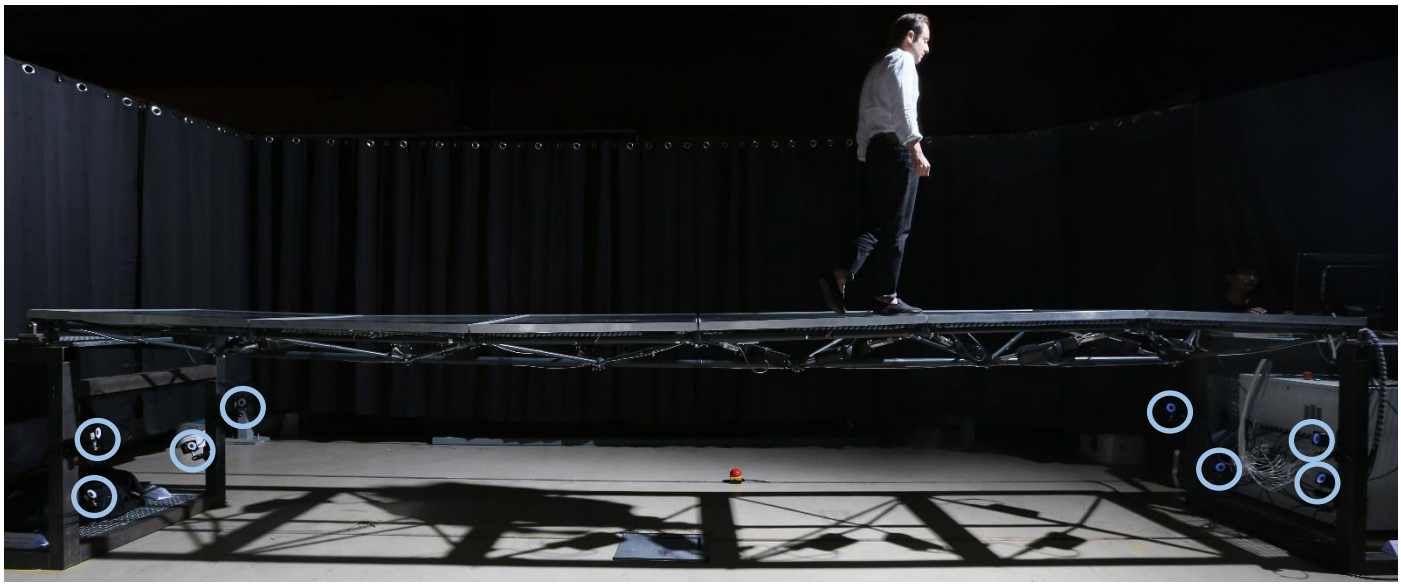
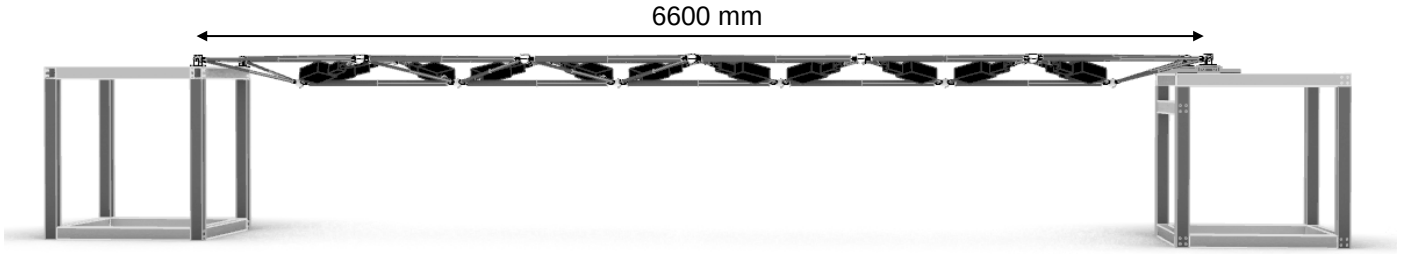
Multipoint Camera Measuring System for a Shape-Morphing Bridge Structure





MSc project

Develop a camera-based system to monitor the displacement of a shape-morphing structure that is currently under testing at the Institute for Lightweight Structures and Conceptual Design (ILEK). The structure has been designed to 'morph' into shapes that are optimal to take each load occurrence. The optimal shape changes as the load changes. Twelve linear actuators have been strategically integrated to control the structural state. The ability to morph into a shape that is optimal to counteract the effect of loading enables effective stress homogenization which results in significant embodied energy (material mass or equivalent carbon) savings with respect to weight-optimized passive structures. Further information on design and control of shape-morphing structures: https://www.gennarosenatore.com/research/adaptive_structures/structural_adaptation_through_shape_morphing.html

To enable shape-morphing, the deformation state of the bridge must be recorded as accurately as possible. This is currently achieved with a commercial camera measuring system consisting of 8 cameras (indicated with blue circles in the image). The challenge of this work is to reduce the number of cameras with the same or, if possible, improved accuracy. For this purpose, the multipoint method developed at the Institute for Technical Optics (ITO) will be employed.

This work combines several interesting sub-areas of optical metrology:

- Design and layout of a camera-based measuring system
- Calibration of a multi-camera setup
- Experimental work in the laboratory
- Image processing and measurement data evaluation

What you should be able to:	You will learn about:
Programming in python/matlab/.. Basics of optical metrology Independent, goal-oriented way of working	Camera calibration Imaging measurement technology Image processing Adaptive Structures

Supervision

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