

Introduction to Networked Physics

Three ways to network a physics simulation

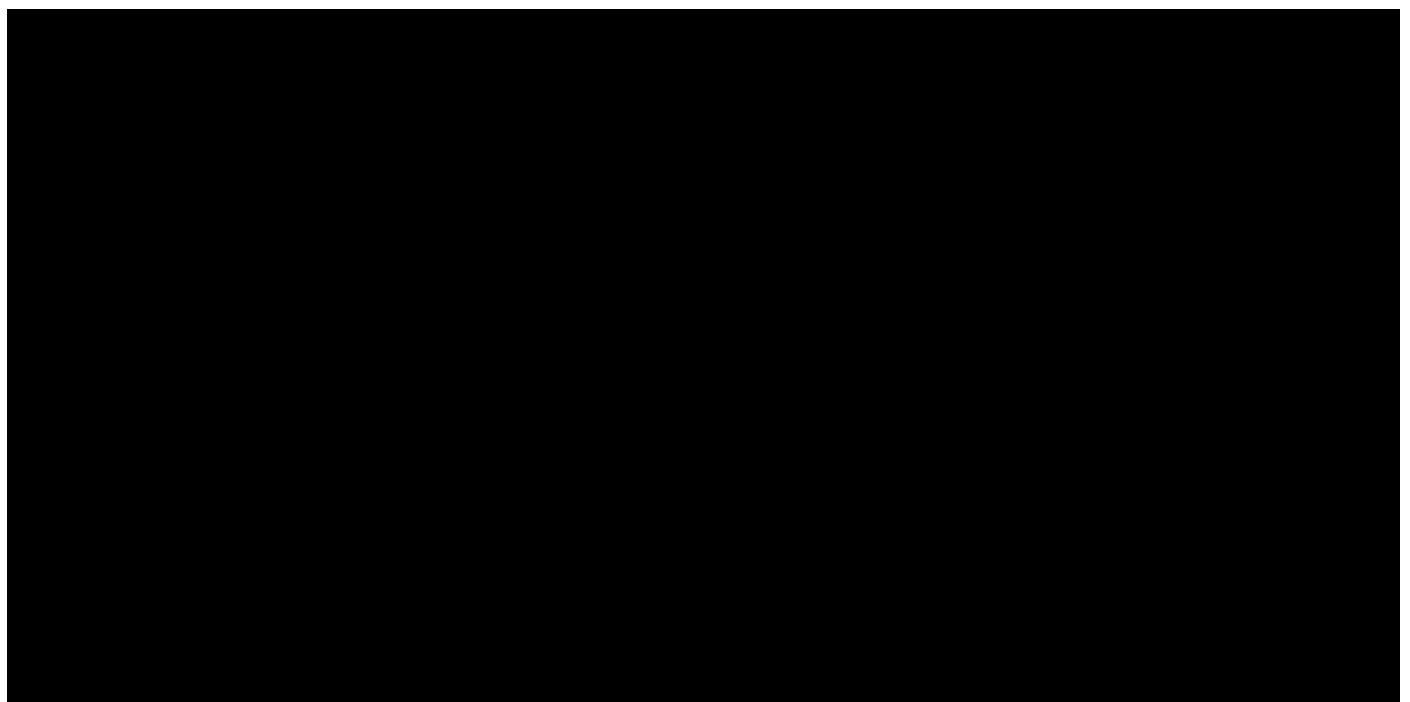
Posted by Glenn Fiedler (<http://web.archive.org/web/20181107181501/https://gafferongames.com/about>) on Friday, November 28, 2014

Introduction

Hi, I'm [Glenn Fiedler](http://web.archive.org/web/20181107181501/https://gafferongames.com/about) (<http://web.archive.org/web/20181107181501/https://gafferongames.com/about>) and welcome to the first article in **Networked Physics** (<http://web.archive.org/web/20181107181501/https://gafferongames.com/categories/networked-physics/>).

In this article series we're going to network a physics simulation three different ways: deterministic lockstep, snapshot interpolation and state synchronization.

