Development of a Highly Parallel BEM-Solver

Christ, Robin (School: Lessing Gymnasium Lampertheim)

Nowadays, Virtual Prototyping and therefore simulation technology is an indispensable part of most product development cycles. The steadily increasing demand for better, cheaper and more reliable products requires state-of-the-art simulation software to keep up with the competition. While the Boundary Element Method (BEM) is a great advantage over the Finite Element Method (FEM) in certain situations, there is still room for improvement implementation-wise. 1 tested the hypothesis that the BEM will profit from being implemented on a massively parallel architecture. Compared to FEM on a single CPU (16C@3.4GHz), the BEM implementation running on the CPU and 4 GPUs(4096 CUs) achieved a 7500x speedup factor, while the difference between the analytical solution and the numerical BEM solution was negligible (<0.1dB). The study showed that the BEM is inherently suitable for a scalable and highly parallel implementation. Furthermore, the advantage of higher-order elements over the classical constant elements was demonstrated.

Awards Won:
Third Award of $1,000