**HW9**

**1.controller.m:(95%)**

function out = controller(u,P)

% process inputs**(40%)**

xd = u(1:3);

% current state

x = u(7:9);

v = u(10:12);

R = renormalization(reshape(u(13:21),3,3));

Omega = u(22:24);

xd\_1dot = [0; 0; 0];

xd\_2dot = [0; 0; 0];

% calculate errors, eq 17-18

ex = x - xd;

ev = v - xd\_1dot;

% inertial frame 3-axis

e3 = [0; 0; 1];

% thrust magnitude control**(15%)**

A = -P.kx\*ex - P.kv\*ev - P.mass\*P.gravity\*e3 + P.mass\*xd\_2dot;

f = dot(-A, R\*e3);

% desired R and omega**(15%)**

Rc = [1 0 0; 0 1 0; 0 0 1];

Omegac = [0; 0.1; 1];

% inertia matrix

J = diag([P.Jxx P.Jyy P.Jzz]);

% error**(20%)**

eR = (1/2)\*vee(Rc.'\*R - R.'\*Rc);

eOmega = Omega - R.'\*Rc\*Omegac;

% moment vector control**(10%)**

M = -P.kR\*eR - P.kOmega\*eOmega + cross(Omega, J\*Omega);

% calculate SO(3) error function, Psi

Psi = (1/2)\*trace(eye(3) - Rc.'\*R);

out = [f;M;eR;eOmega;Psi];

end

**2.simulink PLOT for eR(10%):**

