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# **VISIONGUARD: Real-Time Restricted Area Monitoring System**

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**ABSTRACT:** In today's world, security in restricted areas such as military areas, industrial areas, and private property is a major concern. The security systems currently in practice rely heavily on manual monitoring, which is inefficient and has a high tendency for errors. Keeping these issues in mind, in the following paper, a Real-Time Restricted Area Monitoring System has been proposed, which utilizes YOLO, a deep learning object detection algorithm.

In the proposed system, real-time video feeds are utilized for object detection and restricted area monitoring. The video feeds are processed using computer vision techniques, and the YOLO algorithm is applied for object detection. Once an unauthorized object is detected within a restricted area, alerts are sent, and the object is logged for further processing. In the proposed system, an automated restricted area monitoring system is implemented, which is efficient and effective in providing accurate object detection in real-time.

**KEYWORDS:** Restricted Area Monitoring, YOLO, Object Detection, Computer Vision, Deep Learning, Surveillance System, Real-Time Detection.

## **I. INTRODUCTION**

Security and surveillance are integral parts of modern-day society, especially in areas where unauthorized access can lead to critical consequences. Restricted areas, such as industrial plants, government institutions, and defense facilities, need to be constantly monitored to ensure security and prevent unauthorized access.

In the context of traditional security systems, human intervention is necessary to monitor video feeds, which can lead to decreased attention and awareness over time. This is not a feasible solution, especially when dealing with multiple cameras and restricted areas.

In recent years, the development of Artificial Intelligence and Computer Vision has led to the popularity of automated security systems. Object detection algorithms can be used to analyze video feeds and detect potential security threats without the need for manual intervention.

In this paper, a Real-Time Restricted Area Monitoring System using YOLO is proposed, which can detect unauthorized objects in restricted areas. This is a more accurate and efficient solution to modern-day security issues.

## **II. LITERATURE SURVEY**

Recent research has been conducted to explore the use of deep learning and computer vision techniques, such as YOLO-based approaches, for intrusion detection and surveillance systems. This research has been conducted to improve the accuracy and efficiency of such systems in various environmental conditions.

The research paper "YOLOv5 vs YOLOv8 for Real-Time Human Intrusion Detection" by Sodhro et al. discusses the performance of YOLOv5 and YOLOv8-based approaches under various environmental conditions such as indoor, outdoor, and adverse weather conditions. According to this research paper, YOLOv8-based approaches can improve the accuracy of intrusion detection systems up to 99.1% confidence level under outdoor environmental conditions, whereas YOLOv5-based approaches can improve system performance under adverse weather conditions. However, the system can perform well if an efficient approach for model selection is implemented.

The research work by Chatterjee & Singh has proposed a YOLOv8-based intrusion detection system using a Region of Interest (ROI) approach. This system can handle multiple objects and can be trained using the COCO dataset for various object classes. Although this system can perform well under various lighting conditions, further optimization of this system is required for real-time implementation and low-light conditions.

The ReXCL tool is specifically designed to apply heuristic techniques and machine learning algorithms to extract and classify information from requirement documents. However, it still lacks general validation.[3]

In summary, existing research focuses on object detection and region-based intrusion monitoring. However, challenges such as adaptability, real-time efficiency, and robustness in diverse environments remain. These limitations are addressed in the proposed system using an optimized YOLO-based real-time restricted area monitoring approach.

### III. METHODOLOGY

The methodology of the proposed system is based on real-time video processing and object detection using YOLO.

The proposed system starts by acquiring video input from a camera or video file. The video is then processed frame by frame using image processing techniques such as resizing and normalization to be ready for YOLO object detection.

YOLO is then applied to the video frames to detect objects such as humans, cars, and other objects. The objects detected are then bounded and labeled.

A restricted area is defined in the video frame. The system checks whether the objects detected fall within the restricted area. If an object is detected within the restricted area, it is considered an unauthorized intrusion.

Once the intrusion is detected, alerts are sent to notify the occurrence. The processed video is then displayed along with bounding boxes and restricted areas highlighted.

This methodology is efficient and accurate for monitoring restricted areas in real time.

