Chair of Computational Modeling and Simulation
TUM School of Engineering and Design
Technical University of Munich

Master thesis

3D Bridge Element Identification and Modeling based on Photogrammetric Point Clouds

Motivation

Concrete bridges, the most common bridge type in road infrastructure, require cyclical inspections for secure operability and structural integrity. Recent efforts automate these inspections using UAVs (drones), photogrammetric reconstruction, and Computer Vision methods to detect and map damages, making the process faster, safer, and more objective compared to current visual inspection practice while providing engineers with quantitative damage information. However, such approaches often yield only textured 3D meshes from photogrammetric point clouds, which, while providing visual insights, fall short of engineering standards and lack semantic richness. This thesis aims to develop a method for bridge element detection in 2D images and retrieval of corresponding 3D data subsets, which will be used to fit suitable parametric 3D models to create a coherent, semantically rich 3D model.

Figure 1: Conceptual overview of a bridge inspection using UAVs and Computer Vision for documentation of surface damages

Task

- Literature research on suitable approaches for bridge element detection in 2D images & parametric model fitting.
- Developing a method to identify bridge elements and fit typical bridge elements to the 3D data retrieved based on the 2D segment using SwissInspect's implementation.
- Implementation with a prototypical case study, evaluation of results.

Prerequisites

Necessary: Programming skills (Python, C++, or similar)

Good to have: Experience with point clouds

Supervisors

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