AUTOMATION OF TRAFFIC FLOW MEASUREMENT USING VIDEO IMAGES

This thesis was submitted to the
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Abstract

This research focuses on the design and implementation of a system for automating the task of measuring vehicular traffic flow on a motorway, using video image sequences. Such a system is useful when designing traffic management systems such as signal lights at road junctions. It can also function as part of an intelligent transportation system, providing useful quantitative information, such as number and size of vehicles, speed and direction of movement etc, for managing vehicular traffic effectively.

The system processes a sequence of images captured by a video camera mounted above a motorway. It performs motion segmentation on the images using background subtraction, and derives traffic parameters using a combination of image processing techniques such as statistical methods and solving systems of equations. While making use of existing algorithms for image processing and image sequence analysis, new algorithms have been developed and employed for background extraction and occlusion modeling. The system has been designed to handle inconsistencies caused by occlusion of vehicles, by predicting the motion of vehicles using the derived parameters of motion.

Knowledge about the traffic scene has been used by the system to improve the accuracy of results. The system relies on a centralized 'knowledge base', a source of information related to the traffic scene. This knowledge base is loosely coupled to the system in such a way that the system can be customized to perform well in different traffic scenes by changing only the content of the knowledge base.

The system has been implemented to work on an IBM PC based system with an Intel Celeron 450 MHz processor and 64MB Memory. The tools for implementation have been selected after a study of their performance.

This automated traffic flow measurement system has been tested using three image sequences from different traffic scenes. A number of tests have been conducted by

varying the frame rate, image resolution and the method used to create the background image. The results have been compared with each other, as well as the ground truth, while recording the processing time involved with each test case.

The automated system measures traffic parameters with an average accuracy of 90%. The new technique that has been proposed in this work for background construction produces the most accurate result. Processing speed can be improved by reducing the frame rate and the resolution of images, with a slight reduction in accuracy of the results.

Declaration

I, G. C. de Silva, hereby certify that the work included in this thesis has not been submitted in part or whole for any other academic qualification at any institution.

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