Research Problem Statement

ODOT Research Section
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I. TITLE

17-033 SCALING UP ODOT'S BOTTLENECK IDENTIFICATION AND TRAFFIC PERFORMANCE DATA ALONG ARTERIALS AND COLLECTORS STREETS

II. PROBLEM

Oregon does a good job monitoring freeways, as does the nation where performance measure and data collection efforts and research developments have largely focused on freeway operations. However is clear that arterial and collector streets performance measures are relatively underdeveloped and have not achieved the same level of sophistication and accuracy. It is worth noting that U.S. freeways account for 1.5% of the mileage and 32% of the vehicle miles traveled (VMT), while arterials account for 10% of the mileage and 40% of the VMT. Collector streets account for an even larger percentage of the mileage and a substantial percentage of VMT.

Thus, it appears that the development of robust data collection and performance measurement capabilities for arterials and collector streets is a neglected but important task. Arterials and collectors, by nature, are difficult to monitor since by definition vehicles are frequently stopped at traffic signals. Arterials also differ from freeways in their multimodal character, they include a mix of cars, trucks, buses, bicycles and pedestrians.

ODOT has been successfully utilizing Digital Wave Radar (DWR) sensors, aka Wavetronix units, to measure arterial traffic volumes, speed, length and classification of individual vehicles at a given *point*. In addition at the *segment* level, ODOT has also utilized media access control (MAC) readers through bluetooth protocols as well as private vendor data (INRIX, TomTom, etc) to measure arterial travel data (travel time distributions). ODOT also have access to loop detector data which is alas mostly available for freeways in some parts of the state.

Unfortunately, data coverage of the state's arterial and collector streets is severely limited. DWR or MAC sensors only collect data on a relatively small subset of arterial segments. Hence, current data sources cannot be utilized to identify bottlenecks or small opportunities for improvement projects along arterials without appropriate data coverage. In addition, there is no real-time data in large portions of the transportation network.

III. PROPOSED RESEARCH, DEVELOPMENT, OR TECHNICAL TRANSFER ACTIVITY

The proposed research will utilize public transportation probe vehicle data to significantly extend ODOT's bottleneck identification and traffic performance data along arterial and collector streets. A recent research effort has demonstrated that 5-second GPS data collected from public transportation buses can be effectively used to detect congestion hot-spots and analyze traffic trends (1).

Bus probe datasets have several advantages: (a) buses travel across congested urban areas and cover all major arterials and collector streets (even some freeways for express routes); (b) bus data is linked to a physical sensor in the vehicle (measuring wheels motion), hence, it is possible to detect congestion with more accuracy than with GPS data alone; (c) the detection of queuing or congestion is not limited to intersections but also ramps and commercial access/egress points; (d) buses travel at regular times and routes, hence, it is possible to obtain a large number of observations for any segment and/or time of day and it is possible to remove the bus stop delay; (e) unlike other data sources, bus trajectories can be plotted and mapped which allows finer mapping granularity that is not available for the other data sources, (f) the data is freely available and there is no risk

regarding future availability (the same cannot be said about private vendor data), and (g) it is possible to receive real-time public transit vehicle location data.

The proposed research aims to answer these questions: (i) How to effectively utilize bus probe data to extend ODOT's data coverage? (ii) How can ODOT utilize bus probe data to measure and/or rank small or medium improvement projects along arterials without data coverage? (iii) How can real-time and historical bus probe data be utilized to study the impact of bottleneck spillovers onto arterial and collector streets?; and (iv) How often and severe are arterial bottlenecks that are currently unobserved?

IV. POTENTIAL BENEFITS

The potential benefits of this research will include improved mobility via information about how the transportation system is operating for both managers and users; improved mobility via a means to automatically tune/retime traffic signals along arterials as demand patterns change; reduced fuel and energy consumption due to better arterial traffic management; and data acquisition cost savings.

V. IMPLEMENTATION

This research will be implemented by ODOR region 1 and ODOT ITS unit. Bottlenecks and traffic performance measures can be studied before/after improvements. Locations with known problems (safety and congestion) already identified in the All Roads Transportation Safety (ARTS) Hot Spot Program (2) can be utilized to maximize the benefits of this research.

VI. LIST OF REFERENCES

1. Stoll, Glick and Figliozzi, Utilizing High Resolution Bus GPS Data to Visualize and Identify Congestion Hot-spots in Urban Arterials, Paper accepted for presentation Transportation Research Board Annual Meeting, January 2016.
2. All Roads Transportation Safety (ARTS) Hot Spot Program, ODOT Region 1 Final Results Meeting, June 10, 2015

VII. CONTACT INFORMATION

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