Development of an immersed boundary method implemented on cluster and grid computers, application to the swimming of fish

Project leaders
C Vuik

Research theme
Complex dynamics of fluids

Participants
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Cooperations
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Funded
TUD (DCSE)
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Start of the project
2006

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Project Aim

Devopment of Numerical Methods for Gridcomputing Application to simulation of swimming of fish.

Progress

The project started at the end of 2006. Two implementations of the preconditioned Conjugate Gradient method for solving large sparse linear systems of equations on a (local) heterogeneous computing grid were studied, using GridSolve as grid middleware. This was applied to a 3D bubbly flow problem. Then we experimented with using an asynchronous parallel iterative algorithm as a preconditioner with promising results, again using GridSolve. This approach/technique was then implemented in the CRAC middleware, which allows for direct communication between the processes. Experiments using the CRAC implementation were conducted on the DAS-3 supercomputer, which is a cluster of five geographically separated clusters. Initial tests with asynchronous deflation techniques were also conducted, with promising results.

Dissertations

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Scientific Publications

1. T.P. Collignon and M.B. van Gijzen. Solving Large sparse linear systems efficiently on grid computers using an Asynchronous iterative method as preconditioner. Delft University of Technology, Reports of the Department of Applied Mathematical Analysis, report 08-08.
2. T.P. Collignon, M.B. van Gijzen. Parallel scientific computing on loosely coupled networks of computers. Submitted to: Advanced Computational Methods in Science and Engineering, LNCS (book chapter).