ANDREW ID : rguptach

KDC Assignment 5

For Q 1.1,1.2 and 1.3 refer file HW5_q1.m

For Q 1.4 refer file Hw5_q1_extra.m

Q1.1 –

M_1_1:

Iy2/2 + Iy3/2 + Iz1 + Iz2/2 + Iz3/2 - (Iy3*cos(2*theta2 + 2*theta3))/2 + (Iz3*cos(2*theta2 + 2*theta3))/2 + (l1^2*m3)/2 + (m2*r1^2)/2 + (m3*r2^2)/2 - (Iy2*cos(2*theta2))/2 + (Iz2*cos(2*theta2))/2 + (m3*r2^2*cos(2*theta2 + 2*theta3))/2 + (l1^2*m3*cos(2*theta2))/2 + (m2*r1^2*cos(2*theta2))/2 + l1*m3*r2*cos(theta3) + l1*m3*r2*cos(2*theta2 + theta3)

Q1.2 –

C_2_1:

(theta1_dot*(m3*sin(2*theta2)*l1^2 + 2*m3*sin(2*theta2 + theta3)*l1*r2 + m2*sin(2*theta2)*r1^2 + m3*sin(2*theta2 + 2*theta3)*r2^2 - Iy3*sin(2*theta2 + 2*theta3) + Iz3*sin(2*theta2 + 2*theta3) - Iy2*sin(2*theta2) + Iz2*sin(2*theta2)))/2

Q1.3 –

N_3:

-g*m3*r2*cos(theta2 + theta3)

Q1.4 –

I applied a PD control on the whole are. My state vector had 6 elements first three were thetas and the last three were theta_dots in x,y and z.

the theta double dot was calculated from -

$$M(\theta)\ddot{\theta} + C(\theta,\dot{\theta})\dot{\theta} + N(\theta,\dot{\theta}) = \tau$$

where the tau was calculated from the equation below –

$$\boxed{\tau = M(\theta)\ddot{\theta}_d + C(\theta,\dot{\theta})\dot{\theta}_d + N(\theta,\dot{\theta}) - K_v\dot{e} - K_p e}$$

ANDREW ID : rguptach

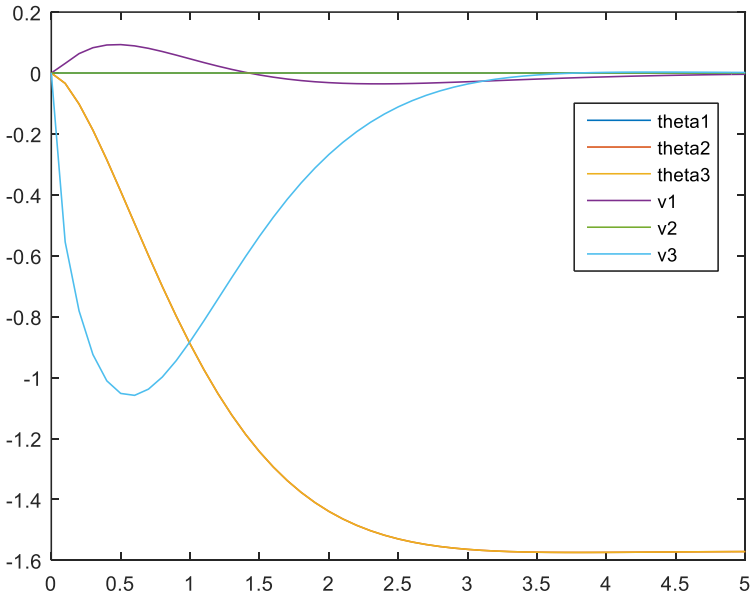
The theta double dot and theta dot desired were set to 0 while the theta desired was set to –pi/2 (the rotation require to make the arm point vertically up)

The final Kp Kd values were –

Kp = 15

Kd = 15

Here is the plot for the theta and thetadot values



All the values settle down to 0 except theta2 which settles at –pi/2