

REAL-TIME IMAGE PROCESSING FOR ROAD TRAFFIC DATA EXTRACTION FROM AERIAL IMAGES

D. Rosenbaum^{*a} J. Leitloff^a F. Kurz^a O. Meynberg^a T. Reize^a

^a DLR - German Aerospace Center, Remote Sensing Technology
Institute, Münchner Str. 20, 82234, Weßling, Germany

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ABSTRACT:

A world with growing individual traffic requires sufficient solutions for traffic monitoring and guidance. The actual ground based approaches for traffic data collection may be barely sufficient for everyday life, but they will fail in case of disasters and mass events. Therefore, a road traffic monitoring solution based on an airborne wide area camera system has been currently developed by DLR. Here, we present a new image processing chain for real-time traffic data extraction from high resolution aerial image sequences with automatic methods. This processing chain is used in a computer network as part of an operational sensor system for traffic monitoring onboard a DLR aircraft. It is capable of processing aerial images obtained with a frame rate of up to 3 Hz in burst mode. The footprint area of the three viewing directions of an image exposure with three cameras is 4 x 1 km² at a resolution of 20 cm (recorded at a flight height of 1500 m). The processing chain consists of a module for data readout from the cameras and for the synchronization of the images with the GPS/IMU navigation data (used for direct georeferencing) and a module for orthorectification of the images. Traffic data is extracted by a further module based on a priori knowledge from a road database of the approximate location of road axes in the georeferenced and orthorectified images. Vehicle detection is performed by a combination of Adaboost using Haar-like features for pixel wise classification and subsequent clustering by Support Vector Machine based on a set of statistical features of the classified pixel. In order to obtain velocities, vehicle tracking is applied to consecutive images after performing vehicle detection on the first image of the burst. This is done by template matching along a search space aligned to road axes based on normalized cross correlation in RGB color space. With this processing chain we are able to obtain accurate traffic data with completeness and correctness both higher than 80 % at high actuality for varying and complex image scenes. The proposed processing chain is evaluated on a huge number of images from inner city scenes of Cologne and Munich, demonstrating the robustness of our work in operational use.

TOPIC: Image processing and pattern recognition

ALTERNATIVE TOPIC: Remote sensing applications