

Evaluation of OpenCL as a development platform to accelerate image processing at synchrotron light sources

Imaging Detectors at modern synchrotron light sources generate large data-sets in the order of 40 GB per 3D image. 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 optimized an image processing software by migrating all computational intensive parts to graphic processors using CUDA toolkit. This allowed us to reduce reconstruction time from multitude of hours down to one minute.

OpenCL is a new standard for parallel programming intended to replace vendor-specific languages like CUDA and to provide a unified way to express algorithms targeted to both GPUs and multicore CPUs. The student is expected to port the reconstruction application to OpenCL and analyze performance of NVIDIA CUDA and OpenCL implementations. The second task is to compare architectures of NVIDIA and AMD graphic cards and to evaluate their performance concerning 3D image reconstruction.

Required Skills: Strong C knowledge, Linux; Python and acquaintance with parallel programming is a plus, acquaintance with CUDA and OpenCL is a strong plus

Experience Gained: Imaging at synchrotron light sources, Image processing and tomographic reconstruction, GPU computing (CUDA and OpenCL)

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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.



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