The Integration of Unmanned Aircraft Systems (UASs) and 3D modeling Software for Baseline Asset Management Monitoring (BAMM) of Dams

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Asset management of bridges, dams and other civil infrastructure is a critical task that owners and operators must conduct annually or on a regular basis. Currently, asset management is now being executed through visual inspections to gather qualitative information on the asset and its likely performance under service conditions. For example, conventional inspections of dams are based on visual investigation methods. The inspection of structural components that are hard to reach is usually done by specialty staff with climbing equipment. These assets are subject to the aging processes as a result of external conditions like snow, rain, increasing loads, and the effects of fatigue due to cracked or defective materials. Moreover, our study suggests that the integration of Unmanned Aircraft Systems (UASs) equipped with high resolution cameras, video, and 3D modeling software can simplify these complex inspection tasks. This method provides an important contribution to monitoring strategies in terms of quality and efficiency. A paradigm shift from annual inspections to an efficient cost-effective monitoring strategy is needed for consistent dam operations and achieving the target service life of existing structures. The task consisted of the team conducting four aerial missions over a dam using the Inspire 1 and Phantom 3 Quadcopters, WiFi, and 3D modeling software. The Phantom 3 was programmed to conduct flight missions gathering video and 2D images of the horizontal and vertical faces of the dam, while the Inspire 1 gathered detailed images of gates, and pictures of various features on the upstream side of the dam. The study provides evidence showing that quadcopters outfitted with specific payloads and the manipulation of photographic data using 3D modeling software can derive textured, monochrome, topography, and digital surface models (DSM) maps showing cracks, weakness that can be measured and baselined. Results indicate that analysis of these maps may be used to identify potential structural issues that should to be monitored over a period-of-time. This new approach could prove to be an important contribution to baseline asset management monitoring (BAMM) as it relates to qualitative and quantitative assessment of dams.

Teams

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