

This topic is “practice ready.” Yes No

Autonomous Structural Health Monitoring and Management using Unmanned Aircraft Systems

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Abstract

Unmanned Aircraft Systems (UAS), more commonly referred to as drones, offer unparalleled opportunities for performing cost-effective and efficient health monitoring and management of transportation infrastructure systems. Current infrastructure inspection methods are, in general, manual, time-consuming, and costly to perform. A multi-tiered network of UAS concept was developed to perform an array of tasks by incorporating various enhanced data collection and interpretation technologies including 3-D rendering using photogrammetry, High Definition (HD) visual monitoring, Light Detection & Ranging (LiDAR), and infrared thermography. 3-D rendering of structures opens up the possibility of virtual inspections using virtual reality systems. HD visual inspection can help expose visual defects on infrastructure systems such as cracks, corrosions, dents and bends. Further image processing and analysis of the defects can be performed using a combination of Bottom Hat Transform (BHT) and Hue, Saturation and Value (HSV) thresholding techniques. LiDAR makes it possible to measure and analyze miniscule defects to millimeters of accuracy, which is extremely useful for infrastructure health monitoring purposes. Infrared thermography can be used for thermal diagnostic applications such as power line inspection and detecting corrosion and delamination. This presentation introduces a vision of UAS based autonomous structural health monitoring and management by not only incorporating various enhanced data collection and interpretation technologies but also implementing swarm technology using fleet of drones.

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Keywords: infrastructure health monitoring—unmanned aircraft systems (UAS)—swarm technology—data processing—autonomous drones