N-body Project
Phys 512 Computational Physics

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1 Intro

I did the regular n-body project with two twists.

1. I used the 2-dimensional gravitational force. So the force goes like $\frac{1}{r}$ and the potential goes like $\log(r)$.

2. I have two different kinds of particles. They're labeled particles A and particles B. They act on each other according to the following sign table:

	A	B
A	-	-
B	-	+

So A particles attract A. B and A particles attract each other. B particles repel each other. This will only show up when simulating a lot of particles and in the extra GIFs I'm including.

2 GIFs

In order to recreate these calculations, you need to call an initial condition function which gives the information about all the particles.

For the first GIF of a stationary particle, use the one_in_middle() initial condition.

For the GIF of the orbiting particles, use the two_particles_circle() initial condition. G_A (the gravitational constant relevant to the particles orbiting) was set to 0.1. (It needs to be set to this for the velocity to be correct.)

For the hundred thousand particles periodic and non periodic, use the mixOfBoth(1000000,0,"good seed", 1000) initial conditions. Note, I made the seed a string instead of a number because I thought that would be more fun. There's a bool variable called periodic that controls whether or not it's periodic. The energy pretty much doubles when the particles collapse. This could be because of too large timesteps. It's a similar result for nonperiodic.