

Towards UAV-based bridge inspection systems: a review and an application perspective

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(Received March 9, 2015, Revised August 17, 2015, Accepted August 25, 2015)

Abstract. Visual condition inspections remain paramount to assessing the current deterioration status of a bridge and assigning remediation or maintenance tasks so as to ensure the ongoing serviceability of the structure. However, in recent years, there has been an increasing backlog of maintenance activities. Existing research reveals that this is attributable to the labour-intensive, subjective and disruptive nature of the current bridge inspection method. Current processes ultimately require lane closures, traffic guidance schemes and inspection equipment. This not only increases the whole-of-life costs of the bridge, but also increases the risk to the travelling public as issues affecting the structural integrity may go unaddressed. As a tool for bridge condition inspections, Unmanned Aerial Vehicles (UAVs) or, drones, offer considerable potential, allowing a bridge to be visually assessed without the need for inspectors to walk across the deck or utilise under-bridge inspection units. With current inspection processes placing additional strain on the existing bridge maintenance resources, the technology has the potential to significantly reduce the overall inspection costs and disruption caused to the travelling public. In addition to this, the use of automated aerial image capture enables engineers to better understand a situation through the 3D spatial context offered by UAV systems. However, the use of UAV for bridge inspection involves a number of critical issues to be resolved, including stability and accuracy of control, and safety to people. SLAM (Simultaneous Localisation and Mapping) is a technique that could be used by a UAV to build a map of the bridge underneath, while simultaneously determining its location on the constructed map. While there are considerable economic and risk-related benefits created through introducing entirely new ways of inspecting bridges and visualising information, there also remain hindrances to the wider deployment of UAVs. This study is to provide a context for use of UAVs for conducting visual bridge inspections, in addition to addressing the obstacles that are required to be overcome in order for the technology to be integrated into current practice.

Keywords: unmanned aerial vehicle; bridge inspection; condition assessment; bridge asset management

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