Position-Based Viscoelastic fluid simulation

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Abstract:

Deformable material has become an active area in animation. A huge number of techniques have been explored for achieving a large deformation in a more plausible result. Particle-based representation has its natural advantage for describing reasonable deformation. Specifically, deformable materials are supposed to be treated as continuous flow for more realistic behaviour. Thus research of non-Newtonian fluid has become a popular area as an alternative solution. Most of these approaches are built upon existing fluid simulation. Among all the fluid simulation, Position-Based-Dynamic fluid is a novel method which has a better control over particles but in less complex level.

This dissertation explored the viability of a new method for viscoelastic fluid building upon PBD fluid model. Two possible approximations (spring and strain tensor) were implemented for viscosity and elasticity behaviours. The full implementation was simulated on GPU platform with visualisation. The results showed that spring model does not fit the PBD, but that strain tensor model works partially. The limitations and reasons were deeply discussed in many aspects.

The demo video is at https://youtu.be/X-htZlUCS8k
The source code of simulation and math library test is at https://github.com/YuanqiH/PositionBasedViscoealsticFluid