

Project Title: Monitoring of Urban Roadway Safety Hazards from Existing Bus-based Video Imagery

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Center Name: Safety21 National University Transportation Center for Promoting Safety

Research Priority: Promoting Safety

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Project Partners:

- OSU Transportation and Traffic Management

Research Project Funding: \$190,782.00

Project Start and End Date: 07-01-2023 to 06-30-2024

Project Description:

Contributors to traffic safety hazards include lane changes in the presence of queues at signalized intersections and bus stops, mixes of vehicle classes, speed variability, and vehicle overtaking. Assessing locations with increased recurring traffic safety hazards requires extensive and ongoing collection of data on these contributors. Traditional methods entail using sensors at permanent or temporary fixed locations, which are costly, labor intensive, provide limited coverage over time and space, and only provide information on some contributors. Moreover, the location of these sensors may be influenced by factors other than optimal sampling, such as requests from well-organized constituencies. Therefore, relying on such data to assess traffic safety hazards to support improved policies and designs could lead to missing high-risk conditions resulting in inequitable outcomes. Clearly, low cost and extensive, equitable data collection is desirable. Transit buses operate regularly over wide networks. Most agencies have equipped their bus fleet with cameras that record the environment inside and outside buses for liability, security, and safety purposes. Consequently, the imagery is available for other uses at near-zero marginal cost and the coverage provides comprehensive views that could potentially be used to determine times and locations of regularly occurring safety hazards. Moreover, this imagery has been shown by the principal investigators (PIs) to be effective in monitoring traffic volumes across time and space, information that provides exposure-based context for identifying safety hazards. In this project the PIs would investigate if the available, repeated, and extensive imagery recorded by cameras mounted on transit buses in regular operation could be used to identify “hazardous hotspots”. The PIs have been obtaining transit bus-based video imagery to estimate traffic flows across the OSU campus and provide summary results to campus planners and operators on a regular basis. The OSU campus will again be used as a living lab testbed. The size and diversity of land uses make the campus representative of urban areas. Moreover, the campus is undergoing major construction activities, which would allow investigation of different infrastructure conditions that could influence traffic safety. The use of the campus as an experimental testbed would also allow for in-situ ground-truth observations to assess the accuracy of the video-based results. The hazards to be considered in the proposed one-year project (phase 1) include lane specific queue lengths at intersections and bus stops, frequency of lane-changing in the presence of queues, and vehicle type mix with an emphasis on vulnerable vehicles (e.g., bicycles, scooters, and motorcycles). Speeds and their variation where autos conflict with vulnerable vehicles are also important safety factors. In phase 1, exploring the ability to measure speeds from the imagery will begin. In addition, imagery of traffic conditions at construction zones will be collected for future investigations of speed changes and other safety related hazards. The identification of hazards will be demonstrated using semi-automatic techniques based on an extension of a Graphical User Interface used in a previous project focused on traffic volumes. Moreover, steps toward automation for large scale analysis will be taken during phase 1.

Outputs:

General research: New methods, techniques, and technologies to identify safety hazards along urban

roadways. Demonstration of quantifying the queuing, lane-changing, and vehicle type mix safety factors from video imagery. Research based outreach: Discussion of identified safety vulnerabilities and “hotspots” on the OSU campus during regular meetings with OSU’s Transportation and Traffic Management (who will provide bus imagery) to increase the practical impact of the project’s results and allow user grounded investigations.

Outcomes/Impacts:

The ultimate impact of this project will be the ability to determine the location and times of recurring roadway traffic conditions that could compromise safety across urban roadways using an existing and widespread source of available data, namely, video imagery obtained from cameras mounted on buses in regular transit service. The ability to systematically determine and monitor hazardous roadway conditions would provide input to policymakers and designers developing measures aimed at reducing the likelihood and severity of traffic and traffic-related accidents.