A 3-D detection method of moving traffic loads based on the stereo vision

Xinhong Liu

Department of Bridge Engineering, Tongji University, Shanghai 200092, China

Xiaoliang Li

Shanghai Tongji Testing Technology Co.,Ltd , Shanghai 200092, China

Ye Xia, Limin Sun

State Key Laboratory for Disaster Reduction in Civil Engineering, Tongji University, Shanghai, 200092, China

Contact: yxia@tongji.edu.cn

Abstract

Vehicle tracking based on computer vision is an important part of traffic load monitoring. The stable and reliable vehicle detection is the primary task of vehicle tracking. The widely used 2-D detection works accurately in simple situation but faces obstacles in dealing with multi-vehicle overlap. Therefore, this paper proposes a 3-D detection method of vehicles based on the stereo vision, which can position accurately the vehicles partly covered in the image to keep a continuous vehicle tracking. This method builds spatial relations between observed objects such as wheels and the feature points on the vehicle. With spatial relations determined, when the observed objects of the vehicle are partly covered by other objects, their positions can be inferred accurately from the visible feature points of the vehicle. Experiments were taken to verify the effectiveness of the proposed method.

Keywords: stereo vision; 3-D detection; vehicle tracking; traffic load monitoring; multi-vehicle overlap; feature points

1 Introduction

Effects of a bridge in the service stage include the effects of live loads and dead loads[1]. As one of live loads, traffic load is an important factor that influences the safety of bridge structure[2]. In addition, the use of concrete and steel composite beam structural systems has received significant attention due to their construction speed together with structural and cost advantages[3]. For such structures, the fatigue life prediction is necessary and it requires traffic load monitoring data.

In the traffic detection process, the traffic information obtained by the single traditional detector is not sufficient. Various sensors are usually needed to assist to complete a test task. In addition, due to the characteristics of multi-sources and different natures of test data, the integration and fusion of multiple traffic detection data have become the bottleneck. So, the visual traffic detection method becomes popular for its capability in obtaining multiple traffic parameters.[4]

Monocular vision is widely used because of its low cost. It is a 2-D detection method and require some

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