2019 UDOT RESEARCH PROBLEM STATEMENT

*** **Problem statement deadline is Feb. 6, 2019. Submit statements to UTRAC@utah.gov.** ***

Title: Modeling the demand and operating characteristics for wheelchair-accessible, on-demand mobility services
No. (Office Use): 19.07.01

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Select ONE Subject Area ☐ Materials/Pavements ☐ Maintenance ☐ Traffic Mgmt/Safety ☐ Structures/Geotech ☐ Planning ☐ Perf Mgmt/Data Analytics ☒ Public Transportation ☐ Other

1. Describe the problem to be addressed:

The Utah Transit Authority (UTA) recently released a request for proposals (RFP) to offer on-demand transportation services for wheelchair-dependent passengers in Salt Lake County (1). The RFP describes a six-month pilot study potentially operating from March to August 2019, wherein wheelchair-dependent users will request on-demand transportation services from a major transport network company (TNC). The TNC would serve the requests using wheelchair-accessible vehicles (WAV) provided under agreement with UTA, and drivers who UTA will train to operate the special equipment and interface with wheelchair-dependent passengers. The pilot program will generate data which – combined with a current UTA / Utah State University survey of the mobility-limited population and the wheelchair ramp deployment data UTA already collects – present an unprecedented opportunity to understand and simulate the travel activity patterns of the wheelchair-bound population.

The purpose of this project will be to develop an initial model representation of the wheelchair-dependent population in Salt Lake City. This model will provide a framework for understanding the data collected in the survey, as well as a mechanism for UTA, UDOT, or other planning agencies to test questions related to the mobility options of wheelchair-bound individuals. The complete model consists of three principle steps:

1. Generate a synthetic representation of the wheelchair-bound population
2. Model the daily activity pattern of this population via data-driven simulation
3. Simulate the movements and mode choices of the population using the open-source microsimulation software MATSim (2).

This initial problem statement addresses steps 2 and 3 of the proposed model, with step 1 a possible follow-on project (to be funded separately or subsequently). The simulation will represent the daily patterns of observed wheelchair-dependent passengers who seek to maximize the time they spend at their programmed activities and minimize the time and money they spend travelling. The simulation will also represent WAV operators as agents who seek to respond to mobility requests. The simulation will use the open-source software MATSim, which has been used to simulate complex transportation interactions such as last-mile TNC/transit connectivity in the Bay Area and autonomous taxi scenarios in Asheville, NC.

The resulting tool will provide UTA a mechanism to understand the tradeoffs and synergies between conventional transit and on-demand mobility services, and how such services could optimize their supply and request handling algorithms. This initial simulation model will be a tool to understand the relationship between supply and demand for the WAV service. The model will estimate measures of performance such as WAV utilization, wait time, and the share of riders who opt for WAV over conventional transit operations.

Subsequent research would focus on step 1, generating a synthetic wheelchair-dependent population from aggregate socioeconomic data. This step would be necessary to transfer the model to separate contexts, including regions other than the Wasatch Front or future year scenarios. Other steps forward may expand the model to understand tradeoffs between mobility and destination choice, or simulate the general population who may ride alongside the WAV passengers.

References:

1. Utah Transit Authority (2018). *Request for Proposals for Wheelchair Accessible Vehicle On-Demand Mobility Services*. Dated December 27, 2018.
2. Horni, A., Nagel, K. and Axhausen, K.W. (eds.) 2016 *The Multi-Agent Transport Simulation MATSim*. London: Ubiquity Press. DOI: http://dx.doi.org/10.5334/baw. License: CC-BY 4.0
3. Bischoff, J., Rodier C., Pourrahmani, E., Jaller Martelo, M., Pahwa A., and Maciejewski M. (2019) Competition Among Automated Taxis, Transit, and Conventional Passenger Vehicles: Traffic Effects in the San Francisco Bay Area. In *Transportation Research Board Annual Meeting*.

4. Kressner, J. D., Macfarlane, G. S., Donnelly, R., & Huntsinger, L. F. (2016). Using passive data to build an agile tour-based model: A case study in Asheville. In *Innovations in Travel Modeling Conference*. Denver, CO.

2. Write the project objective (25 words or less):

Develop a robust simulation-based model of wheelchair-accessible travel from recent Salt Lake City data.

3. Explain why this research is important:
(In response, consider addressing specific UDOT goals, applicability in Utah or other states, etc.)

On-demand TNC services are an important tool in UTA and UDOT's efforts to provide innovative solutions to all users, including those unable or unwilling to drive vehicles or conveniently access conventional transit systems. This will be among the first partnerships between a public transit agency and a TNC; a detailed understanding of this system, including the ability to test policies before they are implemented, will benefit Utah and other states who are considering systems of this type.

4. List the major tasks:

1. Kickoff meeting to develop a project scope of work and detailed cost estimate
2. Obtain data from wheelchair ramp deployments, WAV pilot study, and UTA/Utah State survey
3. Conduct a literature review on demand modeling for special transportation markets
4. Synthesize daily travel patterns for wheelchair-dependent individuals
5. Program MATSim algorithms for WAV operators
6. Limited model calibration to match pilot study patterns and results
7. Report recommendations and results to UTA and UDOT in the form of a written report

5. List the expected deliverables (reports, manual, specification, design method, training, etc.):

1. Initial report outlining literature review and describing travel patterns in survey and TNC pilot study
2. Access to computer software and documentation in using the model to test modeled variables
3. Final report summarizing findings

6. Describe how the research results will be implemented:
(In response, consider addressing UDOT leader support, process or standard improvement, etc.)

This research will provide UTA and UDOT with a tool they can use to study policies and practices related to the WAV system.

7. Requested from UDOT: $40000 **Other/Matching Funds:** $ **Total Cost:** $40000
(or UTA for Public Transportation)

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

It is recommended that this project begin in the summer of 2019 with the project scope of work and detailed cost estimate, including negotiations with UTA and the TNC to obtain the necessary data. The work will continue with the remaining tasks as outlined. The results of the research will then be reported to UDOT in the form of a written report. This report is expected to be complete in the Fall of 2020.