Final Presentation

Suspended Particle Explosions

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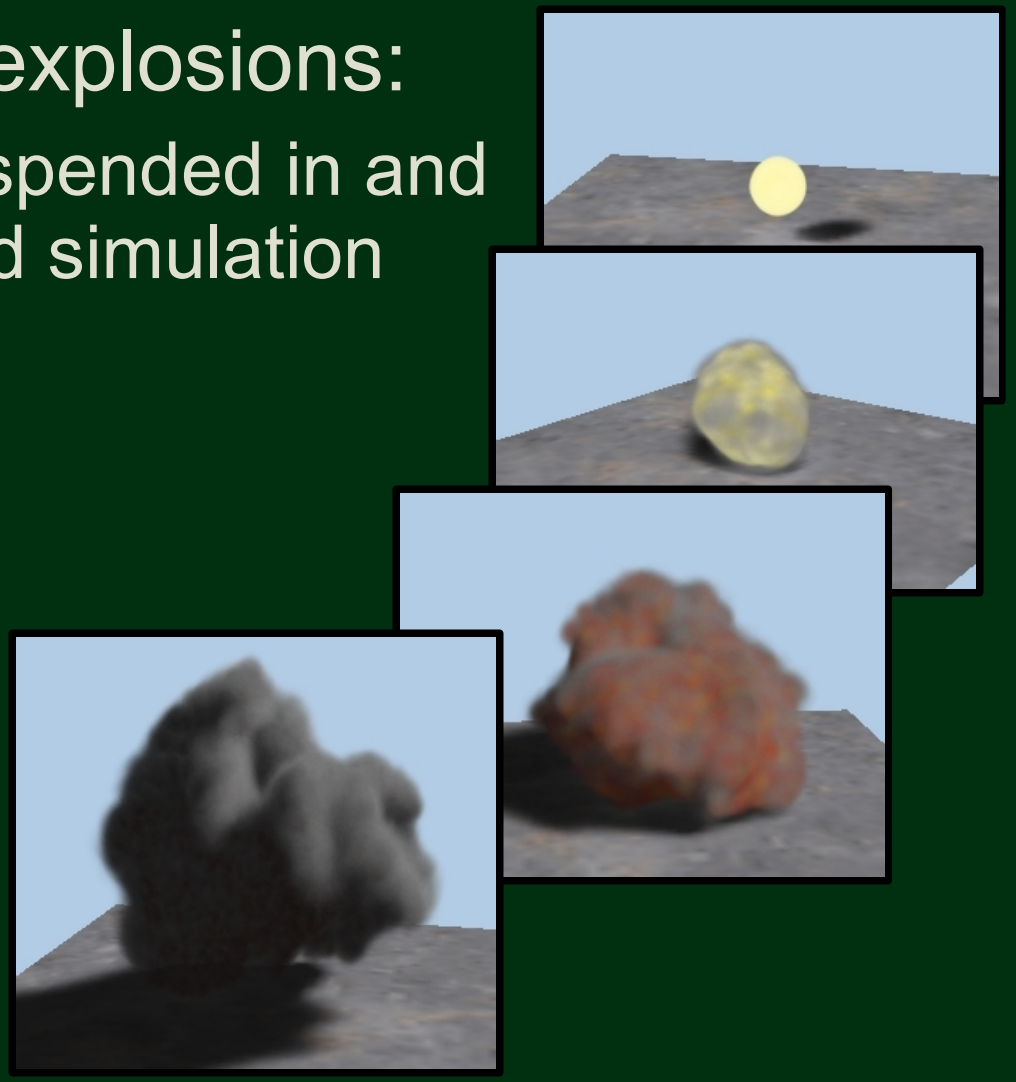
Outline

- Introduction
- Fluid Simulation
- Particle Simulation
- Shadows and Light
- Improvements
- Demo videos

