Research Project Descriptions

UTC Project Information	
Project Title	Safety Evaluation of Pavement Surface Characteristics with 1mm 3D laser Imaging
University	Oklahoma State University
Principal Investigator	PI: Kelvin C.P. Wang, Ph.D., P.E., Oklahoma State University
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Funding Source(s) and Amounts Provided (by each agency or organization)	SPTC $198,972 Oklahoma Department of Transportation: $115,595 Oklahoma State University: $82,677
Total Project Cost	$396,544
Agency ID or Contract Number	DTRT13-G-UTC36 SPTC14.1-77
Start and End Dates	September 1, 2014 – August 31, 2014
Brief Description of Research Project	**PROBLEM**: The hardware and software necessary to automatically obtain pavement safety data based on surface characteristics is limited to using separate traditional instruments that are only capable of measuring pavement characteristics in small areas. For instance, high-speed friction testers and macro-texture sensors can only collect data on a line on pavement; while high-precision friction and texture measurement instruments are usually static, time-consuming, and can only cover very small pavement areas. In addition, high-speed line-of-sight or point laser sensors for macro-texture measurement is based on decades' old design and electronics, and need substantial noise filtering to obtain signal data that is no longer as high-fidelity and high-resolution as needed for analysis. **PROPOSED SOLUTION**: The PaveVision3D system can present surface defects in a visual and realistic format at 1 millimeter resolution in all 3 dimensions with complete lane coverage, even when the data collection speed is more than 60 miles per hour. In this research, data collected with PaveVision3D technology will be used to evaluate various benchmarks for surface characterization related to pavement safety. Pavement cross slope and edge falloff will be considered. Estimated Mean Texture Depth (MTD) and Mean Profile Depth (MPD) based on the 1millimeter, 3D data on any location of a pavement lane, including but not limited to wheel-paths, will be automatically calculated. The PAVDRN model will be used as a basis for this research effort for automated prediction of hydroplaning speeds for a pavement network. It uses a one-dimensional steady state

	form of the kinematic wave equation to estimate the water film depth (WFD). The program also uses a condensation of formulas to determine a relationship between velocity at which hydroplaning initiates and WFD. Subsequent model modifications will be made to allow for more flexible and accurate modeling of the hydroplaning occurrence in real-world situations. Further, considerations in new model development will be given to extreme weather conditions such as long-lasting drought or unusually high levels of rain fall. The research outcomes will be particularly important when extreme weather conditions cause substantial water on the pavement surface that contribute to hydroplaning conditions.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	
Web Links • Reports • Project website	