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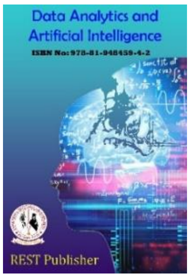

Real Time Vehicle for Traffic Detection for Intelligent Transportation System Using Machine Learning

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Abstract: *An improved method for vehicle detection in various traffic scenarios based on an improved YOLO network is proposed to reduce the rate of false detection of vehicle targets caused by occlusion. The Flip-Mosaic algorithm is used in the proposed approach to improve the network's perception of small targets. It was established a multi-type vehicle target dataset that was gathered in various scenarios. The dataset served as the basis for training the detection model. The Flip-Mosaic data enhancement algorithm improved vehicle detection accuracy and decreased false detection rates, as demonstrated by the experiments.*

Key Words: *object detection, YOLO, digital image processing*

1. INTRODUCTION

By developing an effective communication system between the cloud platform, roadside infrastructure, road users, and large data centres, the smart freeway facilitates vehicle–road collaboration. Even though the expressway network's construction is getting smarter and the technology for comprehensive traffic management is getting better quickly, there are still some problems that need to be solved. Segmented billing was implemented throughout the entire network system, and the expressway successfully implemented the "one network" operation mode of "one pass, one deduction, one notification." The billing mileage was determined by the system and the toll booths based on the driving path, and the charging mode was changed from weight charging to per-vehicle charging. The expressway toll system faces difficulties in recovery and evading traffic under the new toll collection system. In addition, the expressway has faster speeds, a large capacity for traffic, and a lot of commercial trucks carrying dangerous goods compared to urban arterial roads. Despite the relatively low accident rate, traffic accidents on the expressway cause more damage and have longer-lasting effects, such as congestion caused by accidents.

2. OBJECT DETECTION

Object detection is a computer technology that deals with detecting instances of semantic objects of a particular class (like humans, buildings, or cars) in digital images and videos. It is related to computer vision and image processing. Face detection and pedestrian detection are two well-studied subfields of object detection. Many areas of computer vision, such as image retrieval and video surveillance, use object detection. It is widely used in computer vision tasks like face detection, face recognition, vehicle counting, video object co-segmentation, and image annotation. It can also be used to track people in videos, a person in a video, a cricket bat's movement, or a football ball during a game.

3. YOLO V5

The fifth generation of YOLO is YOLO v5. It is well-known for its speed of prediction and accuracy in detection. The network structure of YOLO v5 is straightforward and consists of input, backbone, neck, and prediction. A) Data: YOLO v5 incorporates the Mosaic data augmentation method into the training images, as did YOLO v4. Four distinct images are combined into a single image through random scaling, random cutting, and random layout. Small target detection greatly benefits from the enrichment of the training image's background information.

4. DIGITAL IMAGE PROCESSING

The application of an algorithm to digital images by means of a digital computer is known as digital image processing. Digital image processing is a subfield of digital signal processing with numerous advantages over analog image processing. It prevents issues like noise and distortion buildup during processing and allows a much wider range of algorithms to be applied to the input data. Digital image processing can be represented as multidimensional systems because images can be defined in more than two dimensions. There are three main influences on the creation and development of digital image processing: first, computer technology's development; second, the growth of mathematics, particularly the development of discrete mathematics theory; Thirdly, there has been an increase in the need for a wide range of applications in industries, agriculture, the military, the environment, and medical science.

5. OBJECTIVES

to anticipate traffic by recognizing vehicles in the surveillance data. This project serves as the foundation for vehicle detection and traffic prediction using the YOLO algorithm. Through this, the process of detecting a congested area can be examined. In the future, numerous IOT modules and server configurations can be made possible.

6. RELATED WORKS

According to Nidhi Soni et al., it is urgent to investigate the influence of accident-causing factors and implement effective strategies to reduce the number of accidents. In recent years, researchers have focused on people, vehicles, roads, the environment, and the influence of influencing variables on traffic accidents. Discriminative correlation filter (DCF)-based trackers, according to Taihang Dong et al., have recently achieved excellent performance at a high computational efficiency. According to Chaonan Fan et al., the traditional GMM is sensitive to changes in illumination and easily recognizes the background as a moving target. As a result, the five-frame interframe difference method and the improved custom GMM were combined in this paper to create a moving target detection algorithm. According to Yangquan Yu et al., there are advantages and disadvantages to using two common algorithms for moving target detection: In this paper, the background subtraction method and the frame difference method are compared and analyzed. According to Badri Narayan Subudhi et al., this article proposes a novel background subtraction (BGS) method for detecting local changes in video scenes that correspond to the movement of objects. Six local features are proposed as an effective combination here; three previously proposed and three newly proposed In this case, a statistical parametric biunique model is proposed for background modeling and subtraction.

7. METHODOLOGY

Computer vision technology has also made significant progress in recent years as a result of the advancement of GPU hardware devices and the theory of deep learning. The use of computer vision technology to cut down on manpower consumption has significant practical implications. The fundamental component of intelligent monitoring systems for a variety of application scenarios is object detection, which is also an important fundamental branch of digital image processing and computer vision. The vehicle is detected using the YOLO algorithm, with cctv footage serving as the input. The x and y planes are used to analyze the frames in the footage, and the detection is very accurate. Even in dimly lit environments, image annotation can be used to identify objects. Real-time surveillance or data input is required. The YOLO algorithm's better detection of vehicles yields better results.The definitive results are shown by the parameterized result. The prediction of traffic can be developed in the future using this method.

