

TOWARDS A GPU ADD-ON FOR THE MESS LIBRARY

Jens Saak

*Max Planck Institute for Dynamics of Complex Technical Systems
Sandtorstr. 1, 391 06 Magdeburg, Germany
e-mail: saak@mpi-magdeburg.mpg.de*

Joint work with Alfredo Remón and Martin Köhler

Abstract

The omnipresence of graphics processing units (GPUs), and their remarkable computational power, in modern desktop computers has made it unavoidable to support those devices in any computational software that claims to be efficiently using the hardware. CUDA and OpenCL have, on the other hand, made programming GPUs much easier and more attractive to a wide range of scientists. Here we present first steps towards an add-on to the MESS library that combines the multicore capabilities of the existing software on the CPU with the manycore features provided by the GPU. We exploit specialized data structures that lower the memory consumption while at the same time increasing the throughput of the GPU computations. The hybrid nature of the implementation offloads the expensive linear system solves to the GPU while in parallel the CPU computes minor operations like evaluation of stopping criteria and solution updates in each step.

The proof of concept implementation is demonstrated in numerical experiments showing what the advantages and drawbacks of the current implementation and the GPUs as high performance computation devices in general are.