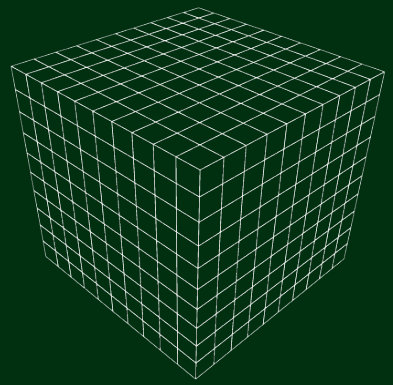
Introduction

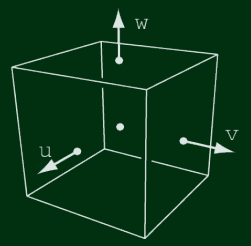
- Suspended particle explosions:
  - A particle system suspended in and interacting with a fluid simulation



Fluid Simulation

- Discretization into identical cells
- Velocity components defined on the corresponding faces
- Other values defined at the cell center (pressure, temperature etc)
- Timestep consists of:
  - Advection: Transports all properties along the currents.
  - Projection: Forces the velocity field to be mass conserving.



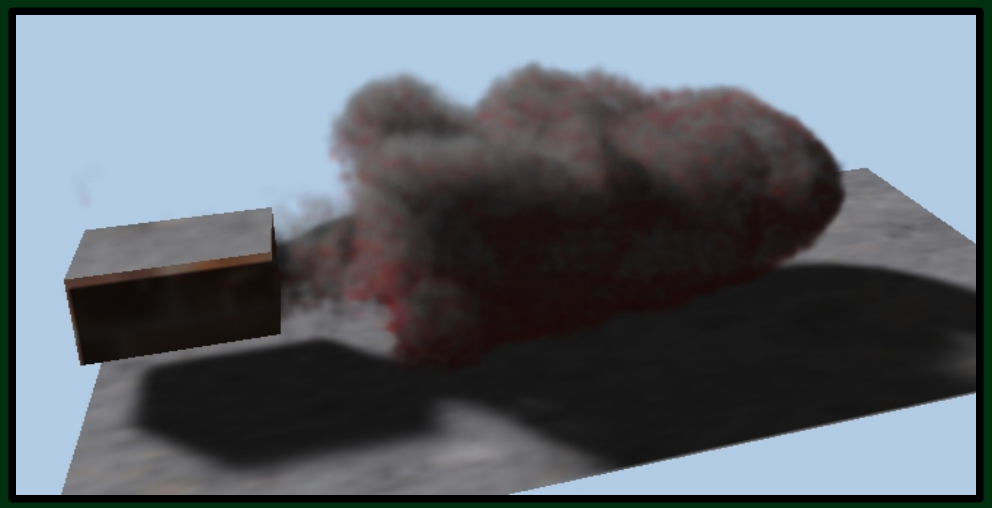


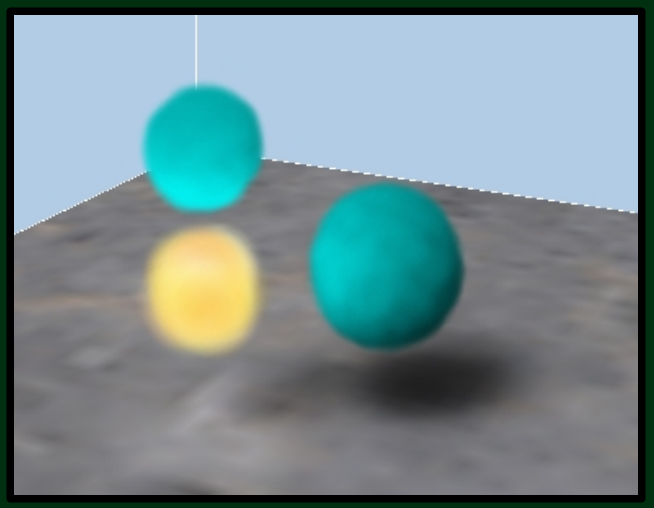
Particle Simulation

- All particles have the properties one would expect: position, speed, mass, temperature and many more...
- Particles interact with the fluid by exchanging heat and forces
- The particles “swim” in the fluid

Shadows and Light

- Deep shadow map approach:
  - Scalar field holds the matter distribution
  - Occlusion is computed for every cell, from that we calculate the amount of light reaching the cell





Improvements

- Porting the simulation to the GPU would likely increase speed
- The rendering might be improved with ray tracing techniques
- Appearance of the Explosions could be modeled closer on real explosions, matching color and other properties to photographs/videos

Demo

Questions?