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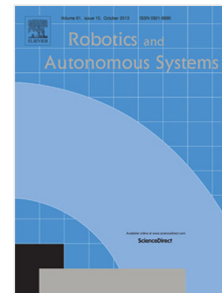
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Road Detection Algorithm for Autonomous Navigation Systems based on Dark Channel Prior and Vanishing Point in Complex Road Scenes

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Highlights:

- A novel road detection method for Autonomous Navigation Systems (AVNS) is proposed.
- A rough road region segmentation method in complex background based on dark channel is proposed.
- Three effective soft voting rules are proposed to distinguish the road from segmented regions.
- Lots of images experiments, statistics and comparisons verify the performance of proposed method.

Abstract. Vision-based road extraction is essentially important in many fields, such as for intelligent traffic, robot navigation and so on. However, the road detection in urban or ill-structured roads is still very challenging at current stage, and the existing methods often suffer from high computational complexity. This paper reports a novel and efficient method for road detection in challenging scenes. First, the dark channel based image segmentation is proposed to distinguish a rough road region from complex background noise, which is envisioned to reduce the workload of road detection. Furthermore, instead of using the conventional pixel-wise soft voting, a new voting strategies based on the vanishing point and the properties of the segmented regions is proposed to further reduce the computation time of road extraction stage. Finally, the segmented region which has the maximum voting value is chose as the road region. Experimental results demonstrated that the proposed algorithm shows superior performance in different kinds of road scenes. It can remove the interference from pedestrians, vehicles and other obstacles. Our method is about 40 times faster in detection speed, when compared to a recently well-known approach.

Keywords: machine vision; dark channel; image segmentation; road detection

1 Introduction

With the rapid development of Autonomous Navigation Systems (AVNS) of Unmanned Ground Vehicle (UGV), Robotics and Intelligent Transportation Systems (ITS) [1], road scene understanding has become one of the popular topics in computer vision. However, road detection is still a challenging problem due to different road types and variations in background, weather

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