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**Fluid Simulation in the Movies: Navier and Stokes Must Be Circulating in Their Graves**

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Fluid simulations based on the Incompressible Navier-Stokes equations are commonplace computer graphics tools in the visual effects industry. These simulations mostly come from custom C++ code written by the visual effects companies. Their significant impact in films was recognized in 2008 with Academy Awards to four visual effects companies for their technical achievement. However artists are not fluid dynamicists, and fluid dynamics simulations are expensive to use in a deadline-driven production environment. As a result, the simulation algorithms are modified to limit the computational resources, adapt them to production workflow, and to respect the client's vision of the film plot. Eulerian solvers on fixed rectangular grids use a mix of momentum solvers, including Semi-Lagrangian, FLIP, and QUICK. Incompressibility is enforced with FFT, Conjugate Gradient, and Multigrid methods. For liquids, a levelset field tracks the free surface. Smooth Particle Hydrodynamics is also used, and is part of a hybrid Eulerian-SPH liquid simulator. Artists use all of them in a mix and match fashion to control the appearance of the simulation. Specially designed forces and boundary conditions control the flow. The simulation can be an input to artistically driven procedural particle simulations that enhance the flow with more detail and drama. Post-simulation processing increases the visual detail beyond the grid resolution. Ultimately, iterative simulation methods that fit naturally in the production workflow are extremely desirable but not yet successful. Results from some efforts for iterative methods are shown, and other approaches motivated by the history of production are proposed.