

Number: 25-74

Proposed Title:

Automated Condition Assessment for Traffic Signs with Mobile Lidar System

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

Traffic signs are crucial traffic control devices and maintaining the visibility of them during nighttime can be vital to drivers and pedestrians. Currently, the retro-reflectivity of the traffic signs is typically visually evaluated by the crew at nighttime, which can be subjective and inconsistent. The mobile lidar system that ODOT operates, which covers the state highway in bi-annual basis, can not only capture the location and geometry of the transportation assets (e.g., signs, road, barriers), but also the radiometric attributes of the object in the form of intensity values. The intensity value is a measure of the strength of the return signal, which has strong correlations with the retro-reflectivity of the surface. In a prior research project SPR799, the research team investigated using mobile lidar system to evaluate the retro-reflectivity of the traffic signs and pavement markings. While the team had great success in tackling the pavement markings, the Leica Pegasus: Two mobile lidar system, cannot reliably capture the signs due to significant ranging errors and intensity saturation. Fortunately, ODOT recently purchased another mobile lidar unit (manufactured by Riegl), that could have the potential to produce accurate data at the sign sheets, which can be then used to evaluate the radiometric and geometric characteristics.

2. Document how this **transportation issue** is important to Oregon and will meet the [Oregon Research Advisory Committee Priorities](#)

The proposed project is directly aligned with the following Oregon Research Advisory Committee Priorities: **Innovative technologies and systems, Safety, and Cost reduction to asset maintenance.**

The proposed research will rigorously assess whether the new mobile lidar system that ODOT purchased recently can be leveraged to evaluate the condition of a traffic sign including its geometric characteristics and retro-reflectivity. The automation of extracting traffic signs from the mobile lidar data can minimize the tedious and labor-intensive point cloud processing, which will enable state-wide evaluation and maintenance of the traffic signs. Comparing to the current practice, because the lidar sensor is an active remote sensing device operated in near-infrared wavelengths, it can capture the retro-reflectivity information during daytime such that the outcome of this research can potentially substantially reduce the night operations for sign evaluation, which could be a safety concern, while increasing the consistency with quantitative results.

3. What **final product or information** needs to be produced to enable this research to be implemented?

This proposed research will first perform a thorough and rigorous analysis to assess the feasibility of using mobile lidar data to evaluate the condition of traffic signs where the function correlates the lidar intensity values with the retro-reflectivity will be developed. Additionally, a software program will be developed to enable automated

extraction of traffic signs as well as their characteristics (e.g., location, verticality, planarity, height/vertical clearances, retro-reflectivity). The output will be compatible with other GIS tools for visualization, spatial analysis, and other applications. Additional tests covering a wide variety of signs and scenarios will be carried out to further demonstrate the effectiveness and accuracy of the proposed method and tools. All the findings, analysis, and testing results will be documented in the final report.

4. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

Name	Title	Email	Phone
Marie Kennedy	State Sign Engineer	Marie.KENNEDY@odot.oregon.gov	503.986.4013
Frank Belleque	Traffic Marking & Sign Engineer	Frank.BELLEQUE@odot.oregon.gov	503.428.6874
Dean Chess	Product Evaluation Coordinator	Dean.M.Chess@odot.oregon.gov	503.986.3059
Jennifer Lanzarotta	GIS Analyst	Jennifer.LANZAROTTA@odot.oregon.gov	503.339.5851
Rhonda Dodge	Lead Remote Sensing Surveyor	Rhonda.k.dodge@odot.state.or.us	503.986.3775
Jon Rawlings	Project Surveyor	Jonathan.RAWLINGS@odot.state.or.us	503.986.7137

5. Other comments:

In another ongoing project SPR866, the research team is also looking into ways to extract street-side asset such as pole-like objects (e.g., utility poles, traffic signs, streetlamps). However, this project is primarily focused on road characterization while the scope does not include further classification for the pole-like objects.

6. Corresponding Submitter's Contact Information:

Name:	Ezra Che
Title:	Assistant Professor (Senior Research)
Affiliation:	Oregon State University
Telephone:	541-737-4934
Email:	Erzhuo.Che@oregonstate.edu