Karlsruhe Institute of Technology

Institute for Data Processing and Electronics
Prof. Dr. Marc Weber

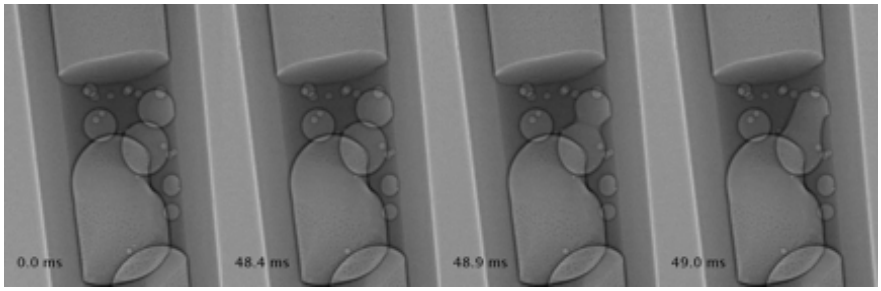
Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen, Germanny
http://www.ipe.kit.edu

Optimization of bandwidth of high performance cameras at synchrotron light sources

Proposal for Master Thesis at KIT

Imaging Detectors at modern synchrotron light sources create large data-sets in the order of 40 GB per 3D image with high repetition rates. Up to now these data sets have been analyzed in complex post processing cycles that made fast turn around time impossible.

Including hundreds of simple processors used to transform vertexes in 3D space modern graphic adapters offer a way to speed up the process by more than one order of magnitude at low cost and with good scalability. In order to provide near real-time visualization of the recorded data, the Institute for Data Processing and Electronics (IPE) has started optimization of image processing software by migrating all computational intensive parts to graphic processors (GPU). With the accelerated computation at the current stage the I/O operations became a major performance stopper. Therefore, for further increase of performance the total data size should be reduced using frame-rejection filters and image compression.



High-speed X-ray image sequence: There are no changes in the sample during the first 48.4 ms of the Sequence, but very fast processes occur shortly afterwards.

The reconstruction of 3D images from 2D projections can be accelerated by more than 2 orders of magnitude with GPU-servers equipped with 4 to 8 NVIDIA Tesla cores.

The student is expected to work with the image data from the local ANKA synchrotron light source and propose the data reduction scheme based on frame rejection and compression/decompression. As well the student is expected to provide a GPU C-library implementing this scheme.

Required Skills: C, numerical algorithms

Experience Gained: Imaging at synchrotron light sources, Image processing and compression, GPU computing

Contact:
Suren Chilingaryan (07247 / 82 6579)
<suren.chilingaryan@kit.edu>
Andreas Kopmann (07247 / 82 4910)
<andreas.kopmann@kit.edu

Artistic view of ANKA synchrotron at KIT