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State-Space catcher thing

```
clear; close all
```

define vars

motor parameters

```
    Kt = 6.66;          % Nm/A torque constant based off BSM-50N-275 ABB
 servo
    %Kv = 1;            % back-emf constant (incase have this instead)
    L = .0332;          % H motor inductance
    r = 16;             % ohms  motor resistance
% physical parameters
    m1 = 3;             % kg mass of puck
    m2 = 5;             % kg mass of platform
    k = 18500;          % N/m mechanical spring element
    b1 = 500;          % Ns/m
    J = 11240;          % kgm^2 moment of inertial
    b2 = 60*.02;        % Ns/m bearing friction
    rWheel = .025;      % m  drive wheel radius
% transformer
    TFrp = rWheel;        % transformer translation to rotation
    TFmotor = Kt;         % transformer rotation to electrical

% stuff
TFelement = (b1*TFrp^2*TFmotor)/(J*TFmotor*m2*TFrp^2*TFmotor); %
 calculating elements in A
dt=.001;
t = 0:dt:.3;  % time array
```

define matricies

```
x0 = [...
    2.445;... % Vm1
    0;... % Vm2
    0;... % Fk
    0;];  %iL
A = [...
    -b1/m1, b1/m1, -1/m1,0;...
```

```
    TFelement, -TFelement, TFelement, TFelement/(TFrp*TFmotor);...
    k, -k,0,0;...
    0,0,0,-r/L;];

B = [...
    0;...
    0;...
    0;...
    1/L];
C = [1,0,0,0];
D = 0;
```

