Research Recap

Mobility21
A USDOT NATIONAL UNIVERSITY TRANSPORTATION CENTER

Improving Rush Hour Traffic Flow by Computer-Vision-Based Parking Detection and Regulations

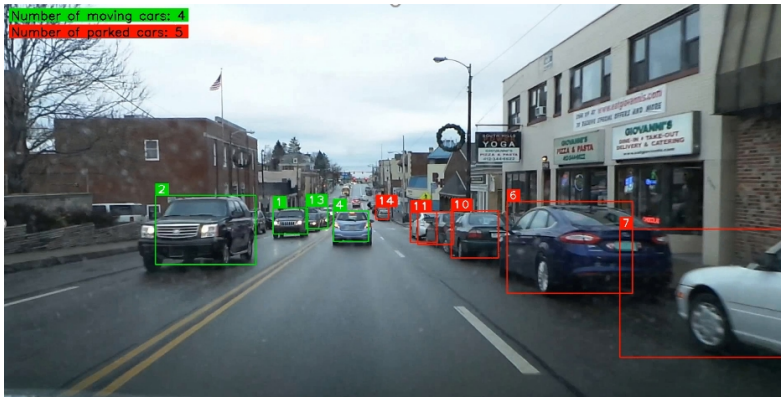
Purpose: To provide accurate and real-time data to efficiently monitor parking in high-traffic areas. By monitoring the travel behaviors of all travelers in a network, a determination will be able to be made to figure out the optimal trade-off between parking availability and traffic flow.

Approach: To be able to monitor all road vehicles the team developed a computer vision tool to accurately count moving and parked cars from videos taken from inside another moving vehicle. The complexity of the multi-modal system was analyzed with a multi-modal dynamic user equilibrium (MMDUE) model. The multi-modal network for downtown and the southern Pittsburgh region was used as the experimental area.

Key Findings:

Network Flow & Mode Choices: The team found that there were few solo travelers that made the commute to downtown, most likely due to the fact that the parking fee in downtown Pittsburgh is high, there is a low inconvenience cost for carpooling, and there are many public transit park-and-rides along this route.

Costs: By evaluating the options provided to routine commuters, the team deduced that the data showed passenger cost increases with respect to the demand level, and the influence of demand level to the average cost is linear.



Parked Car Detection: To robustly distinguish parked from moving cars visual cues like proximity to the curb are not enough, one also needs temporal cues and one needs to track the detections over many video frames. The temporal cues were provided by optical flow images. Tracking was done by DeepSort that incorporates a motion model along with an appearance model, it is able to track an object even if it is occluded for an extended time.

Conclusion: By collecting this data on parking at various times, along with traffic flow information, travel behavior could become easier to understand over time by also taking into consideration the mode of transportation. With further collection and analysis of this data, the team deduced that in the future the data could be useful to determine how to avoid congestion on roads that are heavily traveled during peak times.

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Project Record:

- https://ppms.cit.cmu.edu/projects/detail/172

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