Contents

Function to perform PD control+gravity compensation

```
function [ dx ] = PDControlGravity(t,x,system_params)
```

```
% note x is in the form of q_1, q_2,dot q_1, dot q_2

        % Extracting the system params
        I1=system_params(1);  I2 = system_params(2); m1=system_params(3); r1=system_params(4)
; m2=system_params(5); r2=system_params(6); l1=system_params(7); l2=system_params(8);
        g=9.8;

        a = I1+I2+m1*r1^2+ m2*(l1^2+ r2^2);
        b = m2*l1*r2;
        d = I2+ m2*r2^2;

        % the actual dynamic model of the system:
        Mmat = [a+2*b*cos(x(2)), d+b*cos(x(2));  d+b*cos(x(2)), d];
        Cmat = [-b*sin(x(2))*x(4), -b*sin(x(2))*(x(3)+x(4)); b*sin(x(2))*x(3),0];
        Gmat =  [m1*g*r1*cos(x(1))+m2*g*(l1*cos(x(1))+r2*cos(x(1)+x(2)));
    m2*g*r2*cos(x(1)+x(2))];
        invM = inv(Mmat);
        invMC = invM*Cmat;
```

```
Not enough input arguments.

Error in PDControlGravity (line 6)
        I1=system_params(1);  I2 = system_params(2); m1=system_params(3); r1=system_params(4)
; m2=system_params(5); r2=system_params(6); l1=system_params(7); l2=system_params(8);
```

PD controller

```
        % Initialize the gain matrix
        KP=25;
        KD=19;
        K=[KP*eye(2), KD*eye(2)];

        % Calculate the input
        u=-K*[x]+Gmat;

        % Update the dx matrix
        dx=[x(3);x(4);invM*u-invMC*[x(1);x(2)]-invM*Gmat];
```

```
end
```

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