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

Development of a Python script for the analysis of high-speed material characterization data.

One special subject of research at the chair of carbon composites is the mechanical behavior of composites at different strain rates. In order to characterize the properties of under high strain rates, between 100 1/s and 1000 1/s, it is necessary to use special test methods since the standard universal testing machines either cannot achieve the necessary speeds or deliver unreliable data. One of these methods is implemented at our chair, the so-called “Split Hopkinson Bar”. This technique is based on the propagation of elastic waves through the sample and two metal bars. The deformation of the bars and the sample are measured using strain gages, amplifiers, oscilloscopes and a high-speed camera. From the analysis of this data, the stress – strain behavior of the material can be determined.

In the framework of this thesis a new script should be developed to analyze the data faster and more reliably and improve the interface with the commercial digital image correlation (DIC) software used (GOM-Correlate). The implementation of Open-Source DIC routines could also be addressed during this work. The script should be written in Python and include a GUI.

Research focus of the work
• Analysis of signals and real time data: convolution, filter, numerical integration and derivation, signal synchronization
• Parallelization
• Graphic user interface
• Object oriented and modular programming
• Material Characterization: Digital image correlation, Split Hopkinson Bar

Requirements
• Intermediate to advanced knowledge in Python and programming
• English or German knowledge B.2 or higher
• High motivation and ability to work critically and independently
• Knowledge beneficial but not required: material characterization, DIC, experience working with oscilloscopes, strain gages, amplifiers and high-speed cameras.

Starting date: ASAP

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