

Holtwick, S.; Ganzenmüller, S.; Hipp, M.; Pinkenburg, S.; Rosenstiel, W.; Ruder, H.
Object-oriented framework for parallel smoothed particle hydrodynamics simulations. (English) [Zbl 1310.76146](#)

Shokin, Yuri (ed.) et al., Advances in high performance computing and computational sciences. The 1st Kazakh-German advanced research workshop, Almaty, Kazakhstan, September 25 – October 1, 2005. Berlin: Springer (ISBN 3-540-33864-0/hbk). Notes on Numerical Fluid Mechanics and Multidisciplinary Design (NNFM) 93, 151-167 (2006).

Summary: Smoothed Particle Hydrodynamics (SPH) is a widely spread method in scientific computing. It is a grid-free method for particle simulations. Most of the existing implementations are written in FORTRAN and C and therefore difficult to maintain and to extend. Here we describe the design and the implementation of a parallel object-oriented framework for particle simulations written in C++. The key features of sph2000 are easy configurability, good extensibility and the constantly expanding range of applications. The use of design patterns lead to an efficient and clear design, simplifying further algorithmic and methodical modifications and extensions. Advances made in the field of hybrid parallelization improve the efficiency and the portability of parallel applications. In addition the implementation of parallel I/O enhanced the performance significantly. The method was also upgraded by concepts to permit the simulation of compressible problems with free surfaces like spray atomization and to consider surface tension in these simulations.

For the entire collection see [\[Zbl 1097.76004\]](#).

MSC:

[76M28](#) Particle methods and lattice-gas methods

[68N19](#) Other programming paradigms (object-oriented, sequential, concurrent, automatic, etc.)

Cited in 1 Document

Software:

[sph2000](#); [Cactus](#); [POOMA](#); [TPO++](#)

Full Text: [DOI](#)