Multi-Stage Method of Generating 3D Civil Site Surveys

15-022

Detect Long-Term Building Movements Using Hierarchical Point Cloud Generation (HPCG)

ISSUE

The ability to provide precision measurements of building changes over time is a "missing link" in the Civil Engineering tool kit. Existing methods do not provide sufficient data to create a 3D model with accurate geometry and high-fidelity, fine detail representation to detect movements or flaws on the order of 0.1mm.

TECHNOLOGY DESCRIPTION

A George Mason team has developed a method to deliver a 3D photorealistic model with 10 times the resolution of existing methods. Images captured in person or by UAV are used to generate a series of point clouds at varied length scales through dense Structure-from-Motion. These separate point clouds are then merged into a final, full-site, extremely high-resolution 3D model of the entire site. The technique can reveal small-scale movements and defects due to, for instance, nearby construction works, renovations, or aging. The method is particularly powerful when used to evaluate changes over the course of several years.

ADVANTAGES

- Precise, detailed, highly dense and photorealistic 3D models
- More accurate than LIDAR scanners or an unguided structure-from-motion algorithm
- Far less expensive when compared to LIDAR scanners
- Wide range of uses
  - Evaluate changes in structures such as ships, airplanes, buildings, dams, bridges
  - Capture movements and changes due to renovations or construction
  - Assess damage for insurance purposes
  - Determine building safety following natural disasters
  - Measure land or soil erosion

LIDAR Technique

Conventional Photogrammetric Technique

Patented HPCG

STATE OF DEVELOPMENT
Mature

Note the difference in model quality, especially the ability to reconstruct