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## **Real-time Traffic Light Recognition Based on Smart Phone Platforms**

Traffic light recognition is of great significance for driver assistance or autonomous driving. In this paper, a traffic light recognition system based on smart phone platforms is proposed. First, an ellipsoid geometry threshold model in HSL color space is built to extract interesting color regions. These regions are further screened with a post-processing step to obtain candidate regions which satisfy both color and brightness conditions. Second, a new kernel function is proposed to effectively combine two heterogeneous features, HOG and LBP, which is used to describe the candidate regions of traffic light. A Kernel extreme Learning Machine (K-ELM) is designed to validate these candidate regions and simultaneously recognize the phase and type of traffic lights. Furthermore, a spatial-temporal analysis framework based on a finite state machine is introduced to enhance the reliability of the recognition of the phase and type of traffic light. Finally, a prototype of the proposed system is implemented on a Samsung Note3 smart phone. To achieve a real-time computational performance of the proposed K-ELM, a CPU-GPU fusion based approach is adopted to accelerate the execution. Experimental results on different road environments show that the proposed system can recognize traffic lights accurately and rapidly.