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Project Topic: Multiple Interacting Liquids

Reference:

Multiple Interacting Liquids by Frank Losasso, et al

Fluid Simulation (SIGGRAPH 2007 course notes) by Robert Bridson, et al

Directible photorealistic liquids. In Proc. of the 2004 ACM SIGGRAPH/Eurographics Symp. on Comput. Anim., 193–202.by RASMUSSEN,

,et al

Abstract:

The paper we are going to implement proposes an approach that extends the level set method to simulating the interaction of multiple liquid and the interaction between liquids and surface of specific material, based on surface tension or more complex chemical reaction. This paper uses a separate level set method for each region and a novel projection algorithm that translates the resulting vector of level set values to the standard single-valued level set representation. We plan to implement the standard level set method first and then extend it to the method described in this paper. Then we plan to use the modified level set method to simulate multiple liquids interaction.

Main Techniques:

* Multiple Level Set
  + Each level set function is independently evolved in time. The level set functions are fixed by removing overlaps and vacuums while preserving an accurate interface location.
  + Projection method: this projection method computes the average value of the two level set functions and subtracts this average from both of them. So at points the two level sets intersect, their average equals their individual values. In this way subtracting off their averages sets them both to zero preserving the interface location.
  + Particle Level Set Method: each level set has an associated set of particles that are seeded near the boundary of its interior region.
* Multiple Liquid
  + Main Equation: Poisson Equation, which is separable so we can consider each dimension independently.
  + Viscosity: used to stress tensor for incompressible fluid, implemented with the method discussed in Directible Photorealistic Liquids by Rasmussen et al.
  + Viscoelasticity: incorporated by adding the viscoelasticity term to Navier-Stokes equations.