SDM283 - MiniProject1 - IRB460

Taks1 - by Group8 MIAO Ziliang 11911901

```
clc; clear all; close all;
theta1 = 10;
theta2 = 10;
theta3 = 10;
Q4 = CoordinateTransformation(theta1,theta2,theta3) * [0;0;0;1];
q40 = Q4(1:3,:);
fprintf("Coordinate of the end of IRB460 is [%.4f,%.4f,%.4f] at
 the condition of theta1 = %.4f, theta2 = %.4f, theta3 = %.4f
\n",q40(1),q40(2),q40(3),theta1,theta2,theta3);

function T = CoordinateTransformation(theta1, theta2, theta3)
    theta1 = theta1/180*pi;
    theta2 = theta2/180*pi;
    theta3 = theta3/180*pi;
    q10 = [0; 260; 742.5];
    q20 = [0; 260; 742.5+945];
    q30 = [0; 260+1025; 742.5+945];
    g0 = [RotateZ(theta1), [0; 0; 0]; 0 0 0 1];
    gab0 = [eye(3), [0;1025+260+220;945+742.5-217.5];0 0 0 1];
    gab = Rotation(q10,theta2) * Rotation(q20,(theta3-theta2)) *
 Rotation(q30,(-theta3)) * gab0;
    T = g0 * gab;
end
function R = Rotation(q_axis,theta)
    x_hat = [0 0 0; 0 0 -1; 0 1 0];
    x = [1; 0; 0];
    % Caculate Method 1 (Use method "expm")
%     twist = [x_hat, cross(q_axis,x); 0 0 0 0];
%     R = expm(twist * theta);
    % Caculate Method 2 (Simplify by Rodrigues Formula)
    r = eye(3) + x_hat * sin(theta) + (x_hat)^2 * (1 - cos(theta));
    R = [r, (eye(3) - r) * q_axis; 0 0 0 1];
end
function R = RotateZ(theta)
     R = [cos(theta) -sin(theta) 0; sin(theta) cos(theta) 0; 0 0 1];
end
function R = RotateX(theta)
    R = [1 0 0; 0 cos(theta) -sin(theta); 0 sin(theta) cos(theta)];
end
```

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Coordinate of the end of IRB460 is [-230.1412,1305.1957,1633.6327] at
 the condition of theta1 = 10.0000, theta2 = 10.0000, theta3 = 10.0000
```

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