But before we get to this, let's spend some time exploring the physics simulation we're going to network in this article series:



Here I've setup a simple simulation of a cube in the open source physics engine [ODE](http://web.archive.org/web/20181107181501/http://www.ode.org/) (<http://web.archive.org/web/20181107181501/http://www.ode.org/>). The player moves around by applying forces at its center of mass. The physics simulation takes this linear motion and calculates

https://gafferongames.com/post/introduction_to_networked_physics/ Go

AUG NOV DEC

10 captures

11 Oct 2017 - 7 Nov 2018

2017 2018 2019

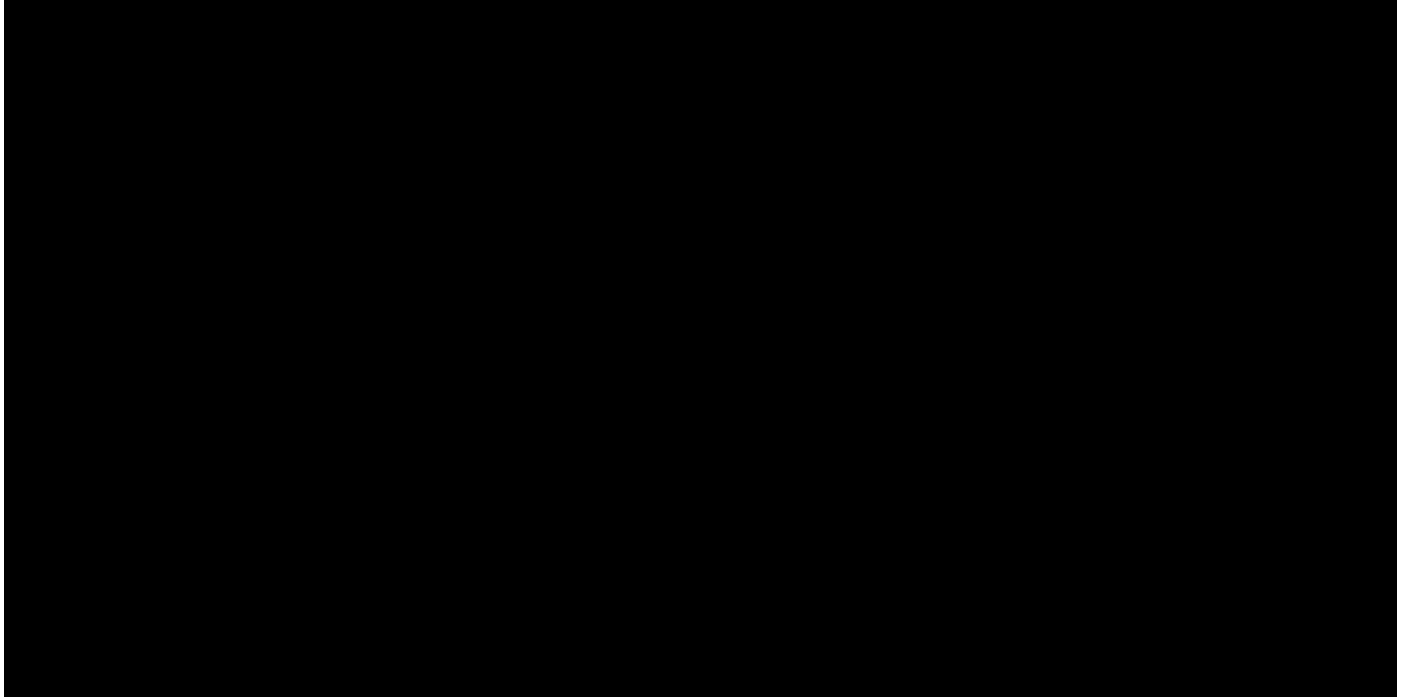
About this capture

This is why I chose a cube instead a sphere. I *want* this complex, unpredictable motion because rigid bodies in general move in interesting ways according to their shape.

An Interactive World

Networked physics get interesting when the player interacts with other physically simulated objects, *especially* when those objects push back and affect the motion of the player.

So let's add some more cubes to the simulation:



When the player interacts with a cube it turns red. When that cube comes to rest it turns back to grey (non-interacting).

