Unified Particle Physics for Real-Time Applications

Bailey Allen



Summary

The goal of this paper was to develop a framework for producing 'real-time visual effects' using particles to represent objects. This allows many different objects and effects to be simulated using a single 'solver' or algorithm, as all contacts and collisions between objects is handled through their particles.

The goal is to show how this method can be used to simulate many different types of objects such as rigid bodies, gases, liquids, cloth, as well as interactions between the objects, without sacrificing efficiency and maintainability of the system.

Key Points

- The system employed by the paper is a unified solver, which is designed to simulate many different objects in the same system. A particle based system allows many different object types to be created with little added effort. It also allows for object types to be merged to create new effects such as melting and bending.
- Using a particle based system allows the algorithm to use a parallel solver. This is more efficient for real-time rendering as it is able to utilise all GPU cores, unlike a more serial algorithm would.
- Because collisions are handled at the particle level, it means interactions between different object types are automatically handled. This means effects like buoyancy and squishing do not need to be manually implemented into the system.

Questions

- 1. What uses would you see for this software in every day computing?
- 2. What other improvements could be made to increase performance or usability?
- 3. What other effects could be implemented using this system?

Paper by: M. Macklin, M. Müller, N. Chentanez, T.Y. Kim