ENME 631 Numerical Methods

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The file "verlet.jl" runs all of code requested for Additional Homework #1. Explanation and comments below. Plots and code are attached.

The Solver:

I've constructed a verlet position integrator for n spatial coordinates. It works based on the process outlined in the additional notes Dr. Mohamad posted on D2l (section 7.5.4, "The Verlet Method"). The algorithm first calculates the position at time i+1 explicitly, using the position, velocity and accelerations from time i. Next, it calculates the velocity at time i+1 implicitly, in my case using a predictor-corrector method. My implementation works as follows:

1. Predict the velocity at time i+1 using the explicit first-order Euler method and the acceleration at the current time i
2. Corrects the velocity using equation 7.52 from the provided notes, averaging the accelerations from times i and i+1, where the acceleration at time i+1 is calculated using the predicted values of velocity.

Solving the sample problem:

As requested, the sample problem was solved for the time interval 0-10 seconds. Time steps smaller than the suggested value of 0.1 seconds did not noticeably change the solution. A slightly smaller timestep of 0.01 was used to remove visible jaggedness in the tight initial turns of the velocity curves.