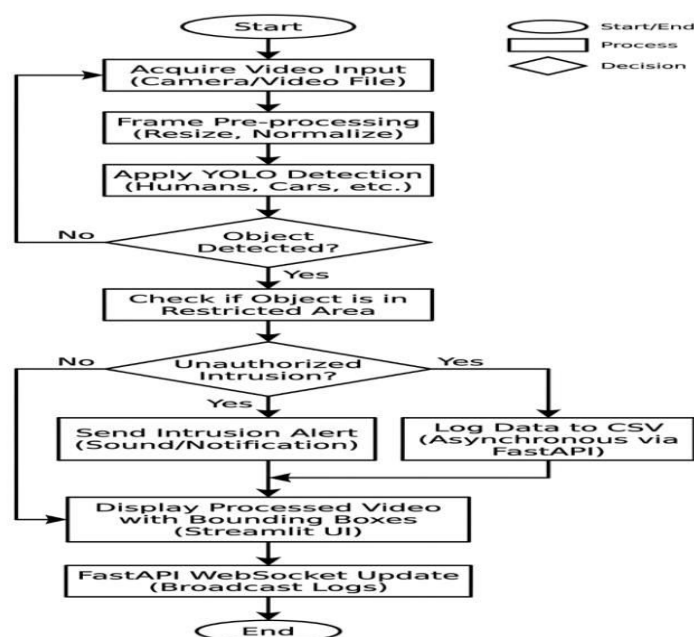


Fig 3.1 VisionGuard: Real-Time Restricted Area Monitoring System Methodology

#### IV. SYSTEM ARCHITECTURE

The system's architecture is based on a pipeline of various modules, including the video input module, preprocessing module, object detection module, and alert generation module.

The input module receives live videos from cameras. The preprocessing module processes the received videos to prepare them for analysis by resizing and converting them to proper formats.

The main part of the system is the object detection module, which uses YOLO to detect objects in the videos. The detected objects are then sent to the region analysis module to compare their location with the location of the restricted region.

When an object is detected in the restricted region, the alert generation module is triggered to raise alarms and log the event. The output module shows the processed videos with the detection results.

This architecture provides efficient data flow and allows the system to process the data in real time, ensuring the system's reliability and robustness.

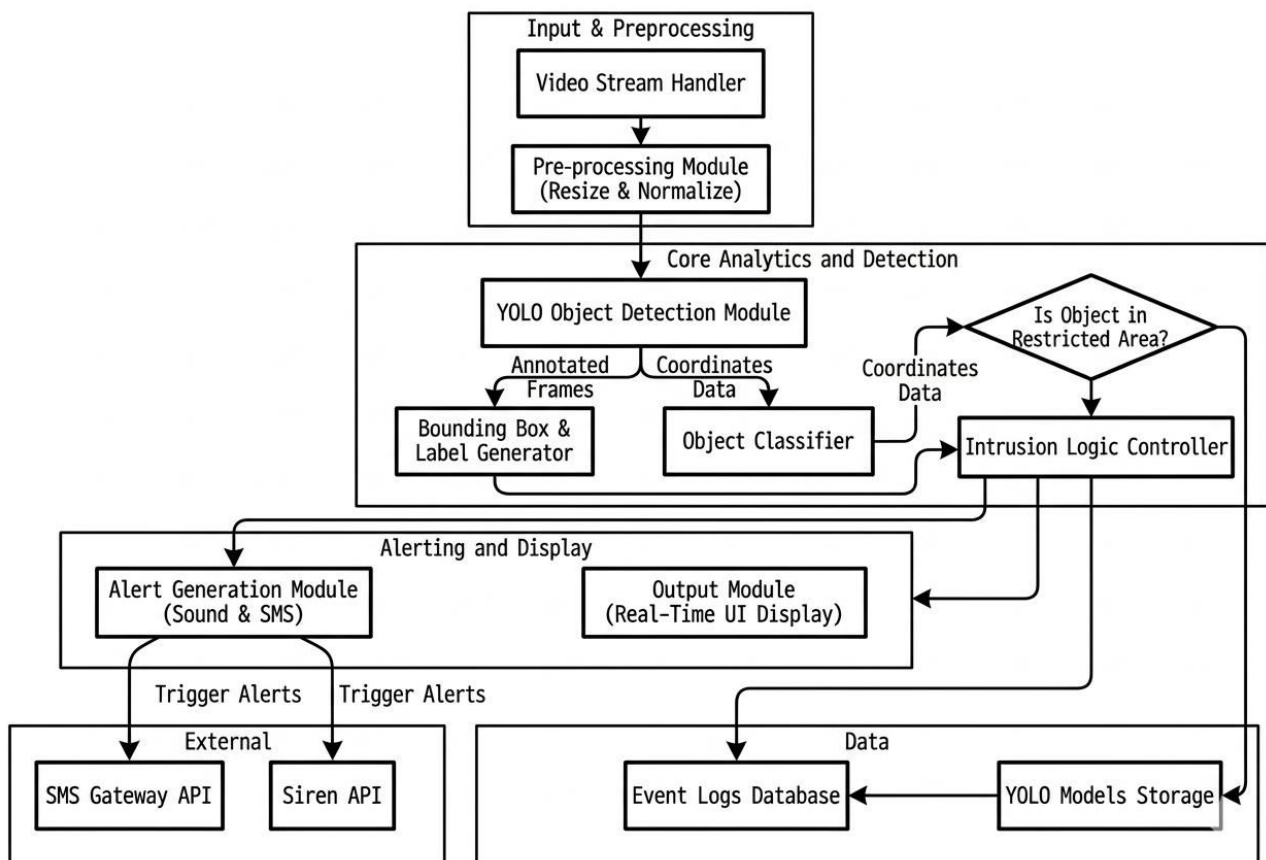


Fig 4.1 System Architecture

#### V. OUTPUT SCREENS

The system provides a user-friendly interface for monitoring and visualization.

