

Intro to building a physically based simulator

These course notes are an excellent introduction to writing a physically based simulator:

Andrew Witkin and David Baraff, "Physically Based Modeling: Principles and Practice," Siggraph '97 Course notes. <http://www.cs.cmu.edu/~baraff/sigcourse/>

You can find a description of how to handle rigid body contact using impulses here:

Guendelman E, Bridson R, Fedkiw R. Nonconvex rigid bodies with stacking. In ACM Transactions on Graphics (TOG) 2003 Jul 27 (Vol. 22, No. 3, pp. 871-878). ACM.
https://graphics.stanford.edu/papers/rigid_bodies-sig03/

You can find a clear writeup about the spring mass system's behavior and a reminder for how to solve those differential equations here:

Allen, Brian F., and Petros Faloutsos. "Misconceptions of PD control in animation." In *Proceedings of the ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 231-234. Eurographics Association, 2012. <http://dl.acm.org/citation.cfm?id=2422389>

We talked about this paper, which talks about particle simulation with constraints and Verlet integration in the context of simulating rag doll characters for the game Hitman.

Jakobsen, Thomas. "Advanced character physics." In Game Developers Conference, pp. 383-401. 2001. http://www.gotoandplay.it/_articles/2005/08/advCharPhysics.php

This paper has a good practical discussion about different integrators and discusses the design decisions behind Maya nCloth, nParticle, etc.

Stam, Jos. "Nucleus: Towards a unified dynamics solver for computer graphics." In *Computer-Aided Design and Computer Graphics, 2009. CAD/Graphics' 09. 11th IEEE International Conference on*, pp. 1-11. IEEE, 2009. <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5246818>

Some Simulation References

Fortunately, there are many good simulation engines out there. You do not have to write your own! Here are some references to get you started.

Open Dynamics Engine <http://www.ode.org/>

Bullet Physics Library <http://bulletphysics.org/wordpress/>

Also check out this SIGGRAPH 2011 course: <http://bulletphysics.org/siggraph2011/>

Karen Liu's RTQL8 <http://www.cc.gatech.edu/~karenliu/RTQL8.html>

Karen Liu's DART <http://dartsim.github.io/>

Emanuel Todorov's MuJoCo has apparently not yet been released? <http://www.mujoco.org/>

Box2D <http://box2d.org/>

Gazebo <http://gazebosim.org/>