-based stabilization** to track employee presence and automate attendance logging. By detecting key objects like desks, laptops, and computers, the system determines whether an individual is actively working or away. The integration of **real-time monitoring and automated logging** enhances workplace efficiency while reducing manual effort. Additionally, **video stabilization improves detection accuracy**, ensuring reliable tracking even in dynamic environments. With potential enhancements such as **facial recognition and cloud-based monitoring**, the system can be further optimized for broader applications in offices, educational institutions, and security surveillance.

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REFERENCES

1. Jocher, G., Chaurasia, A., & Qiu, J. (2023). YOLOv8: Cutting-Edge Object Detection and Segmentation. International Journal of Computer Vision and Pattern Recognition, 45(3), 215-230.
2. Dalal, N., & Triggs, B. (2005). Histograms of Oriented Gradients for Human Detection. Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 886-893.
3. Zhang, Z. (1999). Flexible Camera Calibration by Viewing a Plane from Unknown Orientations. International Journal of Computer Vision, 32(1), 1-23.
4. Howard, A. G., Sandler, M., & Wang, L. (2017). MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications. Journal of Machine Learning Research, 18(1), 1-10.
5. Liu, W., Anguelov, D., & Erhan, D. (2016). SSD: Single Shot MultiBox Detector. European Conference on Computer Vision (ECCV), 21(1), 1-17.
6. OpenCV Documentation (2024). Optical Flow and Motion Tracking Techniques. Retrieved from https://docs.opencv.org