



New Bridge Inspection Approach with Joint UAV and DIC System

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Summary:

This research aims to develop a new bridge inspection approach using unmanned aerial vehicle (UAV) coupled with digital image correlation (DIC) system. The DIC system incorporating UAV images can measure displacements or strains by analyzing patterns of reference and deformed images. As part of this research, a commercially available UAV, DJI Matrice 210, was integrated with the DIC system using a 3D printed mounting plate, and the joint UAV-DIC system was utilized to inspect a timber bridge girder in the Structure Lab. Then, the UAV-DIC system inspected an existing timber slab bridge in Pipestone, Minnesota, but the system was not able to efficiently identify critical damage due to its instability caused by windy conditions. Therefore, only the UAV equipped with a gimbal camera was operated to perform the bridge inspection. A significant number of images from the UAV were used and analyzed through a conventional image analysis algorithm within ImageJ software for damage quantification. The major conclusion from this research was that the UAV-DIC system was only able to detect and quantify damage (i.e., crack) on the considered girder under almost zero ambient wind conditions, and the UAV integrated with the image analysis algorithm was capable of damage identification and quantification for the inspected bridge.

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