Tracking Vehicles in Traffic Surveillance Video

Michael Maire, UC Berkeley

Chandrika Kamath, CASC, Lawrence Livermore National Laboratory

www.llnl.gov/casc/sapphire/

We present a system for detecting and tracking vehicles in surveillance video. Our algorithm uses a simple motion model to determine salient regions in a sequence of video frames. Similar regions are associated between frames and clustered to yield coherent final tracks. The entire process is automatic and uses computation time that scales according to the size of the input video sequence.

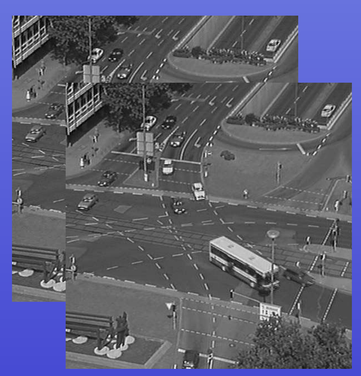
Introduction

Automatically detecting and tracking vehicles in video surveillance data is a challenging problem in computer vision with important practical applications, such as traffic analysis and security.

Our approach differs from some of the previous vehicle tracking work in that we do not require any user calibration of road or camera location. Instead, we use low-level cues to pick out moving regions, which are subsequently tracked.

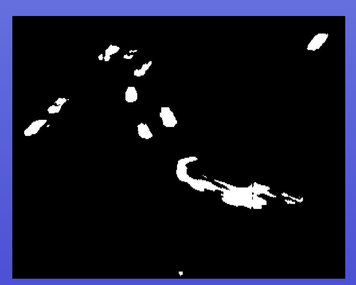
Methods

We first apply a local motion model to the difference between consecutive frames to produce a map of salient foreground pixels. The foreground is segmented into regions which are used as templates for a normalized correlation based tracker.

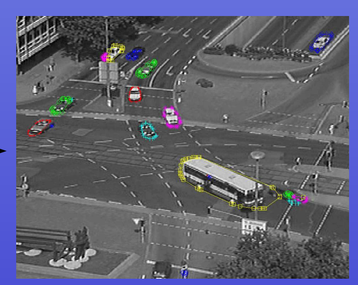


Input Frames

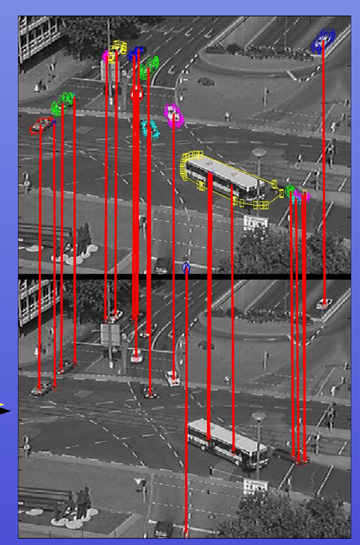
Motion Model



Background Map

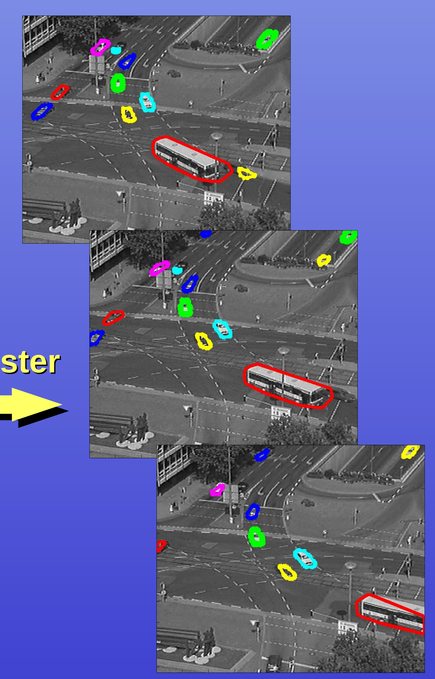


Region Templates



Normalized Correlation between Frames

Cluster



Final Track

Computing the similarity between each template and its nearby possible matches in the next frame, we have a criterion by which to group regions into coherent objects. Extraneous tracks that violate the appearance or motion characteristics of a vehicle are then dropped from the final output.

Results

We tested our algorithm on publicly available surveillance video of traffic intersections[†]. Typical results are shown below.

[†]Traffic video obtained from KOGS/IAKS Universitaet Karlsruhe. http://i21www.ira.uka.de/image_sequences/

This work was performed under the auspices of the U.S. Department of Energy by University of California Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

This research was performed while Michael Maire was on appointment as a U.S. Department of Homeland Security (DHS) Fellow under the DHS Scholarship and Fellowship Program, a program administered by the Oak Ridge Institute for Science and Education (ORISE) for DHS through an interagency agreement with the U.S Department of Energy (DOE). ORISE is managed by Oak Ridge Associated Universities under DOE contract number DE-AC05-00OR22750. All opinions expressed are the author's and do not necessarily reflect the policies and views of DHS, DOE, or ORISE.

UCRL-POST-214191