GPU activities at FI MUNI and their results

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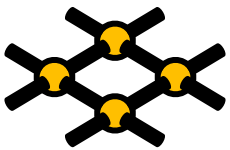
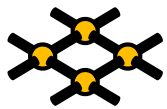
Laboratory of Advanced Network Technologies
MetaCentrum

CESNET



MetaCentrum

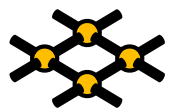


Grid Computing Seminar 2010

Praha, 2010–10–15

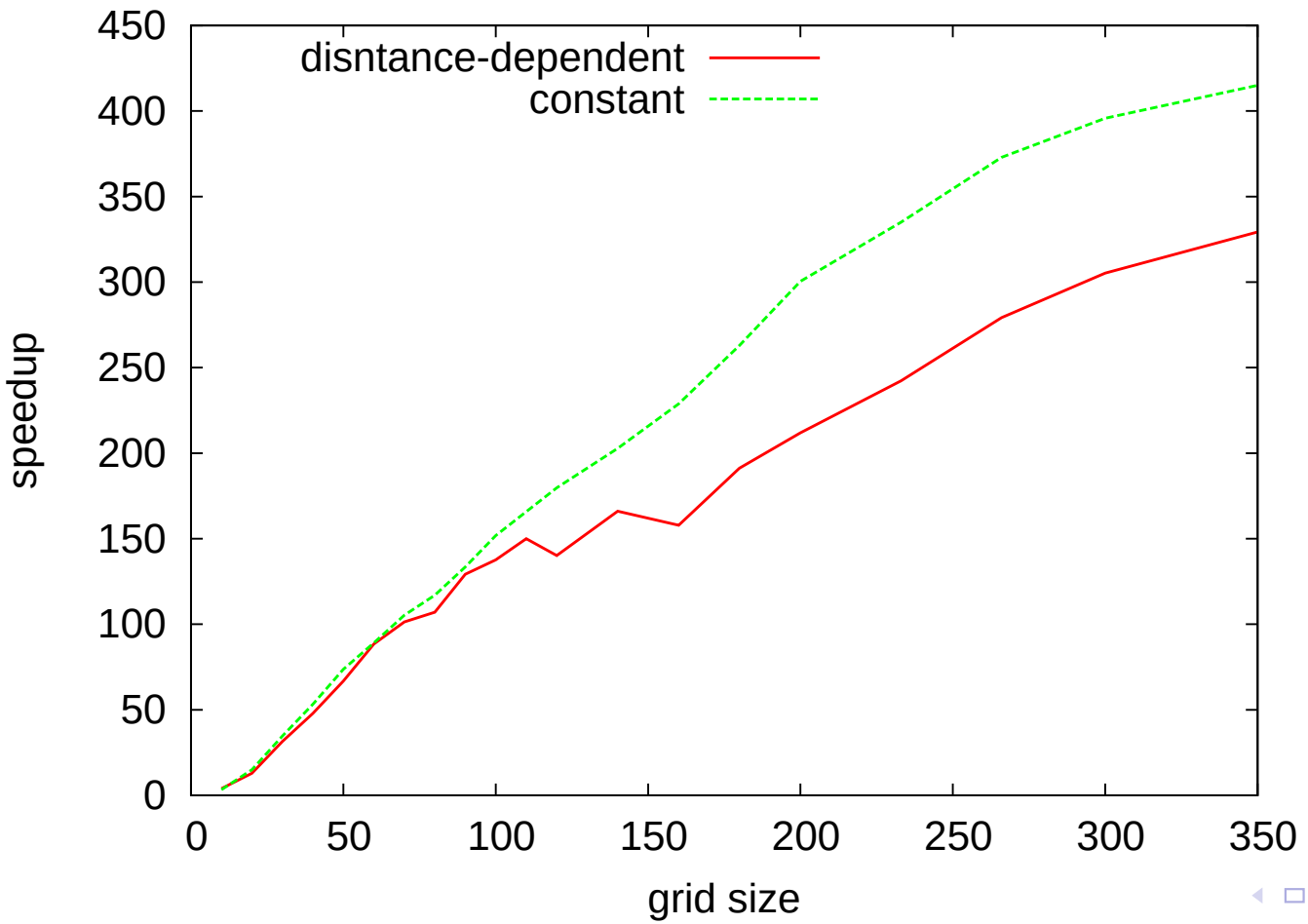
AutoGrid

- Potential maps generation for molecular docking
- The most computationally expensive parts accelerated on GPU
- CPU part analyzed and modified



