[MULTI OBJECT TRACKING ON LOW COST EMBEDDED PLATFORM]

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Abstract

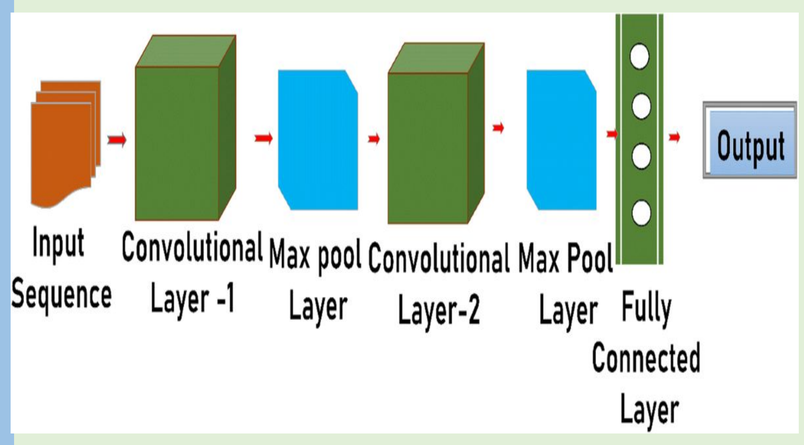
To develop a real-time Multi-Object Tracking (MOT) system on a low-embedded platform, implementing an efficient tracking algorithm after YOLO-based detection. The goal is to achieve minimal latency while ensuring high accuracy on resource-constrained hardware.

Background

Multi-Object Tracking (MOT) is a crucial task in computer vision, used in surveillance, traffic monitoring, and autonomous systems. Traditional MOT systems require high computational power, limiting their deployment on low-power embedded devices. This project aims to develop an efficient and real-time MOT system optimized for embedded platforms like Raspberry Pi. By integrating YOLO for object detection and DeepSORT for tracking, the system ensures high accuracy while operating with minimal computational resources. Key challenges such as occlusion handling, object re-identification, and real-time performance optimization are addressed to make the system robust and scalable for real-world applications.

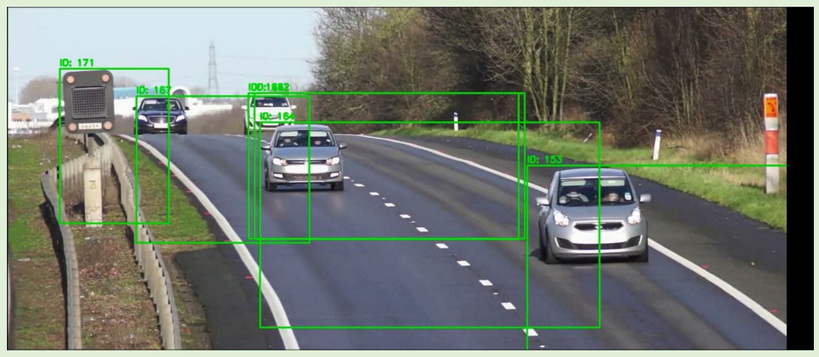
Methods

Our methodology consists of several key stages to develop a real-time Multi-Object Tracking (MOT) system on a low-cost embedded platform. The approach integrates YOLO for object detection and DeepSORT for tracking, optimizing performance for embedded hardware like Raspberry Pi.



Results

our Multi-Object Tracking (MOT) system successfully detects and tracks multiple objects in real time on a low-embedded platform. Using YOLO for object detection and DeepSORT for tracking, the system achieves accurate object identification and robust ID assignment even under occlusions. The optimized implementation ensures efficient tracking with minimal computational overhead, making it suitable for real-world applications like video surveillance and traffic monitoring.



Conclusion

In this project, we successfully implemented a real-time multi-object tracking (MOT) system using the Deep SORT algorithm on embedded platforms with constrained resources, such as the Raspberry Pi. By integrating a state-of-the-art object detection model like YOLO with the Deep SORT tracker, we were able to develop a solution capable of accurately detecting and tracking multiple objects simultaneously. Deep SORT's use of Kalman filtering and deep learning-based re-identification allowed us to achieve robust performance, even in scenarios involving occlusions, object overlaps, and motion dynamics. This system proves to be highly effective for real-time applications where both efficiency and precision are critical, demonstrating the potential of low-cost embedded platforms for advanced tracking tasks in practical settings.

Future Perspectives

The system can be enhanced by integrating **lightweight deep learning models** for improved efficiency on embedded platforms. Future work includes **edge AI optimization, better occlusion handling, and multi-camera tracking** for broader coverage. Expanding its applications to **autonomous systems, smart surveillance, and real-time analytics** will further enhance its impact.

Impact on Society

Our **Multi-Object Tracking (MOT) system** enhances **public safety, smart surveillance, and traffic management**, reducing manual monitoring efforts. It enables **efficient crowd analysis, theft prevention, and accident detection**, improving urban security and law enforcement. By optimizing tracking on **low-power embedded systems**, it promotes **cost-effective and scalable AI-driven solutions** for various real-world applications

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