



Project Number

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Truck Taxonomy and Classification Using Video and Weigh-In-Motion (WIM) Technology

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Current Situation

Millions of tons of goods are in motion on Florida's highways all day, every day, in transit on multilane highways or making deliveries on local roads. Trucks are how most goods in the U.S. are transported – trucking is critical to the economy. Freight analysis – the nature of the goods that are being moved and where they are moving from and to, as well as how much is being moved – is vital for planners and has implications for many aspects of design, including roadway designs, amenities for truckers, trucking fees, and others. Determining how many trucks are on the road, what types of trucks are on the road, and what commodities they are carrying is at the heart of freight analysis.

Research Objectives

University of Florida researchers developed an automated system for detection and classification of trucks from high resolution video.

Project Activities

This project falls in the general area of machine learning, in which computers perform complex tasks, learn from the task, and improve their performance the next time they undertake the task. Object detection and recognition are very active areas of research in the field of machine learning.

The researchers began with high resolution video of traffic taken from roadside cameras, made available by the Florida Department of Transportation (FDOT). The first task required the system to determine if a truck was present in a frame of video. Challenges of this task included successful recognition under various lighting and weather conditions, at different observational angles, with partial visibility due to surrounding traffic and complex backgrounds. The researchers adopted state-of-the-art detection software called YOLO, achieving a high degree of correct detection in general traffic scenes.

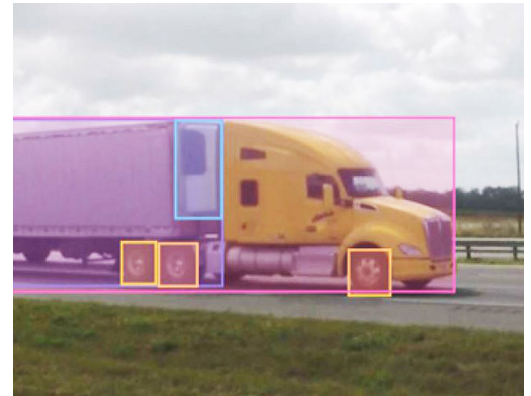
Once a truck was successfully detected, the next step was to classify the truck according to the Federal Highway Administration's Vehicle Category Classification, which distinguishes vehicles based on the number of axles and body configuration. For example, the commonly seen five-axle semi is Class 9 in this scheme. The researchers experimented with various methods of classification and several computer programs. Challenges such as vehicle size and number of trailers were overcome by using trainable machine learning programs.

Finally, the researchers used detection and recognition methods to determine the commodity being carried by detected trucks. They used two strategies: (1) whether the truck has a refrigeration unit and (2) whether the truck has an identifiable name or logo. Information derived from these tasks was used in conjunction with standard databases to identify the commodity in the truck.

Project Benefits

This project developed a powerful and useful tool for freight analysis, which can assist planners in understanding freight flows in Florida and how best to plan for them.

For more information, please see www.fdot.gov/research/.



This partial video image shows automatic detection of this truck's number of axles and refrigeration unit.