Project Study / IDP

Speeding-up of Linear Programs Solving on GPU

Background

Linear Programs (LPs) appear in a large number of applications and efficiently solving them is essential. While solution algorithms for LPs cannot easily be parallelized, recent studies suggest that GPUs still can offer a significant performance boost, especially in cases where multiple (up to millions) small-scale LPs have to be solved efficiently and in parallel. As compared to parallelizing the inner workings of solution algorithm, this topic is till now under-researched.

Research Tasks

This project study should investigate the above questions. In particular, the group of students working on this study should:

- Perform a literature review of the current research in the area of batched small-scale LP-solving using GPUs.

- Identify variations of the simplex algorithm suitable for solving multiple small-scale LPs in batch.

- Using the selected algorithm, implement a CUDA-based solver for multiple LPs in JAVA.

- Create a performance case study and analyze special cases (i.e. basic solution feasibility, cycling etc)

Literature

These two papers are a good introduction into the topic:

- *Simultaneous Solving of Linear Programming Problems in GPU* by Amit Gurung, Binayak Das, Rajarshi Ray: http://www.hipc.org/hipc2015/documents/HiPC-SRS-Paper/1570220654.pdf

- *Solving Batched Linear Programs on GPU and Multicore CPU* by Amit Gurung, Rajarshi Ray: https://arxiv.org/pdf/1609.08114.pdf

Qualified applicants are invited to send their electronic application to `cem@wi.tum.de`.