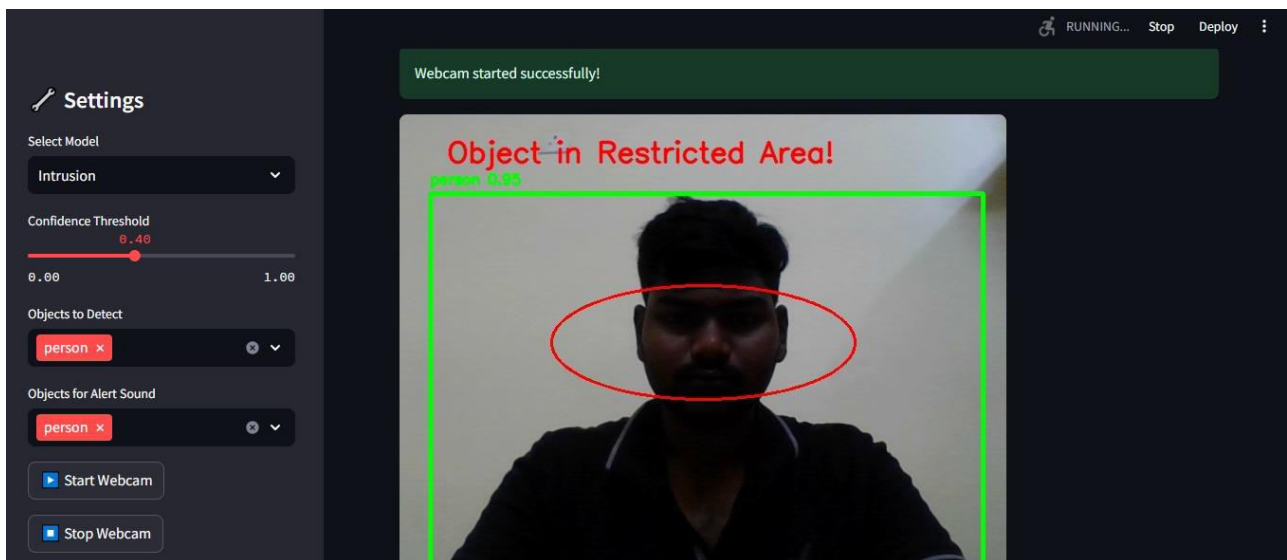
The main screen displays the live video feed along with detected objects highlighted using bounding boxes.

The restricted area is clearly marked to indicate the monitored zone.

When an unauthorized object enters the restricted area, the system highlights the intrusion and triggers an alert. The interface also allows users to view recorded events and logs. The output screens provide clear visualization and enable users to easily understand system behavior and detection results.



Fig 5.1 Home Interface



5.2 Detect Page



Fig 5.3 Live Monitoring Dashboard

Timestamp	Class	Confidence (%)	Restricted Area Violation
2026-03-29 16:34:47	person	90.69%	Yes
2026-03-29 16:34:26	person	94.84%	Yes
2026-03-29 16:34:24	person	94.68%	Yes
2026-03-29 16:34:22	person	93.89%	Yes
2026-03-29 16:34:20	person	94.68%	Yes
2026-03-29 16:34:17	person	94.47%	Yes
2026-03-29 16:34:15	person	95.05%	Yes
2026-03-29 16:34:13	person	95.43%	Yes
2026-03-29 16:34:11	person	94.50%	Yes

Fig 5.4 No. of detections Dashboard

### VI. CONCLUSION

In this project, a Real-Time Restricted Area Monitoring System using YOLO has been developed to improve security and surveillance. The system automates the process of restricted area monitoring and detection of unauthorized access using deep learning techniques.

The system employs object detection using YOLO and provides accurate results in real-time. This reduces manual intervention in surveillance and eliminates errors in monitoring restricted areas. The system can be used in different scenarios, including industries and public places.

The project proves that computer vision and deep learning techniques can be used to develop an effective surveillance system.

## VII. FUTURE SCOPE

Although the system is working properly, some improvements can still be made to the system in the future. One such improvement is the addition of advanced versions of YOLO, which can improve the accuracy and efficiency of the system.

Another change that can be made is the addition of facial recognition, which can detect specific people entering certain areas. The system can also be improved to allow it to support multiple camera inputs, which can be helpful for surveillance purposes. The system can also be improved by integrating it with IoT devices, which can allow people to monitor the system remotely. In addition, the system can also be improved by incorporating predictive tools, which can detect security risks beforehand. These improvements will further enhance the efficiency of the system, which can be applied in real-world scenarios.

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