8. DATASET COLLECTION

The authors of open-source datasets frequently construct them in accordance with the requirements of the current research. As a result, the characteristics of the data may not strictly conform to the requirements of the current research. This paper establishes some datasets to verify its own research because research in a particular domain necessitates datasets under specific scenarios or conditions. The multi-angle monitoring video of a specific point is based on the angle and resolution of the expressway monitoring application.

9. IMAGE LABELING METHOD FOR VEHICLE DETECTION

The learning activity of vehicle inspection is supervised. Classification and location information about the vehicle in the image are necessary for model training. The practical application of vehicle target detection in highway scenarios was taken into consideration when categorizing vehicle targets.

10. IMAGE ANNOTATION

The model's quality was largely determined by the labeled dataset's quality. so that a vehicle detection model could be trained that was more realistic to the real-world traffic on the highway

Architecture Diagram

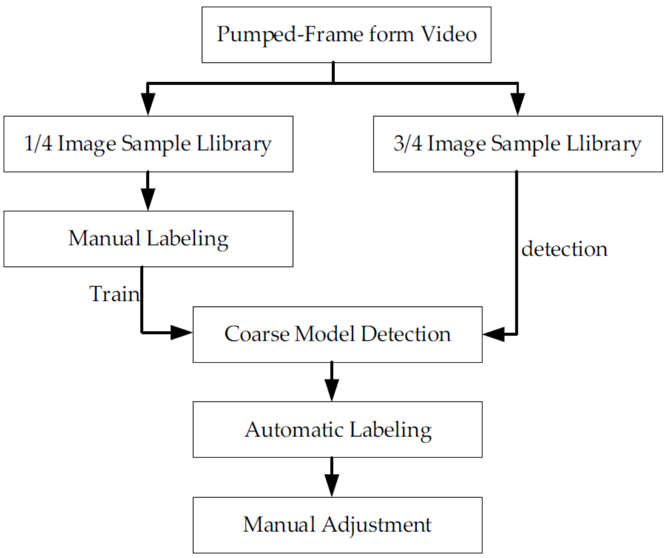

FIGURE 1. Architecture Diagram

11. RESULT AND DISCUSSION

the efficiency of this paper's improved data enhancement optimization method. The improved YOLO v5 network performed better in terms of prediction when identifying cars and other vehicles. Particularly in the case of a smaller calibration frame, the overall performance of the two models improved by 0.5% and 0.3%, respectively, as a result of their similarity to one another. The process of optimizing vehicle inspection performance was the primary focus of this section. Finally, a comparison of performance before and after the improvement effect demonstrated the method of improvement proposed in this project's efficacy.

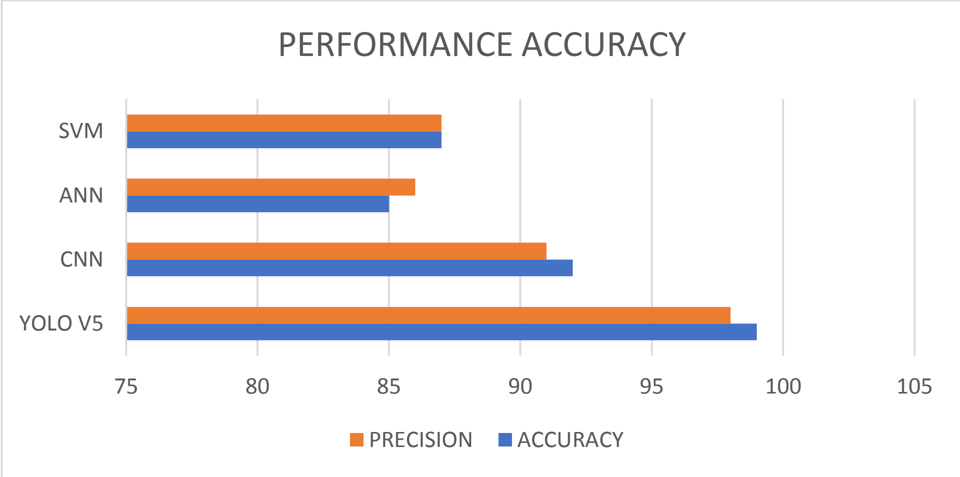

FIGURE 2. Performance.

ALGORITHM	ACCURACY	PRECISION
YOLO V5	99	98
CNN	92	91
ANN	85	86
SVM	87	87

FIGURE 3. Table Prediction Result

12. CONCLUSIONS

The rich data samples and high-speed scene-diversified dataset were constructed first. The dataset provided a dataset with strong applicability for vehicle object detection in high-speed scenarios because it covered numerous highway scenarios and monitored various road sections and perspectives. In addition, the improved YOLO v5 network was utilized for object detection in this article. The accuracy of identifying vehicle targets at their source was improved by utilizing diverse datasets. The outcome, which was more in line with the requirements of engineering practice and significantly improved the rate of recognition of similar small targets, was based on this method. These enhancements may have a significant impact on real-world applications.

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