2016 UDOT RESEARCH PROBLEM STATEMENT

****** Problem statement deadline is March 14, 2016. Submit statements to Tom Hales at tahales@utah.gov. ******

Title: Development of Methodologies and Algorithms for Adaptive Transit Signal Priority **No. (office use):** 16.06.07

Submitted By: Milan Zlatkovic **Organization:** University of Utah

Email: milan@trafficlab.utah.edu **Phone:** 801-819-5925

UDOT Champion (suggested): TBA

Select One Subject Area

- ☐ Materials/Pavements
- ☐ Maintenance
- ☐ Traffic Mgmt/Safety
- ☐ Preconstruction
- ☐ Planning
- ☒ Public Transportation

1. Describe the problem to be addressed.

The use of public transportation systems is on the rise in the Salt Lake Valley. Over the past several years, we have witnessed an expansion in the deployment of semi-rapid transit modes (LRT and BRT), as well as rapid modes (commuter rail). On the other hand, there is a constant increase in automobile use and automobile VMTs. Transit Signal Priority (TSP) has been recognized as an efficient tool for prioritizing public transit at signalized intersections, but it also has some negative impacts on automobile traffic, which can become significant at busy intersections. This research will look into the methodologies for implementing Adaptive TSP that will provide more balance between priority for transit and automobiles. It will also include and mostly rely on the UDOT's state-of-the-art Signal Performance Metrics system. This will prepare the terrain for future expansion of semi-rapid transit modes that are being planned in UT.

2. Explain why this research is important.

This research will develop algorithms for Adaptive TSP that will rely on the features of Econolite ASC/3 signal controllers and UDOT's Signal Performance Metrics system. With an expansion of semi-rapid transit modes, as well as an increase in ridership along standard bus routes, and an increase in automobile traffic demand, a clash of priorities at busy intersections is imminent. Standard TSP strategies provide benefits for transit systems, but they also tend to deteriorate LOS for automobile traffic to a certain level. Adaptive TSP looks into the overall performance of an intersection and decides on the priority levels and strategies that would balance benefits and impacts for both modes. Limited practice and research in this area show many benefits of Adaptive TSP compared to more traditional strategies. This research will add to the current state of practice, and will look into innovative ways of using signal performance metrics for different control strategies.

3. List the research objective(s):

1. Review current state of art and practice in TSP, with a focus on Adaptive TSP deployments and research
2. Collect traffic data along selected routes (such as 3500 S, 400 S, State Street…) (intersection counts, travel times, delays, transit ridership etc.)
3. Develop, calibrate and validate base microsimulation models in VISSIM
4. Develop algorithms for Adaptive TSP that will rely on the features of Econolite ASC/3 controllers and the Signal Performance Metrics system
5. Create scenarios for evaluation of Adaptive TSP algorithms vs. traditional TSP strategies
6. Evaluate the effectiveness of Adaptive TSP algorithms
7. Report findings

4. List the major tasks:

1. Literature review of traditional and Adaptive TSP and their deployments
2. Field data collection and analysis
3. Development of Adaptive TSP algorithms
4. Development of microsimulation models for different scenarios
5. Analysis of Adaptive TSP effectiveness

5. List the expected results:

1. Analysis of different TSP strategies
2. Adaptive TSP algorithms that can be implemented in the field
3. Microsimulation models of different scenarios
4. Effectiveness of Adaptive TSP on the local level

6. Describe how this research will be implemented.

This research will develop field-ready algorithms for Adaptive TSP that could be implemented in the Econolite ASC/3 controllers and will be using the features of UDOT's Signal Performance Metrics system. It could be implemented along semi-rapid transit corridors (LRT and BRT), as well as other transit corridors with high ridership, especially at the busiest intersections. It will be using the existing resources to find a better balance between the transit and automobile demands. This research will also provide ideas for future similar studies on Adaptive TSP in Utah.

The University of Utah will apply for additional funds from the Mountain Plains Consortium (MPC), a University Transportation Center, and if the funds are approved, the researchers will work with the UDOT/UTA TAC to develop an additional scope that would supplement the work presented in this proposal.

7. Requested from UDOT: $30,000 **Other/Matching Funds:** $TBA **Total Cost:** $TBA
(or UTA for Public Transportation)

8. Outline the proposed schedule, including start and major event dates.

The proposed project duration is twelve months, as follows:

Summer 2016 – Summer 2017

Project phases:
Phase 1: Literature review and data collection
Phase 2: Data analysis and model development
Phase 3: Algorithm and scenario development an implementation in microsimulation
Phase 4: Final analysis and report