A Vision-Based Traffic Light Detection System at Intersections

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Abstract

The traffic light detection system is one of the key components of the vision traffic law enforcement system, such as red light runner detecting, turning against traffic light, and stopping at the non-stopping zone. With various conditions of both open outdoor environments and device setups, the traffic light detection must be robust to weather and illumination conditions, and also tolerant to various perspective angles.

An automatic traffic light detection system at intersections is presented in this paper. It performs traffic light detection on traffic videos without any signals from the traffic light controllers. This system is useful to be integrated with another ITS (Intelligent Transportation System) components. Background images are first generated by the system and in the mean time illumination parameters are estimated. The HSI color model is employed, and fuzzy methods together with morphological technique are utilized to acquire the candidate traffic light areas. With the relative spatial and temporal information, the scales, positions, and timing sequences of traffic lights are obtained. Some results from a preliminary trial are reported, and the associated researches are in progress.

Keywords: Traffic Light Detection   Traffic Law Enforcement   ITS Subsystem
          HSI Color Image Processing

1. Introduction

A red-light runner, who violates either purposively or non-intentionally the red light signals at an intersection, will easily cause a fatal accident. It is common that in order to pass an intersection as fast as possible, the red-light runner has to accelerate his/her vehicle. Therefore, once a collision occurs it must be a disaster. Traffic accidents do cost a lot almost everywhere. For example, the statistical data reported by The department of statistics of Ministry of Transportation and Communication (MOTC) of Taiwan Government manifested that approximately 3,388 people were killed and more than 1,541 people were critically injured in 2000 due to traffic accidents in Taiwan area. Moreover, in United States, a great loss of 41,800 people’s lives, and 3,219,000 people injured are reported in 2000 by official statistics (U.S. Department of Transportation, U. S. A. Government, 2002).