Mechanics Simulations With JavaScript

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Physics Fall Semester Thesis

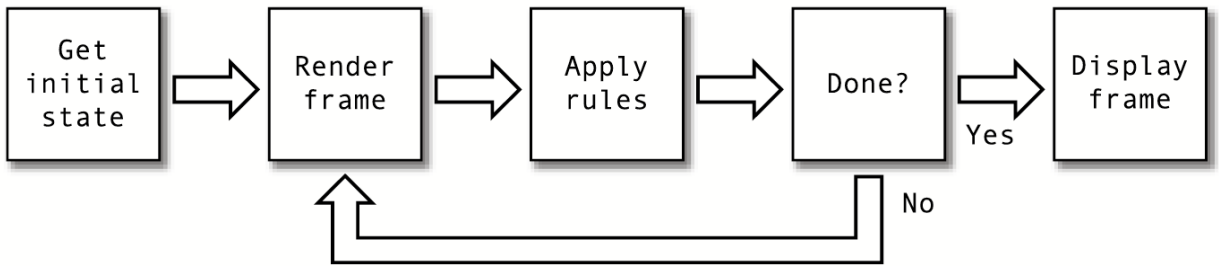
December 3, 2014

Overview - Why Did I Choose This Topic?

- I hope to use programming as a lens to view physics
- Examine mechanics in more detail
- Solve physics problems through simulations
- JavaScript high level language - viewable easily in web browser

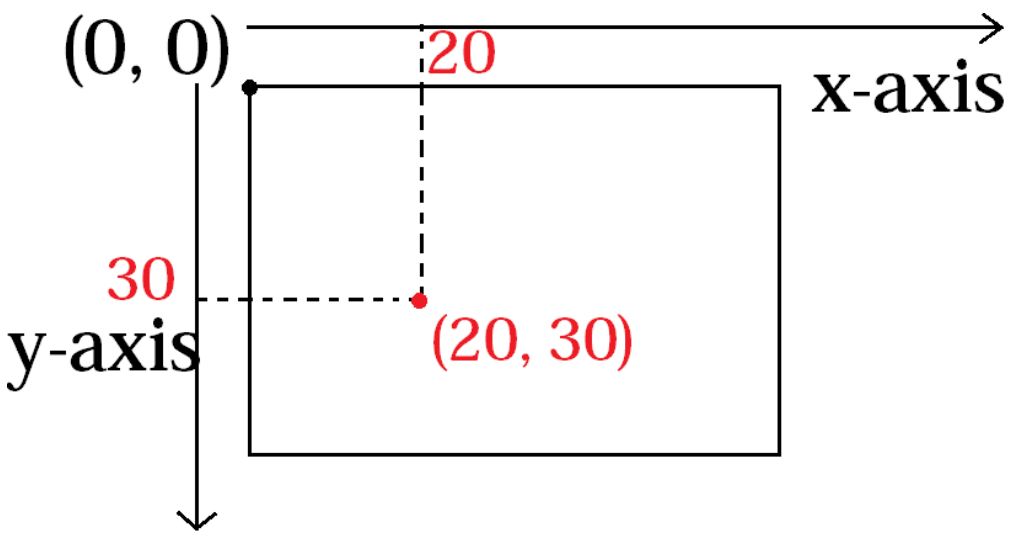
What is a simulation?

- Animation vs. Simulation
- Frames per second
- File size



Method of Basic Simulation

- HTML5 canvas application programming interface (API)
- Timer for each frame



Chapter 1: Basic kinematics and aerodynamic drag

- Three simulations
- Simulation #1: Basic bouncing ball
- Simulation #2: Bouncing ball with aerodynamic drag
- Simulation #3: Multiple bouncing balls

Simulation #1: Study of Fluid Dynamics

$$F_D = \frac{1}{2}\rho v^2 C_D A$$

- F_D = force of drag
- ρ = density of fluid
- v = speed of object relative to fluid
- C_D = drag coefficient (affected by texture, shape, viscosity, lift, etc)
- A = cross-sectional area of object

I will examine the drag coefficient in more detail and simulate various objects' flight path with different resistances.

Simulation #2: Study of Charged Particles in Magnetic Fields

Lorentz Force Law: $F = q\vec{v} \times \vec{B}$

I will examine situations where the magnetic field $\vec{B}$ isn't uniform.

Other physics topics I want to pursue: gyroscope, a complex astronomy simulation, rigid-body mechanics.

Thank You