Implicit Integration + Large Linear Systems

15-867: The Animation of Natural Phenomena

We can approximate implicit integration of a nonlinear system as follows. The integrator turns into a solution to a linear system. The key is the large sparse Jacobian matrix, df/dx.

The Jacobian is large, sparse, symmetric and positive definite. This allows us to solve this system with the conjugate gradient method.

Using the conjugate gradient method, we can now write down pseudocode for implicit integration. We only need:

- getState
- setState
- getDeriv
- multByJacobian
- conjugateGradient

Question: What is the Jacobian for three "beads on a wire" connected by undamped linear springs?