While it's cool to roll around and interact with other cubes, what I really wanted was a way to push *lots* of cubes around. What I came up with is this:



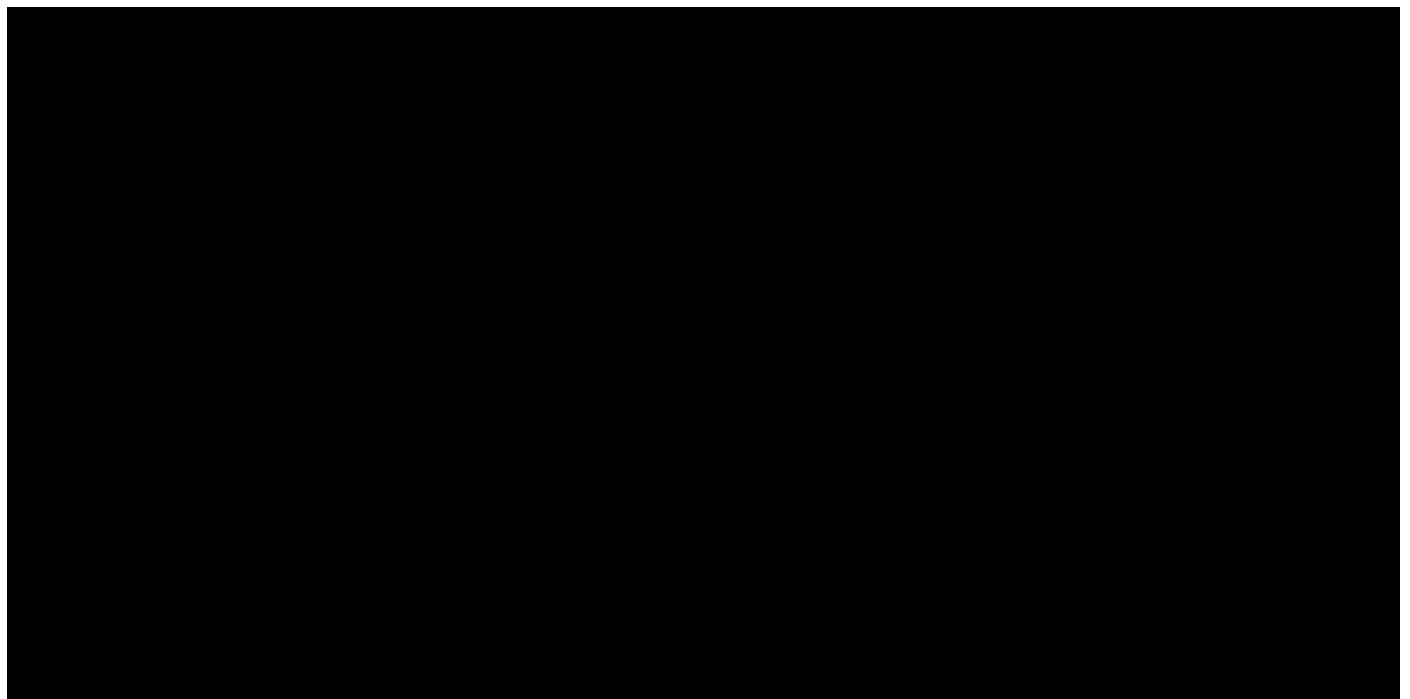
As you can see, interactions aren't just direct. Red cubes pushed around by the player turn other cubes they touch red as well. This way, interactions fan out to cover all affected objects.

A Complicated Case

I also wanted a very complex coupled motion between the player and non-player cubes such they become one system: a group of rigid bodies joined together by constraints.

To implement this I thought it would be cool if the player could roll around and create a ball of cubes, like in one of my favorite games Katamari Damacy.

(http://web.archive.org/web/20181107181501/https://en.wikipedia.org/wiki/Katamari_Damacy).



https://gafferongames.com/post/introduction_to_networked_physics/ Go

AUG NOV DEC
07
2017 2018 2019

10 captures
11 Oct 2017 - 7 Nov 2018


About this capture


the original game.


This is a very difficult situation for networked physics!

NEXT ARTICLE: Deterministic Lockstep

(http://web.archive.org/web/20181107181501/https://gafferongames.com/post/deterministic_lockstep/)

 (<http://web.archive.org/web/20181107181501/https://www.linkedin.com/in/glennfiedler/>)

 (<http://web.archive.org/web/20181107181501/https://twitter.com/gafferongames>)

 (<http://web.archive.org/web/20181107181501/https://github.com/gafferongames>)

Copyright © Glenn Fiedler, 2004 - 2018