Interactive and Reliable Collision Detection

COMPUTER SCIENCE

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Goals

Our goal is to develop interactive and reliable collision detection algorithms:

- All collision queries must be done in a few milliseconds
- We don't want to miss any collisions during the simulation

We have developed two approaches:

Sweep-based Algorithms

Parametric representation of blood vessels



- Continuous collision detection between triangulated models
- Sweep-based collision detection for tube-shaped objects

Continuous Collision Detection



Tight rounding error bound



Bounding volume hierarchy



Results

Benchmarks





- Perform collision detection queries between sweep-based models in a few milliseconds
- Tight fitting bounding volume hierarchy computation



Benefits

- Can perform CCD queries between complex models in a few milliseconds
- Can be parallelized on multicore CPUs and manycore GPUs \bullet
- Reliably queries all configurations and w.r.t numerical issues
- More than an order of magnitude faster than prior methods
- Used for cloth and FEM simulations

- Low memory requirements
- Used for realtime animation of deformable models

Acknowledgements

- Continuous Collision Detection was done with external collaborators: Zhendong Wang, Min Tang and Ruofeng Tong from Zhejiang \bullet University
- Sweep-based Algorithm was done with external collaborators:
- Minsub Shim, Seon-Young Park, Yunku Kang and Myung-Soo Kim from Seoul National University







