3D laser measurement system using high-speed camera technique and GPU based signal processing

Motivation
The measurement of complex phenomena requires optical 4D high-speed measurement systems with high spatial and temporal resolution as well as accordingly high data rates. Therefore, not only state of the art camera hardware (framerates in the range of MHz) and computer hardware is necessary but also an efficient signal processing (GPU direct) in order to manage the system’s challenging data rates.

The aim of this work is the realization of such a laser based measurement system using the chair’s high-speed camera (1 MHz framerate) and GPU based signal processing. Experiments have to be planned and executed in order to investigate the abilities and uncertainties of the system. Based on reference measurements using known measurement systems, the generated data has to be validated. Furthermore, the new system could be used for investigations of swirl-stabilized flames or local sound pressure behavior.

Possible tasks
- design and realization of a laser based high-speed camera measurement system
- development of efficient GPU based signal processing
- data analysis using MATLAB
- validation experiments

Keywords
signal processing, MATLAB, high-speed camera, GPU

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