Computational Steering: Interactive High Performance Computing in Engineering Sciences

Despite many powerful developments in high performance computing and computer visualization most available engineering software still follows the classical way of a strict separation of preprocessing, computing and postprocessing. This lecture will present a new approach for computational steering, where user-interaction is directly integrated with high performance computing. Suitable numerical methods like the Lattice Boltzmann method for fluid dynamics and the newly developed Finite Cell Method for structural mechanics are briefly discussed. Several model scenarios are demonstrated, including an indoor airflow simulation and an interactive simulation of a hip implant based on quantitative computer-aided tomography of a human femur.