

Vision-based Monitoring System for Detecting Red signal crossing

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Abstract

Red light running is a leading cause of urban crashes that often results in injury and death. The main reason for this is when the automobile driver fails to stop at the intersections when the signal light is red, and runs over other road users. In this research a computer vision-based low cost system is proposed for continuously monitoring the vehicles crossing the intersections when the signal light is “red” with the help of video cameras placed at the intersections, and penalizing careless drivers accordingly. This monitoring system finds application at all busy intersections. By using this setup people would be more conscious of getting penalty tickets which in turn will discourage them from running red lights. This research is intended to provide a support tool for the law enforcement agencies to proactively ensure that intersections are engineered to discourage red light running.

Keywords: Vision-based Monitoring System, red signal light crossing, vehicle identification number.

1. Introduction

Red light running is a leading cause of urban crashes that often results in injury and death. Total road deaths in USA in year 2004 were 42,636. A survey conducted during 1999-2000 revealed that 20% of vehicles involved in road accidents did not obey the signal. Each year “red” light running causes nearly 200,000 accidents resulting in above 800 deaths and 180,000 injuries [1], [2]. Signal lights on the road intersection are for controlling traffic. Some people do not abide by the traffic rules and cross the intersection when the signal light is ‘red’. Figure 1 shows a negligent driver, who does not

stop at the red signal and risks the lives of other drivers.



Figure 1: An accident scene on the red light signal intersection

To reduce the accident rate at the intersections, busy and accident prone intersections should be monitored. Not all of the intersections can be monitored 24x7 by the authorities. This demands a cost effective and automated system for continuously monitoring intersections and penalizing the people who violate the traffic rules.

Automatic License Plate Recognition (ALPR) systems have been developed and discussed in [3], [4], [5], [6]. In ALPR systems for monitoring intersections, there is a still camera for capturing the license plate of the car on the intersection. Sensors are located on the road to detect the presence of a vehicle at the intersection. When the signal light is ‘red’ and the sensors are active then a still photograph is taken which is used for issuing penalty ticket by the law enforcement authorities. The camera is accompanied with a bright flash which helps in image quality and cautions the driver for his/her

violation [7]. The ALPR system is not a foolproof system because the license plate can be tampered or the plate might be stolen from another car or due to bad weather conditions the license plate could not be visible, or the sensors on the road might be tampered.

In this research an expert system that would capture the Vehicle Identification Number (VIN) and the License plate of the vehicle crossing the intersection on 'red' signal using two video cameras placed intersection and will send it to the authorities for action, is proposed. Using the vehicle identification number (VIN), it is possible to find the owner of the car, insurance details and the car facts report. The Vehicle Identification Number (VIN) is usually found on the left side of the dashboard under the windscreen, and is shown in Figure 2, enclosed in the red ellipse.



Figure 2: The vehicle identification number on the dash board below the front windscreen

No sensors are needed for the novel Vision-based Monitoring System for Detecting Red signal crossing (VMSDR) that captures and recognizes both Vehicle Identification Number (VIN) and License plate of the vehicle running 'red' signal light at the intersections. VMSDR system needs two video cameras out of which one is placed on the sidewalk and the other is placed on the pole above the intersection adjacent to the signal lights. The video camera placed on the side walk captures the license plate and the video camera placed on the pole along

with the 'signal light' captures the VIN. The positions of the cameras at the intersection are demonstrated in Figure 3.



Figure 3: Position of the video cameras on the intersection

The video cameras will record only during the period when the signal light is 'red' using the timer information. These frames are continuously processed using a processing unit attached to the camera. The processing unit detects the Vehicle Identification Number (VIN) and the corresponding license plate number from the video frames obtained from both video cameras. This information is sent to the base station at the municipal corporation where using this information the owner of the vehicle, address, recent penalty tickets and insurance details are identified and penalty tickets can be issued. The owner will be given a period of time for informing the authority in case someone else is driving his car, during the time and date mentioned in the ticket.