REAL-TIME ADAPTIVE GRAY THRESHOLD MEASUREMENT IN EXTRACTING TRAFFIC PARAMETERS

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ABSTRACT. *In order to extract traffic parameters effectively in all day time, an adaptive gray threshold traffic parameters measurement (AGTTPM) system is built in this paper. In AGTTPM, a novel real-time adaptive gray threshold (RAGT) measurement method is presented to overcome the over sensitivity of vision based system to illumination changing. RAGT is a method which could highly enhance the detection accuracy by means of adjusting the gray threshold according to the surrounding brightness automatically. A restricted Laplacian sharpening algorithm is used in image preprocessing for image enhancement. Then relying on the RAGT measurement, the traffic parameters can be obtained in real time and the corresponding errors can also be inhibited obviously. The implementation of system hardware and software is introduced by steps and RAGT is introduced in the part of software design. Experimental results show the improvements in detection precision and real-time performance.*
Keywords: Digital signal processing, Threshold, Traffic parameters, RAGT, AGTTPM

1. **Introduction.** In recent years, laying new pavement or adding more lanes is becoming less and less feasible in cities, thus that is no longer an efficient solution for serious traffic congestion problem due to consistent increment of vehicles. Traffic signal lights control strategies as useful traffic release methods are being in hot research. Meanwhile extracted traffic parameters that describe the vehicles' characteristics and road congestion extent are necessary to direct the determination of traffic control strategies [1]. Traffic flow, which means vehicle velocity and traffic queue, etc. are all useful traffic parameters, which can not be used only in traffic signal control systems but also vehicle violation detection systems and so on. Generally, traffic parameters are detected by geomagnetic loop, microwave, ultrasonic detector or infrared detector, but all of these methods lack of reliable visual scene information and can not be used in lots of sophisticated detection such as queue length measurement, tracking and vehicle class [2-5]. In addition, most of the detection methods' installment will produce traffic disturbance and their maintenance is expensive. But a video-based traffic parameters extraction method can overcome the faults above and become a remarkable alternative.

More and more researchers are investigating video-based image processing algorithms for sophisticated traffic parameters extraction purpose. Siyal and Ahmed [5] described morphological edge detection and window based image processing technique. By the method of [5], vehicles can be detected without considering gray threshold's choice and has a good detection precision in day but not very well at night. Li and Pan, etc. gave a inter-frame difference of gray value method in certain part of the image [6], which has a good effect to active vehicle but inefficient to static one. Hsu and Mark, etc. developed one entropy measurement [7,8] which is sensitive to large vehicle's shadow and