

November 27, 2014

## Master Thesis

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The Chair of Computing in Civil Engineering (Prof. Smarsly), together with the Chair of Modeling and Simulation of Structures (Prof. Morgenthal), offers the opportunity to conduct a master thesis (in English or German) in the following area.

Faculty Civil Engineering

Computing in Civil Engineering

### **BIM-based inspection of civil engineering structures using unmanned aerial vehicles**

#### **Background**

Civil engineering structures are exposed to a variety of environmental impacts. Consequently, there is a strong need for reliable inspection strategies that provide information on the structural condition. However, conventional visual inspections of civil engineering structures require numerous efforts with respect to equipment, logistics, and staff. Since the past several years, unmanned aerial vehicles (UAVs) are deployed for remotely controlled, visual inspections. The UAVs are able to slowly move along the structures while relaying close-up, high-quality images and other data to engineers responsible for inspection. However, for each structure under investigation, it is necessary to define an optimum flight path for the UAV, covering all relevant parts of the structure.

#### **Project description**

For modern engineering structures, there exist building information models (BIMs), which are computational models that digitally represent the geometry as well as other properties of the structure. Goal of this master thesis is to automatically plan the flight paths for UAVs based on building information models. Main tasks to be conducted include

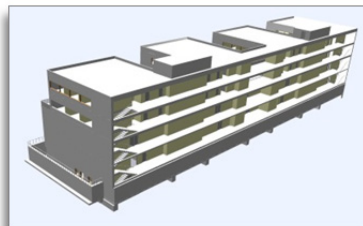
- a literature review on requirements of UAV-based inspections,
- development of a methodology for automatically constructing flight paths using building information models,
- development of a building information model for a real-world civil engineering structure (to be specified),
- design and prototype implementation of methods for automated flight path construction,
- UAV flight tests for validation purposes.

Basic skills in object-oriented modeling and in Java programming language as well as interests in BIM technologies are required.

If you are interested in applying for this topic, please contact Prof. Smarsly, Coudraystraße 7, Room 518, 99423 Weimar, 03643-58-4214, [kay.smarsly@uni-weimar.de](mailto:kay.smarsly@uni-weimar.de)



Unmanned aerial vehicles



BIM (visual representation)