A computer vision system for traffic accident risk measurement
A case study

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Abstract

A reliable estimation of the safety level of the roads is a valuable tool for detecting critical points in the road infrastructure, planning and implement countermeasures, and evaluating their impact on the traffic. A method for the computation of the accident risk is proposed, which is based on microscopic traffic data collected automatically by a video-based monitoring system, i.e. class, speed, and trajectory of each single road-user. The benefit of the proposed method is twofold: the risk level is computed without statistics on past accidents, and its computation is fully automated, therefore it does not require a manual collection of traffic data. The paper presents the definition of the proposed risk index and describes its application to a real case: the evaluation of the accident risk at an urban intersection, before and after the reorganization of its geometry. The proposed risk index, although based only on some parameters that are automatically measurable, seems to reflect the expectation of traffic experts in evaluating the impact of intervention to improve the safety of the intersection.

Keywords - Road safety measurement, accident risk, traffic scene analysis, video analysis, traffic conflicts

1. Introduction

The ever-increasing number of injuries and deaths caused by road traffic accidents motivates a wide range of studies that have been conducted with the general goal of improving the safety of road users. A commonly accepted classification of the causes of accidents divides them into three categories: human behaviours; vehicle characteristics; external conditions (road, traffic, weather). Fig. 1 and Fig. 2 show two examples of dangerous behaviour. In order to mitigate the causes of accidents and to achieve a general reduction in their number and gravity, actions should be taken in all three categories. A crucial aspect in the definition of a plan of intervention is related to the selection of the sites where the danger is high.

The measure of the risk level, which describes the dangerousness of a road, is often based on the number and gravity of past accidents occurred in the area. Such a measurement has many drawbacks, the main of which is that a reliable estimate requires a large number of events. Secondly, it is a common feeling that it provides a risk underestimation because, for various reasons, minor accidents are often not reported. These drawbacks led groups of road safety experts to devise new techniques for the identification of dangerous road sections and the evaluation of the effects of the implemented risk-reducing actions.