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VEHICLE OBJECT DETECTION USING YOLOv4

(Under the guidance of Mrs. Y. Bhagya Lakshmi, Assistant Professor,
Department of Information Technology, Tirumala Engineering College)

K. Sowndarya , N.Sirisha, G. Pravallika, R. Asritha, K. Sowmya

ABSTRACT

To achieve safe driving of vehicles, it is necessary to perceive information about the vehicle's surroundings, and computer vision is one of the key technologies to solve this problem. The YOLO series and SSD, RetinaNet algorithm are representative of one-stage target detection algorithms, which have high accuracy and high speed. YOLOv4 is the latest algorithm of YOLO series, which has improved the speed and accuracy of vehicle target detection than before, but there is still a distance from the real real-time in vehicle detection. This paper proposes an improved YOLOv4-based video stream vehicle target detection algorithm to solve the problem in the detection speed which is not fast enough. This paper first introduces the YOLOv4 algorithm theoretically, then proposes an algorithmic process to speed up the detection speed, and finally conducts practical road experiments. From the experimental results, the algorithm of this paper can improve the detection speed of the algorithm without losing accuracy, which can provide a basis for decision making for safe vehicle driving.

Keywords – Vehicle, Detection, YOLO, SSD, RetinaNet

I. INTRODUCTION

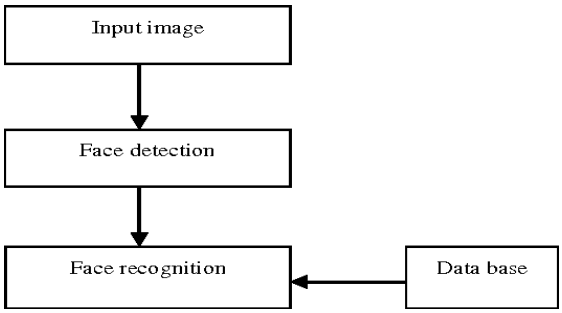
With the rapid development of China's economy and productivity, China's per capita car ownership is on the rise. While cars bring us the convenience of daily life, they also bring us potential safety hazards. To reduce such safety hazards, it is necessary for vehicles to sense their surroundings and thus make corresponding responses to different environments. Computer vision technology is a key technology in the field of intelligent driving, which enables vehicles to sense other obstacles in front of the vehicle such as vehicles, pedestrians, etc. Through the fusion with other sensors such as millimeter wave radar, LIDAR and other data can make the vehicle well sense the surrounding environment, thus ensuring the safety of vehicle driving. In the current field of vehicle target detection, the mainstream detection methods are divided into traditional image processing-based detection methods and deep learning-based detection methods. Traditional image processing-based detection methods require manual design features and a series of feature extraction. This method is easy to understand and has fast computational speed, but the algorithm's generalization performance is poor, and the robustness is not as good as the deep learning-based methods; deep learning-based methods can achieve end-to-end training and detection because they mostly use convolutional neural networks for learning and feature extraction, which have good generalization, robustness, and detection effects. The target detection based on convolutional neural network is divided into one-stage target detection algorithm and two-stage target detection algorithm according to whether the candidate frame of the possible target needs to be extracted in advance, two-

stage representative algorithms are R-CNN, fast R-CNN, faster RCNN, R-FCN, etc. one-stage representative algorithms are YOLO series, SSD, RetinaNet, etc. Considering the requirements of real time and accuracy, YOLOv4 algorithm is chosen in this paper to achieve the detection of vehicle targets.

II. PROPOSED SYSTEM

In the current field of vehicle target detection, the mainstream detection methods are divided into traditional image processing-based detection methods and deep learning-based detection methods. Traditional image processing-based detection methods require manual design features and a series of feature extraction. This method is easy to understand and has fast computational speed, but the algorithm's generalization performance is poor, and the robustness is not as good as the deep learning- based methods; deep learning-based methods can achieve end-to-end training and detection because they mostly use convolutional neural networks for learning and feature extraction, which have good generalization, robustness, and detection effects. The target detection based on convolutional neural network is divided into one-stage target detection algorithm and two-stage target detection.

Algorithm according to whether the candidate frame of the possible target needs to be extractedin advance, two-stage representative algorithms are R-CNN, fast R-CNN, faster RCNN, R-FCN, etc. one-stage representative algorithms are YOLO series, SSD, RetinaNet, etc. Considering the requirements of real time and accuracy, YOLOv4 algorithm is chosen in this paper to achieve the detection of vehicle targets.



ADVANTAGES OF PROPOSED SYSTEM:

YOLOv4 algorithm theoretically, then proposes an algorithmic process to speed up the detectionspeed, and finally conducts practical road experiments.

The algorithm of this paper can improve the detection speed of the algorithm without losing accuracy.

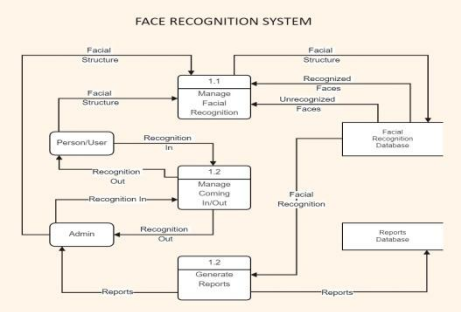
Algorithm: YOLOv4 algorithm.

III. SYSTEM ARCHITECTURE

Information flow and the transformations that are applied as data moves from input to output.
DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction.DFD may be partitioned into levels that represent increasing information flow and functional detail.

IV. DATA BASE

Software design sits at the technical kernel of the software engineering process and is applied regardless of the development paradigm and area of application. Design is the first step in the development phase for any engineered product or system. The designer's goal is to produce a model or representation of an entity that will later be built. Beginning, once system requirement have been specified and analyzed, system design is the first of the three technical activities -design, code and test that is required to build and verify software.



V. SYSTEM TEST

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement.

VI. CONCLUSION

From the results of the real-world road experiments, it can be seen that the improved YOLOv4 detection algorithm can effectively detect vehicles and pedestrians in front. The fused vehicle detection algorithm improves the overall detection speed from about 10 FPS to about 16 FPS, which can effectively improve the overall detection speed, and basically does not degrade the detection effectof the algorithm when tracking with the Camshift algorithm. Therefore, the algorithm designed in this paper has improved the detection speed of video streams.

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