UTC Project Information	
Project Title	MPC-507 – Automating Inspection and Damage Assessment of Transportation Infrastructure with Photographic Imaging
University	Colorado State University
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Project Duration	September 30, 2013 to September 30, 2018
Brief Description of Research Project	Maintaining safe operating conditions and effectively allocating maintenance resources depends on accurate and timely assessments of transportation infrastructure condition. Visual inspection of transportation structures is limited by a lack of optimal means of quantifying assessments and tracking changes in such assessments over time. Although several branches of inspection are thorough and robust, most rely on somewhat subjective measures that are in the eye of the beholder and accordingly can have significant levels of variation across different inspectors (Moore et. al., 2001). In this work, a more objective method of inspection and assessment is proposed using technology associated with recently developed methodologies known as Structure from Motion (SFM). This technology allows assessments to be made from a sequence of digital photographs from non-specialized, low-cost equipment (Westoby et al., 2012, Koutsodis et al., 2014). This proposal outlines how such a procedure can be used to develop methods of inspection and assessment of environmental degradation or traumatic damage that is

	more objective and potentially more valuable in prioritizing transportation structures for repair or maintenance.
Describe Implementation of Research Outcomes (or why not implemented)	This study was primarily a proof-of-concept effort. The results were promising enough to continue these efforts, and additional work are currently in development.
Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	This tool has the potential to either replace or supplement existing visual aids in assessing damage and resilience to multiple classes of structure. It would allow quantitative changes to be historically tracked, since the digital images could be ported to an ephemeral numerical model of the same system. The proposed study contains two educational elements. First, a graduate student will be funded to perform much of the work, particularly any analysis portion of the research. Second, students in the Honors section of the undergraduate class CIVE 360 (Mechanics of Solids) will be tasked with generating image databanks and typical point clouds for prototype structures. These sophomore level students will thus be directly exposed to research and transportation infrastructure early in their undergraduate careers. These students usually work unfunded as part of their academic requirement for honors credits. Historically, 10-15 students have participated each year. The classes of Spring 2016 and Spring 2017 will both participate if they have interest. Additional funding to support equipment needs is being sought as this proposal was being submitted.
Web Links • Reports • Project Website	MPC Research Report – <u>Automating Inspection and Damage</u> <u>Assessment of Transportation Infrastructure with Structure from</u> <u>Motion</u>