Report 05

Ideal & Real Block Diagram for robot Dynamics

MCT 621

Motion Control and Servo Systems

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Submitted By/

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Introduction

In this Report, Ideal and Real block diagrams are purposed for controlling a robot arm regarding the RP robot ARM studied in the lectures for MCT621-Fall 2021, the Four blocks are:

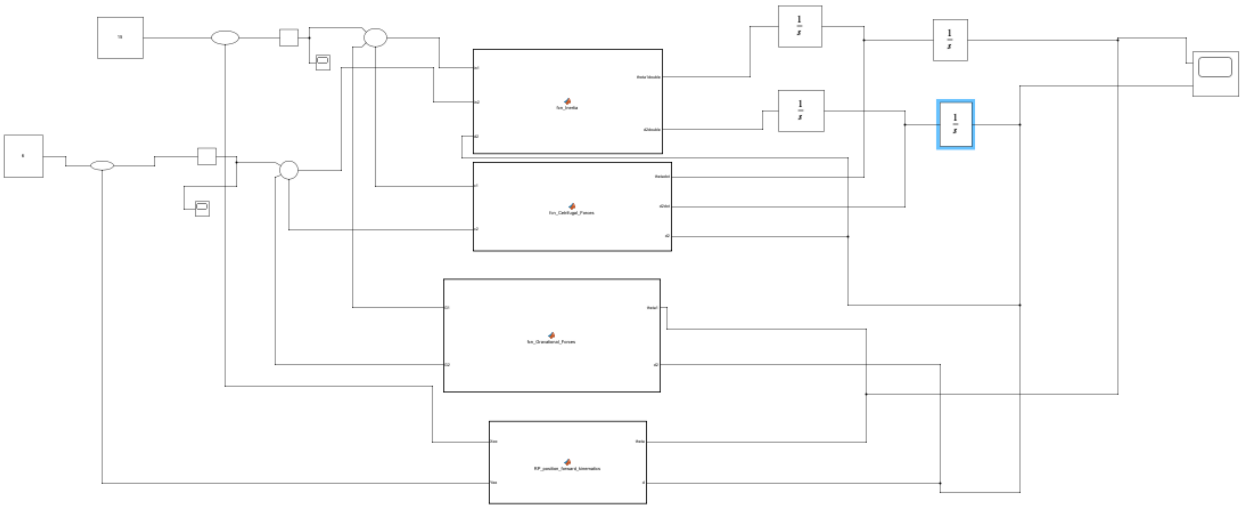
1. Ideal Block Diagram for Dynamics
2. Real Block Diagram for Dynamics using the motor purposed before

These Blocks are described in detail. Then simulation is done on each of them and so having comments on the change of gain.

All simulations are done using MATLAB/Simulink, and the blocks are written as a MATLAB functions.

1. Ideal Block Diagram

The following block diagram is an IDEAL Block diagram for controlling the robot arm. The motor is just set to be an integrator to have ideal kinetics model. The controller used is Proportional controller. The desired position of the end effector is to have X = 15 and Y = 6.



Inertia Function

```
function [theta1double,d2double] = fcn_Inertia(in1,in2,d2)

a2 = 0.3;
b1 = 0.04;
b2 = 0.04;
m1 = 0.3;
m2= 0.7;
L1=1;
Iz1=(1/2)*0.3*((a2^2)+(b1^2));
Iz2=(1/2)*0.7*((a2^2)+(b2^2));
MI=[((m1*L1^2)/4)+Iz1+m2*((L1+(d2/2)^2))+Iz2 0;0 (m2/4)];
Dots2 = inv(MI)*[in1;in2];
theta1double = Dots2(1);
d2double = Dots2(2);

end
```

Centrifugal Forces function

```
function [c1,c2] = fcn_Cetrifugal_Forces(thetadot,d2dot,d2)
m2= 0.7;
L1=1;
CO = ([0 0;-(m2/2)*(L1+(d2/2)) 0]*[thetadot^2;d2dot^2]);
CET = ([(2*m2)*(L1+(d2/2)); 0]*[thetadot*d2dot]);
CE = CO + CET ;
c1 = CE (1);
c2 = CE (2);

end
```

Gravitational Forces Function

```
function [G1,G2] = fcn_Gravational_Forces(theta1,d2)
m1 =  0.3;
m2 = 0.7;
L1 = 1;
g = 9.8;

G = [((-(m1 * L1 * g)/2)+(m2 * g )*(
L1+(d2/2)))*cosd(theta1);((m2*g)/2)*sind(theta1)];

G1 = G (1);
G2 = G (2);

end
```

PID in X Parameters

Source: internal

Proportional (P): -484.41792080809

Integral (I): -27.3839487761219

Derivative (D): -1903.9927928377

Use filtered derivative

Filter coefficient (N): 1107.37726840464

PID in Y Parameters

Source: internal

Proportional (P): 317.474273293507

Integral (I): 206.816957728181

Derivative (D): 108.280911117397

Use filtered derivative

Filter coefficient (N): 12761.3711402062

Response

The system is unstable