Chair of Carbon Composites
TUM School of Engineering and Design
Technical University of Munich

Bachelor's Thesis, Term Project, Master's Thesis

Characterization of Residual Stresses in Large Format Additive Manufacturing Structures

Additive Manufacturing by Material Extrusion– also known as 3D printing – uses thermoplastic polymers to create complex structures layer by layer. By the nature of the process, residual stresses occur when the individual layers cool down and cause stresses in the layers below. To improve the quality of such large printed structures, it is crucial to predict the residual stresses as they cause warping of the final part. Specifically, for the current application, composite tools for the aerospace industry are 3D printed. Hence tight tolerances must be met. The long-term goal is to manufacture flying structural parts for the aerospace industry.

The printed parts need to be investigated for their residual stresses. The deformation of the parts will be measured with Digital Image Correlation. With the known deformation, it is possible to determine the internal stresses by adapting a FE simulation model. The first work package will be the determination of suitable process parameters for manufacturing the samples and printing them. Depending on the type and focus of the thesis, effort on testing and simulation can be adapted.

Research focus of the thesis

- Design of Experiments and manufacturing of samples
- Testing of samples by Digital Image Correlation
- Optional: FE-Simulation of the test method
- Documentation

Requirements

- Clean and independent way of working
- Interest in material testing and composites
- Basic knowledge in 3D printing and testing

Figure 1: 3D printed test cube

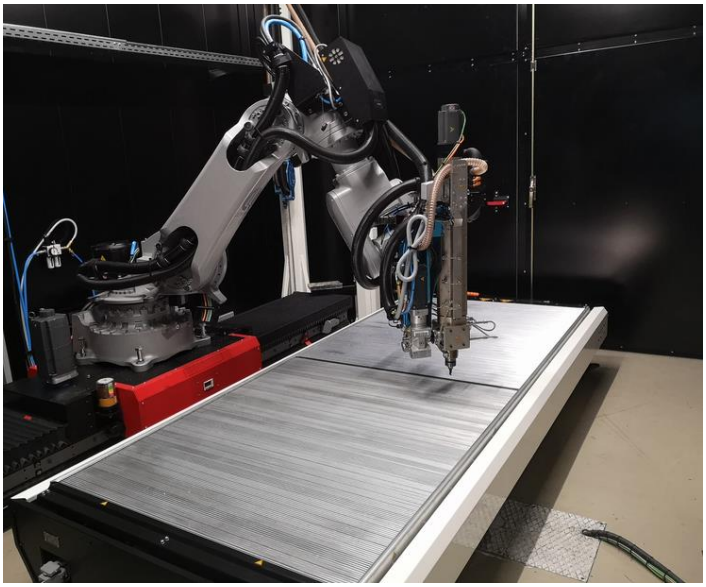

Figure 2**:** CEAD AM Flexbot (Large Scale 3D printer) at the Chair of Carbon Composites

Starting date: Now, flexible

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