2019 UDOT RESEARCH PROBLEM STATEMENT

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

Title: Bridging the Data Gap: Addressing non-compliant pedestrian behavior **No. (Office Use):** 19.05.08

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UDOT Champion (if different): **Email:** **Phone:**

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:

While a great deal of attention has been paid in recent years to improving pedestrian safety, pedestrian fatalities have not seen a significant decline. While some safety precautions can be widely implemented (e.g. increased crossing signal time) others must be more strategic (e.g. mid-block crossings, center median). However, pedestrian safety is difficult to address because crashes do not typically cluster in a single location, and pedestrian volumes are difficult to anticipate and behavior can be unpredictable. For example, in a single week in late 2018, three pedestrians were hit in separate incidents just blocks apart along the same corridor. Two of those crashes were mid-block and the pedestrian was "jaywalking". Planners and safety officials see these incidents and want to know what can be done to make a corridor like this safer, but it is difficult to pinpoint a single treatment when the corridor is nearly identical to hundreds statewide, many of which never see a single pedestrian crash.

A great deal of research has been conducted examining pedestrians in specific circumstances (e.g. at intersections, near rail stations or crossings), however, there is currently a gap in the research regarding pedestrian travel behavior along their entire route. It is well established that pedestrians will maximize their trip utility, taking the fastest route from point A to B, however there is also a decision component that integrates safety and wellbeing into decision making (Agrawal, Schlossberg, & Irvin, 2008). This component is not well understood and encompasses the difficulty of adequately planning for pedestrian improvements. For example, the literature cannot currently identify how far pedestrians are willing to walk to get to a safe crossing, particularly if it is "out of the way", or if specific land-uses actually encourage non-compliance (e.g. crossing mis-block to get to a commercial development on the other side).

This research will utilize the best data sources currently available on pedestrian trip information, including: Strava, Streetlight, volume predictions using the Utah State video/signal prediction model, as well as collecting additional supplemental data on-site to predict pedestrian activity. First, we will compile a comprehensive dataset of pedestrian trips within a sample area determined by the project TAC. This sample will include pedestrian path networks with both origin and destination data as well as geospatial data such as topographic, cadastral, and vector maps. Second, we will pair the data compiled in step one and utilize the pedestrian corridor improvement index (PCII, Beiler & Phillips, 2016) to create pedestrian performance metrics with an analytic hierarchy process. This will include a database of existing land-uses and typological functional classifications of surrounding environments. This data when taken together will allow the project team to utilize spatial analysis to determine how pedestrians identify acceptable gaps between safe crossings or reject gaps and choose instead to cross mid-block. Fitting probit discrete spatial outcome models to the data (Cherry, et al 2011), this research will estimate environmental determinants of gap acceptance (and rejection) behavior, including gap size, vehicle speed, time waiting and gap lane position. Coupled with the PCII evaluation, this method will allow for the prioritization of pedestrian pathway improvements by conducting a thorough pathway analysis of pedestrian trips. Additionally, a third dataset can be integrated using photogrammetry vector maps to calculate shortest path and compare those distances to the network distances ascribed by the sample. The paired PCII method will also allow us, in locations where mid-block non-compliant crossings are identified, to create a systematic analysis to determine how far each pedestrian in the sample was from a safe, compliant crossing location, as well as identifying the surrounding land-use characteristics which may be contributing to non-compliance.

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

Analyze current pedestrian crossing behavior and determine, based on site characteristics, which locations are most appropriate for an increase in pedestrian safety treatments.

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

This research is unique as it will create a new tool pairing existing state of the art transportation analysis matrixes with a land-use database to evaluate pedestrian path behavior specifically. This analysis will result in a rubric to identify specific locations where improved infrastructure or an increase in safety treatments would be beneficial and will serve as a tool for agencies to enhance the decision-making process for planning pedestrian improvement projects. It will also allow UDOT Planning, Traffic and Safety, and Project Development to work together to maximize resources by using travel behavior data to target only locations that would exhibit an increased likelihood of non-compliant crossings based on distance and land-use, rather than making a best guess estimate of where new treatments should be located.

4. List the major tasks:

1. Conduct a literature review of existing methods for computing pedestrian pathways, estimating distance gaps, and innovative methods for correlating land-use and behavioral analysis. Review academic research, government reports, and case studies to determine innovative and best practices for analysis methods and existing understanding.
2. Compile necessary data for the analysis. Data will include:
    a. Pedestrian volume and pathway data from on Strava, Streetlight, signal button push and interpolation using USU methodology, and supplemental on-site visually acquired pedestrian path data (or other appropriate sources as identified in the review)
    b. GIS based land-use inventory of the Wasatch Front (University of Utah)
    c. Topographic, cadastral, and vector road network data acquired (NGRC and UPLAN)
    d. Geometric and operational characteristics of selected roadway facilities (NGRC and UPLAN)
3. Configure spatial analysis tools and integrate PCII criteria. This will include fitting a probit discrete spatial outcome model to determine acceptance and rejection gaps for pedestrian traffic.
4. Evaluate sample sites to determine the most appropriate locations for infrastructure interventions and improvements and create a rubric for identifying these locations on a larger scale/sample.
5. Provide a list of recommended sites within the sample for specific infrastructure interventions (e.g. mid-block crossings, pedestrian refuge islands, channelization, etc.)
6. Prepare a final report, presentation, and recorded webinar summarizing the project.

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

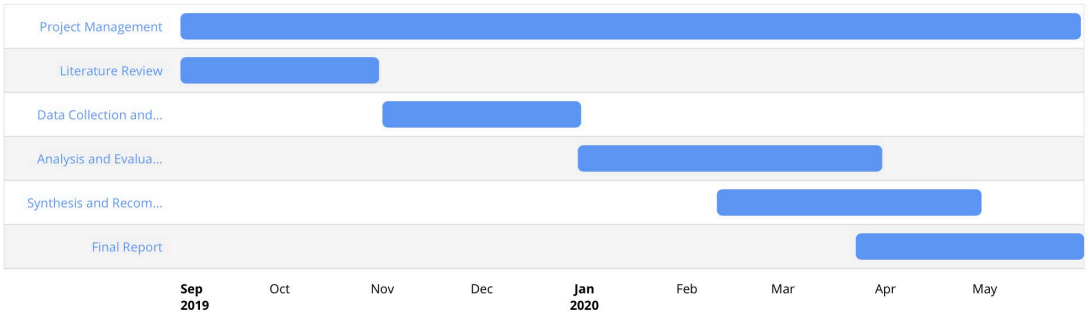
1. Final Report summarizing the process undertaken to collect and analyze the data including analysis and recommendations
2. GIS file of intervention locations based upon the analysis and evaluation of the sample area
3. Paper submitted for presentation to the Transportation Research Board annual meeting as well as other appropriate venues.
4. Paper submitted to a journal for publication summarizing the research methods, analysis and findings.

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

UDOT will be provided with a GIS database of potential intervention locations within a given sample area based upon the analytical evaluation of the pooled spatial modeling, as well as a tool/methodology for identifying sites in other locations. Planning, Traffic and Safety, and Program Development divisions can use the outputs and findings to prioritize locations for infrastructure improvements.

7. Requested from UDOT: $64,000 **Other/Matching Funds:** $0 **Total Cost:** $64,000
(or UTA for Public Transportation)

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


Project Management
Literature Review
Data Collection and...
Analysis and Evalua...
Synthesis and Recom...
Final Report
Sep 2019
Oct
Nov
Dec
Jan 2020
Feb
Mar
Apr
May