

Image-processing algorithms for detecting and counting vehicles waiting at a traffic light

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Abstract-

Traffic lights at most road intersections operate on a fixed timing schedule that leads to suboptimal traffic management, with unnecessary delays, higher fuel consumption and higher emissions. Traffic management can be improved by installing inductive loops; however, installation involves temporary road closures, and high maintenance costs, especially if there is normally a lot of heavy traffic on the road. This paper presents a vehicle detection and counting system based on digital image processing techniques. These images can be taken by IP cameras installed at the top of existing traffic lights. By using the proposed approach it is possible to detect the number of vehicles waiting on each side of the intersection, hence providing the necessary information for optimal traffic management. Results achieved after testing this methodology on three real intersections are promising, attaining high accuracy during the day (98.8%) and the night (91.3%) while counting several vehicles at the same time. Hence, the system is equivalent to installing multiple inductive loops in all the streets of the intersection, but with lower installation and maintenance costs. After integrating the proposed algorithms into a traffic management system, it was possible to reduce fuel and CO₂ emissions by half compared with the standard fixed-time scheduler.

Index Terms- vehicle detection; vehicle counting; digital image processing; Intelligent Transportation Systems, road intersection optimization.

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Citation:

de-la-Rocha, E.; Palacios, R. "Image-processing algorithms for detecting and counting vehicles waiting at a traffic light", Journal of Electronic Imaging, vol.19, no.4, pp.043025-1-043025-8, November, 2010.