Pedestrain Detection

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Abstract: Pedestrian detection is a critical task in the field of computer vision, particularly for enhancing the safety of autonomous systems such as self-driving cars and intelligent surveillance systems. This project focuses on the development and implementation of a real-time pedestrian detection system that accurately identifies and localizes pedestrians in a variety of complex environments. specifically convolutional neural networks (CNNs), to extract high-level features from input images or video frames. In conclusion, this project presents a real-time pedestrian detection system that utilizes deep learning techniques and advanced methodologies to enhance the safety and reliability of autonomous systems. The developed system

Keywords: Python,OpenCV,HOG,SVM,Machine Learning

I.INTRODUCTION

Pedestrian detection is a crucial taskin computer vision and autonomoussystems. It involves the detection and localization of pedestrians in images or video streams, enabling various applications such as pedestrian safety, surveillance, and autonomous driving. The process of pedestrian detection typically involves multiple steps. First, an input image or video frame is analyzed using a trained pedestrian detection model Next, these regions are classified as either containing pedestrians or not. As research and development continue in the field of computer vision, pedestrian detection algorithms will likely become even more accurate, efficient, and robust. By improving the ability to detect pedestrians in various scenarios and environmental conditions, these advancements will contribute to safer and more intelligent systems that benefit both pedestrians and society as a whole.

II.LITERATURE REVIEW

Dalal, N., & Triggs, B. (2005). Histograms of oriented gradients forhuman detection. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Vol. 1, pp. 886-893).
IEEE. - This seminal paper introduced the Histograms of Oriented Gradients (HOG) feature descriptor, which became a widely used method for pedestrian detection. The authors demonstrated high accuracy in detecting pedestrians using HOG features combined with support vector machines (SVMs). Viola, P., & Jones, M. (2001). Rapid object detection using a boosted cascade ofsimple features. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (Vol. 1, pp. 511-518).
IEEE. It served as a basis for subsequent research in cascade- based object detection. Delving into high-quality object detection. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (pp. 6154- 6162). IEEE. - This paper proposed the Cascade R-CNN method, which improved object detection performance by using a cascade of detectors with different levels of precision. The authors demonstratedits effectiveness in pedestrian detection, achieving state-of-the-art accuracy.

The problem of pedestrian detection revolves around accurately and efficiently detecting pedestrians in images or video streams. Pedestrian detection plays a vital role in various applications, including autonomous driving, surveillance, pedestrian safety, and urban planning.
However, it poses several challenges that need to be addressed: Occlusion: Pedestrians often appear in complex scenes where they can be partially or fully occluded by objects such as vehicles, trees, or other pedestrians. Effective pedestrian detection methods should be able to handle occlusions and accurately detect pedestrians even when they are partially visible. Scale and Perspective Variations: Pedestrians can vary significantly in size and aspect ratio, depending on their distance from the camera Cluttered Backgrounds: Pedestrians are often present in cluttered scenes, such as crowded streets or busy intersections. Distinguishing pedestrians from the background and other objects becomes challenging due to visual similarities, lighting conditions, and complex scene dynamics. Accurate pedestrian detection methods should effectivelyhandle such cluttered environments.

IV. METHODOLOGY

Collect a dataset of images or videos that contain pedestrians. Ensure the dataset represents a variety of scenarios, backgrounds, lighting conditions, and pedestrian poses.
Annotate the dataset by labeling thebounding boxes around pedestrians in each image or frame. Pre-process the dataset by resizing the images toa standardized resolution and normalizing pixel values.

ARCHITECTURE

The HOG approach computes gradient orientation histograms in local image regions to capture pedestrian shape information. The architecture typically involves dividing the image into cells, computing gradients within each cell, and forming histograms of gradient orientations. The histograms are then used as features for pedestrian detection using classifiers like Support Vector Machines (SVM).