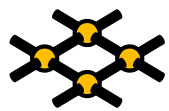
AutoGrid – Speedup

Accelerated design shows speedup of up to 400×



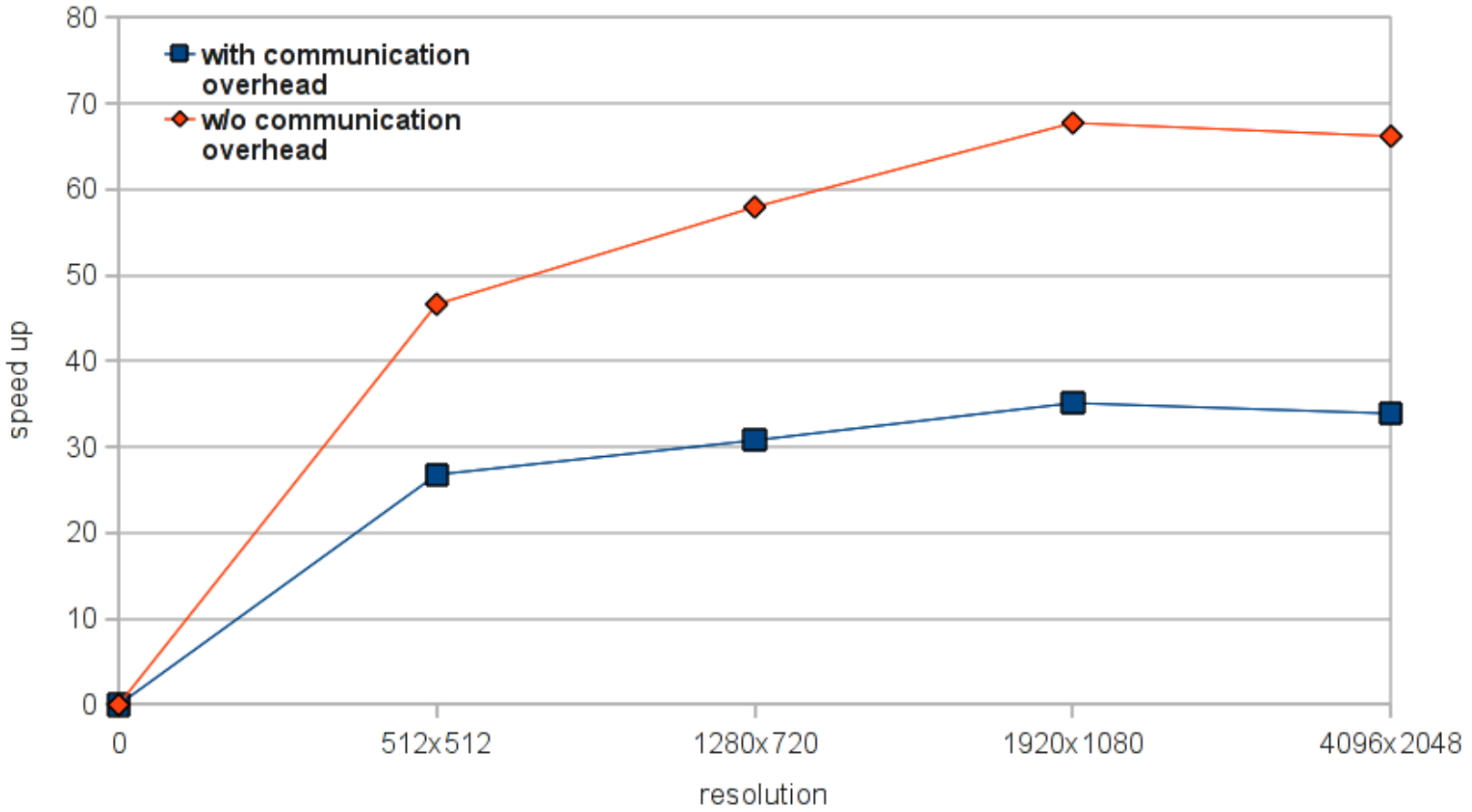
Discrete Wavelet Transform (DWT)

- Digital signal processing technique
- Application in diverse areas
  - digital speech recognition
  - multi-resolution video processing
  - data compression



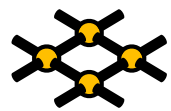
DWT – Speedup

Our GPU implementation shows 68× speedup

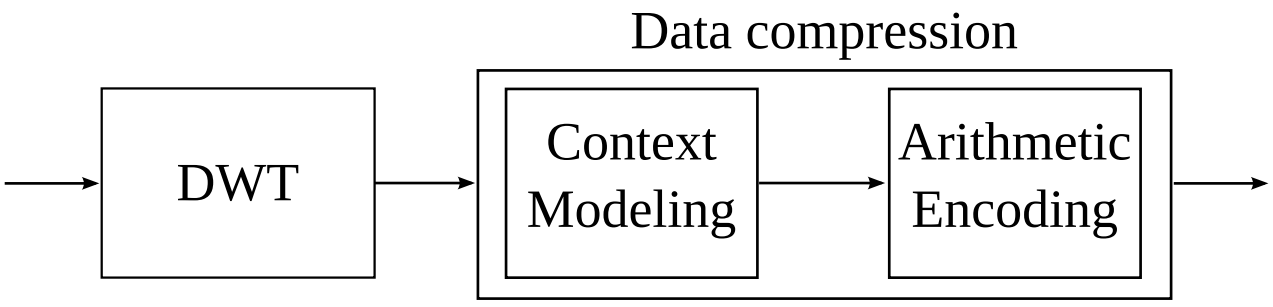


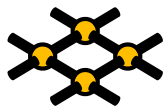
Real-Time Video and Fast Large-Scale Image Compression

