

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-460 (project 507) | June 2022

Automating Inspection
and Damage Assessment
of Transportation
Infrastructure with
Structure from Motion



the ISSUE

Maintaining safe operating conditions and effectively allocating maintenance resources depends on accurate and timely assessments of transportation infrastructure conditions. Visual inspection of transportation structures is limited by a lack of optimal means of quantifying assessments and tracking changes in such assessments over time. Most inspection approaches rely on somewhat subjective measures that are in the eye of the beholder and accordingly can have significant levels of variation across different inspectors. A more objective method of inspection is needed that will capitalize on a combination of digital images, photogrammetry, and finite element analysis methods are woven together into a single methodology to perform structural analysis on a variety of systems.

the RESEARCH

The analyses in this study are based on the combination of two tools: the transition of digital photographs to a finite element mesh, and the static or dynamic analysis of the system using standard finite element methods.

The methodology was applied to several easily photographed structures on the Colorado State University campus. In the static analysis, the primary outputs were the stress and displacement fields. For the dynamic analysis, the free vibration response was completed for the natural frequencies and modal shapes.



A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University

University of Colorado Denver
University of Denver
University of Utah

Utah State University
University of Wyoming



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Project Title

Automating Inspection and
Damage Assessment of
Transportation Infrastructure
with Photographic Imaging

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the FINDINGS

This research provided a connected methodology for performing analysis on structures based only on digital images. This type of tool has tremendous potential.

Limitations of the work include challenges related to representing the structure based on the lighting, being able to capture images when the slenderness of the structural system was high, and several other issues related to filling in the structural details when only one surface is available.

the IMPACT

This tool has the potential to either replace or supplement existing visual aids in assessing damage and resilience to multiple structure classes. It would allow quantitative changes to be historically tracked. This technology allows assessments to be made from a sequence of digital photographs from non-specialized, low-cost equipment.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1079>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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