

MATLAB - Spring-Mass System

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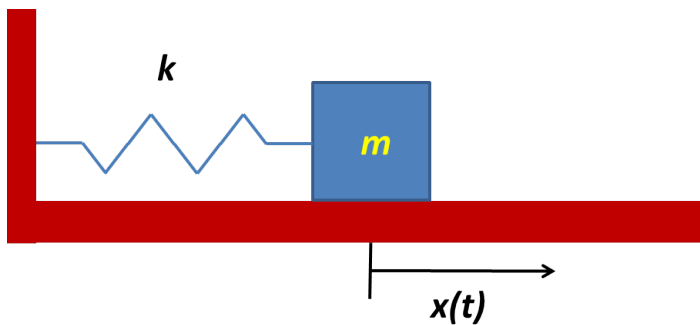
If you have never used MATLAB before, we recommend watching some of [these videos from The MathWorks](#), in particular the [Getting Started video](#). You can go through the videos either before or after completing this tutorial.

Spring-Mass Harmonic Oscillator in MATLAB

Created using MATLAB R2013a

Problem Specification

Consider a spring-mass system shown in the figure below.



Applying $F = ma$ in the x -direction, we get the following differential equation for the location $x(t)$ of the center of the mass:

$$m\ddot{x} + kx = 0$$

The initial conditions at $t=0$ are

$$x(0) = 1$$

and

$$\dot{x}(0) = \dot{v}(0) = 0$$

The first condition above specifies the initial location $x(0)$ and the second condition, the initial velocity $v(0)$.

We'll solve this differential equation numerically, i.e. integrate it in time starting from the initial conditions at $t=0$, using MATLAB. We'll use Euler's method to perform the numerical integration. Some other topics covered in this tutorial are:

- Making a plot of mass position vs. time and comparing it to the analytical solution
- Separating out the Euler's method in a MATLAB "function"
- Collecting multiple parameters in one box using "structures"

In the process, you'll be exposed to the following handy MATLAB utilities:

- Debugger to understand and step through code
- Code analyzer to check code
- Profiler to time code

[Go to Step 1: Euler Integration](#)

[Go to all MATLAB Learning Modules](#)