A WHEEL-BASED SIDE-VIEW CAR DETECTION USING SNAKE ALGORITHM

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Object detection is one of the major tasks in computer vision. The main areas in computer vision are image retrieval, video surveillance and many applications which are related to object detection. Car detection is one of the challenging research areas in object detection where the appearance has various changes due to different models, poses, scales, lighting conditions, background, occlusion and various image sizes. Amidst these external challenging factors, side-view cars have obvious and consistent characteristics in their structure such as wheels, oblique windows and bumpers, which provide crucial cues for detection.

In this work, we describe a novel side-view car detection technique which not only detects the car but also segments it from the background using an initial contour refined by the Snake algorithm. The initial contours are constructed using the detection of wheels and some side-view car statistics. Our approach is subdivided into three stages: wheel detection, bounding box detection, and segmenting the car from its background. In the first step, we use the Circle Hough Transform to detect circles in a given image and validate the wheels with a learnt visual vocabulary. The Circle Hough Transform is one of the best circular detection algorithms in the literature. The visual vocabulary is constructed by clustering SURF descriptors using the traditional K-means algorithm. In the second step, we construct an initial contour with the aid of the wheel-based distance which is calculated from the detected wheels centre coordinates and the width-to-height statistics of different types of cars which include the statistics of some different body style such as sedan, hatchback, coupe, and wagon. Furthermore, we improve the initial contour by considering the oblique lines to identify the front and rear glasses of the car.

This initial contour forms the bounding box of the given car. In the third step, the Snake algorithm proceeds with the initial contour to fit the boundary closer to the car. Hence, the foreground, car, is separated from the background. We empirically evaluated our method on 100 side-view cars which include the four different body style of car and testing results show that this approach has good performance. We obtained a detection and segmentation system that achieves our goals of high accuracy of 95%.