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clear

m = 100;   % mass of box
k = 1000;  % spring constant
c = 20;    % damping coefficient
L = 2;     % position of top of spring when r(t) = 0 and spring relaxed

dt = 0.001;
n=10000;

% program smooth road
r=zeros(n+1, 1);

p(1) = L;   % starting height of box
v(1) = 0;   % starting velocity of box
t(1) = 0;

% note: the equilibrium position for the box is when the spring force
% cancels gravity, that is when -(p - 0 - L)*k/m = 10, and that is
% p = -10*(m/k) + L

for i=2:n+1
 t(i) = t(i - 1) + dt;

  p(i) = p(i-1)+v(i-1)*dt;

  vr = (r(i) - r(i-1))/dt;   % estimate r' at t(i - 1)

  % force on box is from spring, damper, and gravity
  a = (-k*(p(i-1) - r(i-1) - L) - c*(v(i-1) - vr))/m - 10;

  v(i) = v(i-1) + a*dt;
end

plot(t, p)
```