UTC Project Information	
Project Title	3D Virtual Sight Distance Analysis using Mobile LIDAR data
University	Oregon State University
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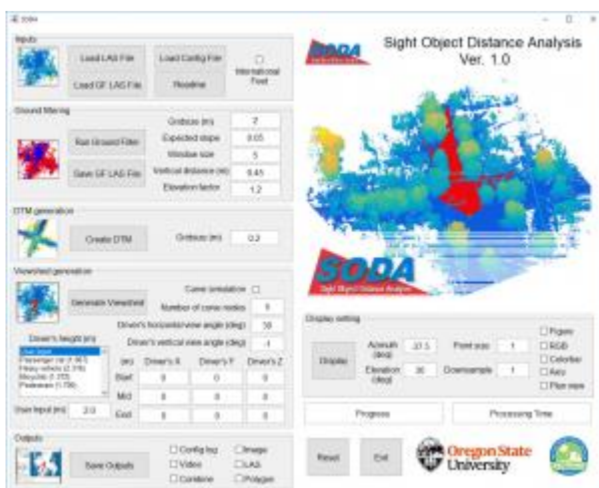
Funding Source(s) and Amounts Provided (by each agency or organization)	University of Washington PacTrans $30,000 Oregon State University $30,000
Total Project Cost	$60,000
Agency ID or Contract Number	DTRT13-G-UTC40
Start and End Dates	January 15, 2015– September 16, 2016
Brief Description of Research Project	This research project investigated advanced safety analysis methodologies for drivers' sight distance (SD) based on high resolution data acquired using lidar (light detection and ranging) technology. This research developed a systematic processing and analysis workflow for virtually evaluating available sight distances by using lidar data sets named SiDAL (Sight Distance Analysis using Lidar). This approach enables one to repeatedly analyze the same scene while considering a variety of vehicle types as well as multimodal forms of transportation (e.g., bikes, pedestrians). The sensitivity of this technique to modeling resolution was analyzed by using a case study of an intersection with restricted visibility. The results showed the ability to capture significantly more detail about visibility constraints in comparison to conventional measurements.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The initial project developed an algorithm that allowed the research team to successfully analyze a wide range of scenarios for visibility. The developed algorithm has a great potential for supporting evaluation of SD constraints for many transportation agencies worldwide. To promote wider distribution and rapid dissemination of the program, the research team utilized PacTrans Technology Transfer Success Story funds to cleanup, optimize, package, and disseminate the code into an easy to use program with a simple, yet powerful, graphical user interface (GUI) that can readily be used by a typical transportation engineer in their workflows. They also developed data converters such

	that the program can use the standard ASPRS las format as well as ASCII text files as input for efficiency. In addition, the developed tool is distributed with some basic training materials (e.g., sample dataset, program user manual, and videos of examples) to support it. In addition to technology transfer to DOTs that partner with Pactrans such as Oregon DOT, an engineering company, Trekk Design Group has reached out to the research team and is utilizing the sight distance analysis program. Presentations have also been given at the Pactrans and Pacific Northwest Transportation Conference.
	 

Impacts/Benefits of Implementation (actual, or anticipated)	The use of high density MLS data for sight distance analysis provides a data driven solution to aid decision making for safe transportation, directly aligning with the PacTrans FY2014-2015 theme. Further, it fits directly within Topic Area #3 Technological Impacts on Safety. Sight distance analyses require careful and detailed field measurements to facilitate proper engineering decision making regarding the removal of obstructions, establishment of regulatory and advisory speed limits, and the location of new access points, among numerous other examples. However, conventional field measurements present safety concerns because they require personnel to be in or adjacent to traffic lanes. They can also be time consuming, costly, and labor intensive. Furthermore, the predominantly two-dimensional (2D) methods involve simplifying assumptions such as a "standard" vehicle heights and lengths without considering the wide range of vehicles and drivers present on the road. Recently, departments of transportation have begun to acquire mobile lidar data for their roadway assets. As an example, Oregon DOT has regularly performs scan surveys of all state owned and maintained highways and updates of high priority areas annually. These data provide a rich, three dimensional (3D) environment that enables one to virtually visit a site at any frequency and efficiently evaluate sight distances from the safety of the office. Oregon DOT utilized mobile lidar data for evaluating passing sight distance and found that they saved $300,000 compared with manual approaches. The tools developed in this research enable more efficient use of the mobile lidar data. This approach enables one to repeatedly analyze the same scene while considering a variety of vehicle types as well as multimodal forms of transportation (e.g., bikes, pedestrians).
Web Links • Reports • Project Website	Report: http://depts.washington.edu/pactrans/research/projects/3d-virtual-sight-distance-analysis-using-mobile-lidar-data-year-3-2015-16/ Pactrans Success Story: https://depts.washington.edu/pactrans/pactrans-technology-transfer-success-story-2018-4-3d-virtual-visibility-analysis-program/ Software Tool, sample datasets, and user manual: http://learnmobilelidar.com/software-tools/ Publication: Jung, Olsen, Hurwitz, Kashani, and Buker (2018). 3D virtual intersection sight distance analysis using lidar data, Transportation Research Part C: Emerging Technologies, 86, 563-579. https://doi.org/10.1016/j.trc.2017.12.004