



TriDurLE

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

UTC Project Information – National UTC TriDurLE	
Project Title	Computer Vision Tools for Bridge Inspections and Reporting
University	South Dakota State University
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Funding Source(s) and Amount Provided (by each agency or organization)	<p>USDOT, Research and Innovative Technology Administration \$101,717</p> <p>Alaska Department of Transportation & Public Facilities (DOT&PF) \$125,000</p>
Total Project Cost	\$226,717
Agency ID or Contract Number	
Start and End Dates	July 2022 to July 2024
Brief Description of Research Project	<p>The Alaska Department of Transportation & Public Facilities (DOT&PF) is responsible for condition assessment of approximately 1000 bridges in the state. Each year, Alaska DOT&PF engineers inspect about 500 bridges. Per the Alaska Bridge Inspection Program, the inspector must complete both a National Bridge Inventory (NBI) inspection (following the FHWA Recording and Coding Guide) and an element level inspection (following the AASHTO Manual for Bridge Element Inspection, MBEI) for each bridge. Using either NBI or MBEI, a significant amount of data must be collected and reported. However, the data collection/reporting is usually done manually, which is time consuming, error prone, and sometimes not consistent when repeated. For example, the deck defect mapping requires manual detection and measurement of</p>

	<p>delaminated concrete, patch repairs, exposed reinforcing steel, and spalling. Computer vision, a type of image processing that incorporates artificial intelligence (AI) for analyzing the surroundings, can significantly expedite the process of damage/defect identification and measurement only using photographs of bridge deck and other elements. Furthermore, this and other AI tools can be utilized to expedite and unify reporting. The main goal of the present study is to develop practical AI tools that help inspectors with measurements and reporting of bridge defects following NBI and MBEI requirements. To achieve this goal, a few bridge elements (e.g., decks and girders) will be targeted for further investigation, inspection database including photographs of the selected elements with/without damage will be compiled, and computer vision tools will be developed for the selected elements to recognize the element defects, quantify the defect per NBI/MBEI, and produce a report following the DOT&PF standard practice. The tools, which can be standard software or web-based, will incorporate mobile devices for the ease of data collection, access, sharing, and reuse in future inspections.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>Three main deliverables of the project will be: (1) a final report, (2) a set of verified opensource computer vision codes for damage detection and measurements from images, and (3) a user-friendly software for routine inspection and reporting. The final report and the opensource codes will be publicly available at no cost for use by other researchers, DOTs, and software developers. The research findings will be further disseminated through journal publications and conference presentations. Furthermore, a presentation will be prepared for the TriDurLE monthly webinar series, which will be recorded and posted in public domains (e.g., YouTube). The research team will prepare user guide and will organize training sessions for the DOT&PF engineers.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>Manual measurements of defects are common practice in bridge inspections and the use of computer vision is scarce. The main benefit of the proposed work is a substantial reduction of the field inspection time, effort, and cost through computer vision tools.</p>
<p>Web links</p> <ul style="list-style-type: none"> • Reports • Project website 	