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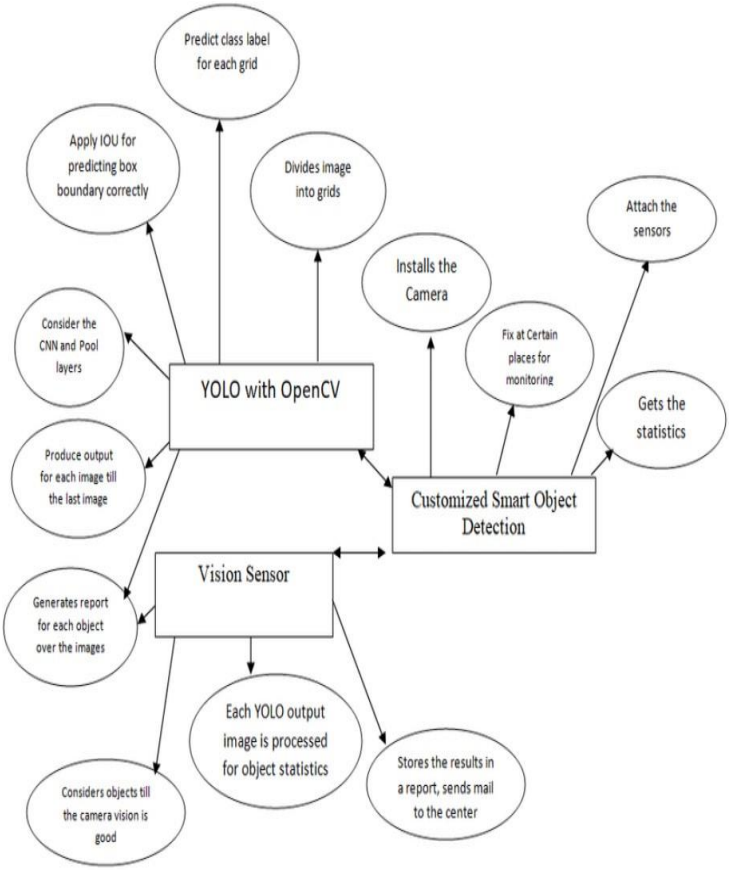
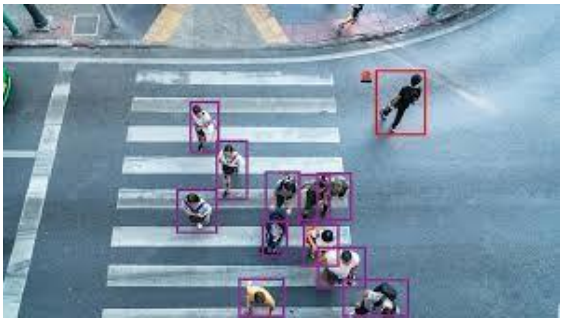
ER Diagrams

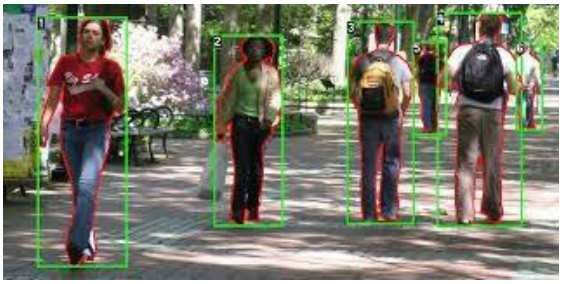


V. EXPERIMENTALRESULTS

There are two ways to detect thepedestrains by image and video

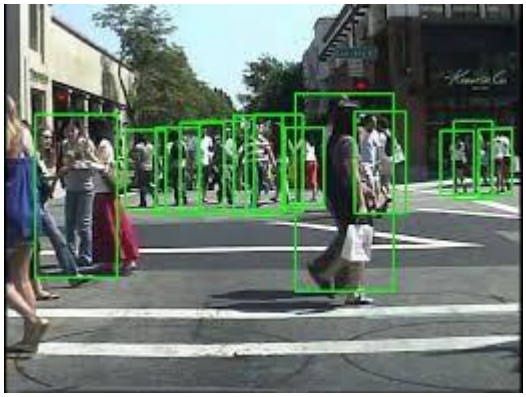
Pedestrian Detection





Using HOG's:

Pedestrian Detection



VI. CONCLUSION

In conclusion, pedestrian detectionis a critical task in computer vision with numerous applications such as pedestrian safety, surveillance, and autonomous navigation. Over the years, various methodologies and architectures have been developed to address this task. From traditional methods like Histograms of OrientedGradients (HOG) and Scale- Invariant Feature Transform (SIFT) to modern deep learning-based approaches.

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