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Computational Steering in Dynamic Structure Simulation: An Improved Communication Concept

Abstract:
This paper describes the current state in the development of a computational steering framework that couples a visualisation front-end and an analysis back-end running independently of each other for interactive simulations from various fields of engineering and science. The objective of our software development is the realisation of a "Human-in-the-Loop" scenario that supports comprehension and intuition when exploring modelled complex natural systems. The special focus of this framework is on an improved communication concept for intensive data exchange between simulation and visualisation. The framework includes an object-oriented pde-solution kernel based on the Finite Element Method, a high-performance 3D graphics user interface and a coupling platform. The development of the point-to-point communication concept among the participating processes is based on the Remote Direct Memory Access RDMA support of the MPICH2 implementation. The usability of the framework is demonstrated with a dynamic structure simulation that is used to reduce the perception of vibration and to optimize comfort and well-being in buildings due to dynamic machine loading.

Stichworte:
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