Writing an ODE Solver

2-14-2011

Opening Discussion

- Do you have any questions about the reading?
- Do you have any questions about the assignment?
- Minute essay comments:
  - What language are we going to use for our ODE/PDE solvers? Existing solvers in other languages.
  - How would you code an ODE solver in C++?
  - Please no Quantum Harmonic Oscillators.
  - What did I use for the continuous parts of my simulations?

Hamiltonians

- The Hamiltonian, H(**p**,**q**), is the total energy for many systems.
- Let's run through the example of our harmonic oscillator.

$$\dot{p}_i = \frac{-\partial H}{\partial q_i}$$

$$\dot{q}_i = \frac{\partial H}{\partial p_i}$$

Implementing Integrators

- Let's go ahead and implement each of the three integrators that we talked about last time and give them each a little test.
  - Euler
  - 4^{th} order Runga-Kutta
  - 1^{st} order symplectic
- Test with harmonic oscillator and with a gravitational system.

Minute Essay

- Does it make a bit more sense to you how we would implement these different integrators?