

Fluid Effects in Digital Content

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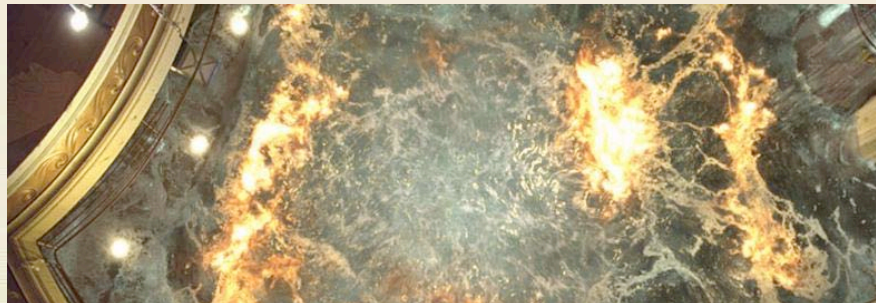
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What are fluid effects?

- Computer graphics technology to generate fluid animations for visual effects in digital content such as movies, animations and games.
- Fluids include water, fire and smoke.



Physically-based fluids animations

- Make use of numerical solution of Navier-Stokes equation, the governing equation of fluids
- Advantages
 - Physically based animations look so realistic because they obey the governing physics.
 - Can save much money and time spent for constructing physical settings including fluids.
 - Safe handling of dangerous fluids like flood, tsunami, fire and explosion.

Our ongoing project

- ETRI has been developing a fluid simulation package for digital content generation together with CSIRO for a last couple of years.
- The main goals of the project are
 - to have a highly accurate fluid simulator acceptable for photo quality digital content generation
 - to allow users to make and insert fluids effects in digital content as easily as possible

* CSIRO : Commonwealth Scientific and Industrial
Research Organization, Australia



Our ongoing project(cont.)

- Some technical issues :
 - Stability and speed rather than physical accuracy in many situations
 - Controllability : Many users want to give a subtle control over the motion of fluid even if the resulting motion is not feasible in the sense of physics.
 - Large scale simulation and rendering

Particle based fluid simulator

- Our fluid simulator is based on a particle method, called SPH(Smoothed Particle Hydrodynamics).
- Strength
 - Mesh free Lagrangian method : Mass and Momentum are well preserved.
 - Easy coupling with other physics such as solid dynamics
 - Effective simulation of small scale features of fluid : bubble, foam and spray

Results

- Flood 1 :



Results(cont.)

- Flood 2 :



Results(cont.)

- Beer :



Results(cont.)

- Astronaut :



Future works

- Future works will be
 - More sophisticated and faster fluid simulator with higher accuracy and reliability capable of supercomputing
 - Highend post-processing of simulation for better renderings
 - Simplified highly optimized fluid simulator for interactive and online applications

Thank you.