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# Vehicle Detection in Intelligent Transportation Systems and its Applications under Varying Environments: A Review

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## ABSTRACT

Robust and efficient vehicle detection in monocular vision is an important task in Intelligent Transportation Systems. With the development of computer vision techniques and consequent accessibility of video image data, new applications have been enabled to on-road vehicle detection algorithms. This paper provides a review of the literature in vehicle detection under varying environments. Due to the variability of on-road driving environments, vehicle detection may face different problems and challenges. Therefore, many approaches have been proposed, and can be categorized as appearance-based methods and motion-based methods. In addition, special illumination, weather and driving scenarios are discussed in terms of methodology and quantitative evaluation. In the future, efforts should be focused on robust vehicle detection approaches for various on-road conditions.

Keywords: Vehicle Detection, Computer Vision, Intelligent Transportation Systems, Varying Environments, Traffic Surveillance

## 1 Introduction

Intelligent Transport Systems (ITS) is a popular field of research in recent years. By providing innovative services relating to different modes of transport and traffic management and enabling various users to be better informed and make safer, more coordinated and ‘smarter’ use of transport networks<sup>[110]</sup>, ITS aims to improve transportation safety, mobility, productivity and environmental performance for traffic planners and road users. With continuous urban road development and extensive construction of expressways, increasing interest is devoted to vehicle detection. As an essential task in ITS, vehicle detection aims to provide information assisting vehicle counting, vehicle speed measurement, identification of traffic accidents, traffic flow prediction, etc.

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