- Ongoing project
- Real-time compression and transmission of video in HD post-HD resolutions
- Fast compression of pathological images of resolutions in order of gigapixels
- GPU acceleration of JPEG2000



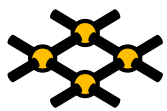
JPEG2000 compression process





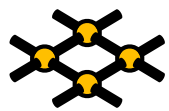
Context-Modeling in JPEG2000

- Serial algorithm
- Redesign to fit specifics of GPUs
- 12× faster compared to JasPer CPU implementation



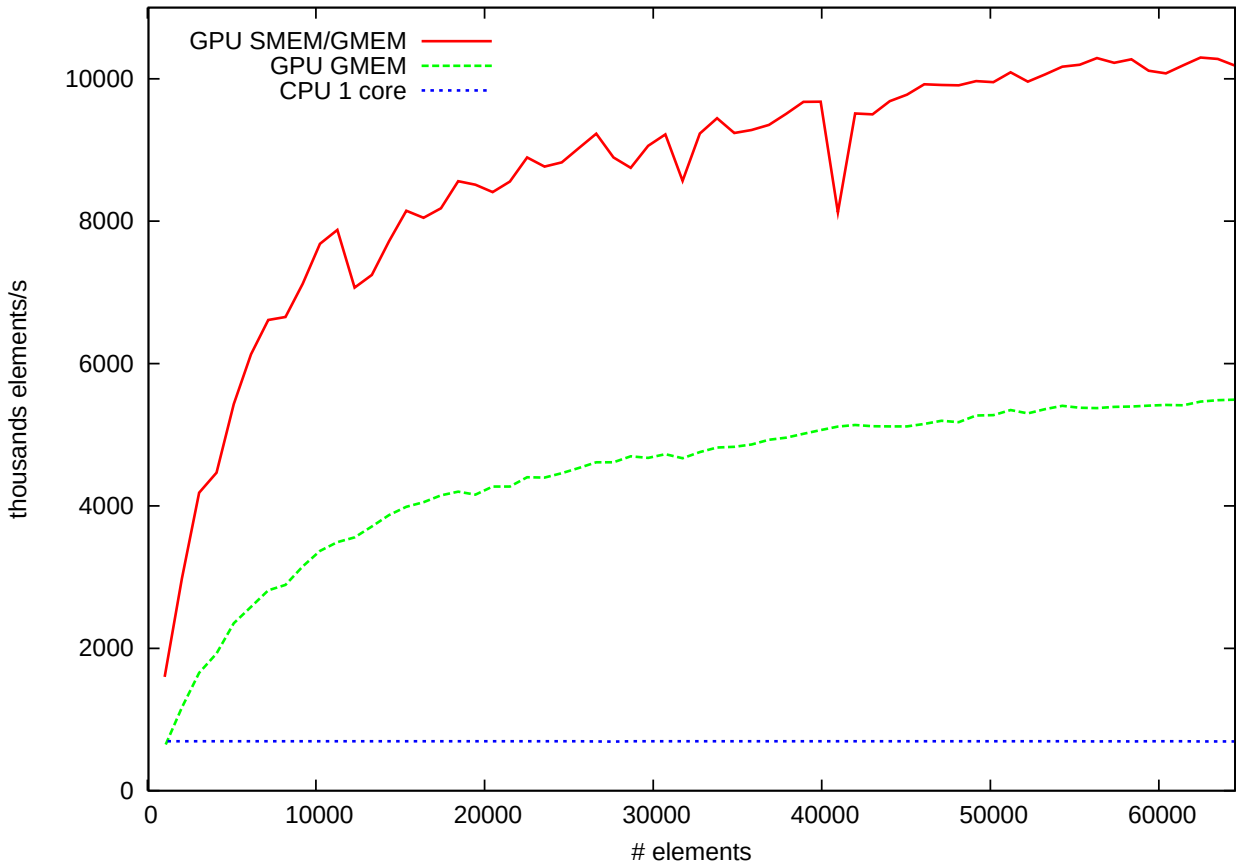
Soft tissues simulations

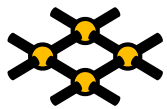
- Haptic surgical simulators
- Simulations modelled using Finite Element Method (FEM)
- FEM discretizes the modeled object as a mesh of elements
- Per element computation and system of equations solving
- Per element computation is complex problem so that it needs to be decomposed into several GPU functions
- Not easy to choose decomposition granularity
- Manual development of as small functions as possible
- Automatic fusion into lager functions



Preliminary performance gain of fusion

80% gain compared to non fused approach





Thank you for you attention!

Q?/A!

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