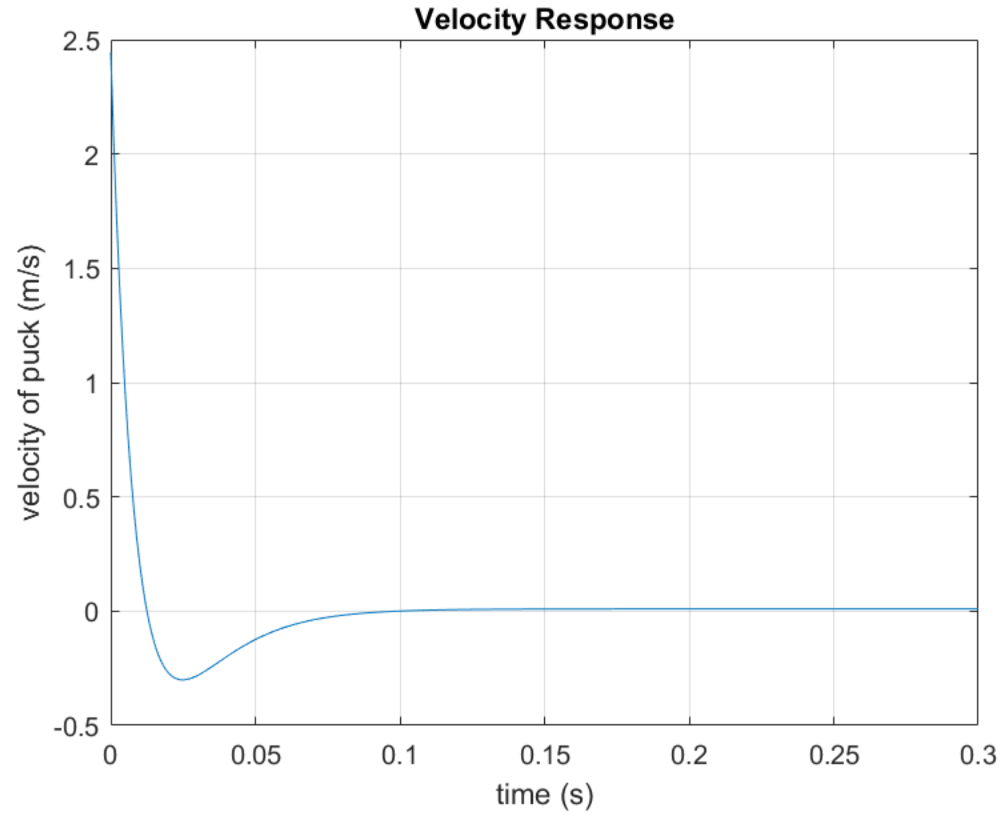
create state-space

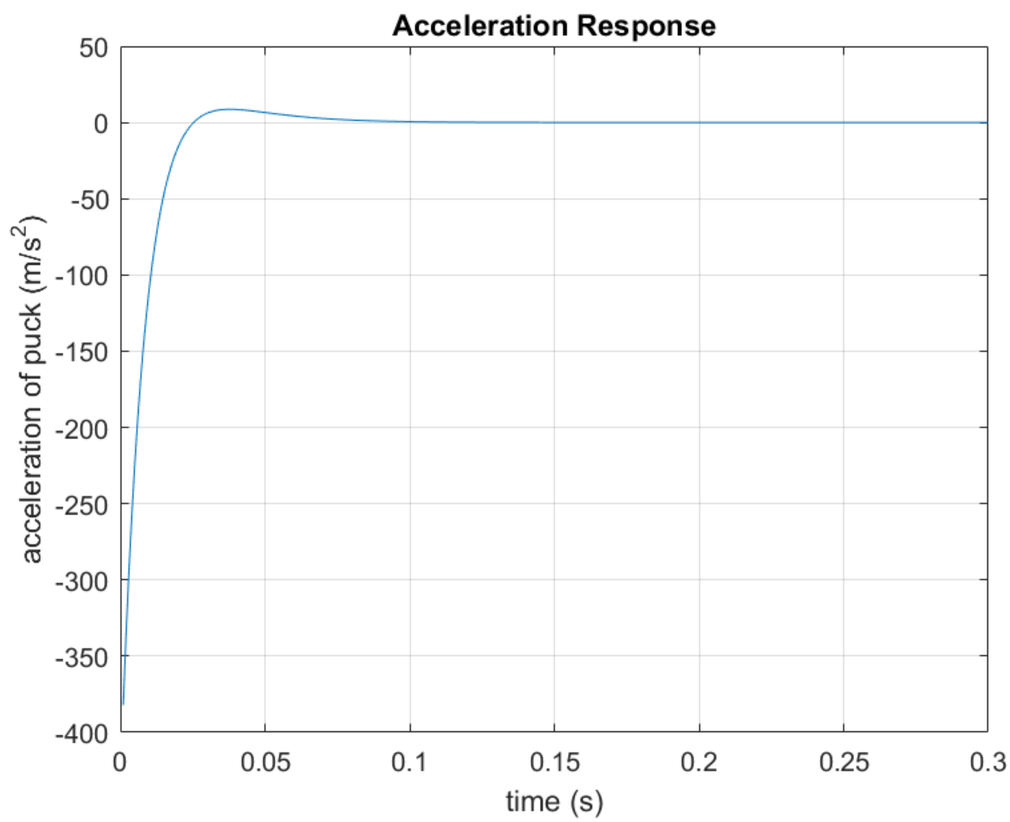
```
sys = ss(A,B,C,D);
%sys.InputName = 'Vs';
%sys.OutputName = {'Vm1';'Vm2'};
u = NaN*ones(1,length(t));
for j = 1:length(t)
    u(j) = 0;
end
y = lsim(sys,u,t,x0);
a = cat(1,NaN, diff(y)/dt);
```

plot things

```
figure
plot(t,y);
%impulse(sys,t);
grid on
title('Velocity Response');
xlabel('time (s)')
ylabel('velocity of puck (m/s)')

figure
plot(t,a);
grid on
title('Acceleration Response');
xlabel('time (s)')
ylabel('acceleration of puck (m/s^2)')
%figure(2)
%rlocus(plant);
```


Velocity Response
velocity of puck (m/s)
2.5
2
1.5
1
0.5
0
-0.5
0
0.05
0.1
0.15
0.2
0.25
0.3
time (s)


Acceleration Response
acceleration of puck (m/s^2)
50
0
-50
-100
-150
-200
-250
-300
-350
-400
0
0.05
0.1
0.15
0.2
0.25
0.3
time (s)

Published with MATLAB® R2015b