



**TriDurLE**

**National Center for Transportation  
Infrastructure Durability & Life-Extension**

UTC Project Information – National UTC TriDurLE	
Project Title	Post-Event Serviceability of RC Bridge Bents Using Visual Inspection
University	South Dakota State University
Principal Investigator	Mostafa Tazarv, PhD, PE Kwanghee Won, PhD
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Funding Source(s) and Amount Provided (by each agency or organization)	<p>USDOT, Research and Innovative Technology Administration \$54,499</p> <p>South Dakota State University \$59,605</p>
Total Project Cost	\$114,104
Agency ID or Contract Number	
Start and End Dates	May 1, 2020 to June 30, 2021
Brief Description of Research Project	<p>Modern seismic design codes ensure a large displacement capacity and prevent total collapse for bridges. However, this performance objective is usually attained at the cost of damage to target ductile members. For reinforced concrete bridges, the columns are usually the main source of ductility during an earthquake in which concrete cover, core, and reinforcement may damage, and the column may experience a large permanent lateral deformation. A significant number of the US bridges will experience large earthquakes in the next 50 years that may result in the bridge closure due to excessive damage. A quick assessment of bridges immediately after severe events is needed to maximize serviceability and access to the affected sites, and to minimize casualties and costs. The main goal of this proposal, which is the first phase of a multi-phase project, is to</p>

	<p>accelerate post-earthquake bridge inspection using “computer vision”. Instead of sending trained personnel to the affect bridges, a drone can be used as a fast inspection device. If the drone is equipped with an image processor, which can relate bridge apparent damages to seismic demands, it will be feasible to quickly assess the post-event serviceability of the bridge and to tag the structure (to be opened, closed, or have limited access). Such assessment will save lives and costs since the bridge serviceability will be known to the public and emergency responders. The main product in this phase of the project will be an open-source computer program that can assess bridge bent damage, determine the bridge demand using post-earthquake conditions, and tag a bridge. In the second phase of the project, the software will be implemented in drones and/or mobile applications. Subsequently, other bridge types or elements may be considered for damage assessment in the following phases.</p>
Describe Implementation of Research Outcomes (or why not implemented)	Three main deliverables of the project will be: (1) a final report, (2) a comprehensive database of RC bridge column performance, and (3) a verified open-source software to tag a bridge after an earthquake. Furthermore, the open-source software will be used in the next phase of the project for implementation in drones.
Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	The project main benefit is to assess a bridge after an earthquake as quickly as possible to maximize bridge serviceability and safety, and to minimize the bridge downtime. The first few hours after an earthquake is the most critical time window for rescue operations.
Web links <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project website</li> </ul>	