

Non-linear FEM solvers on accelerator devices

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Solvers for linear system of equations have been accelerated by many-core hardware already in the past. As soon as discrete PDEs with time dependent or non-linear system matrices have to be investigated the acceleration of the overall code decreases rapidly. In these cases also matrix calculations and assembling have to be performed in the fast memory of the accelerator device.

We will present our all-in-one approach for non-linear elasticity problems in the framework of cardiovascular simulations. The achieved speedup in comparison to one CPU core ranges from 400 for the pure element matrix calculations to a factor of 10-30 for the overall non-linear solver. In case of a deforming geometry we present a mesh smoothing algorithm based on radial basis functions that is perfectly parallelizable on GPUs.

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