Introduction to Robotics
Assignment-1 Report

Gokul B. Nair
201502034

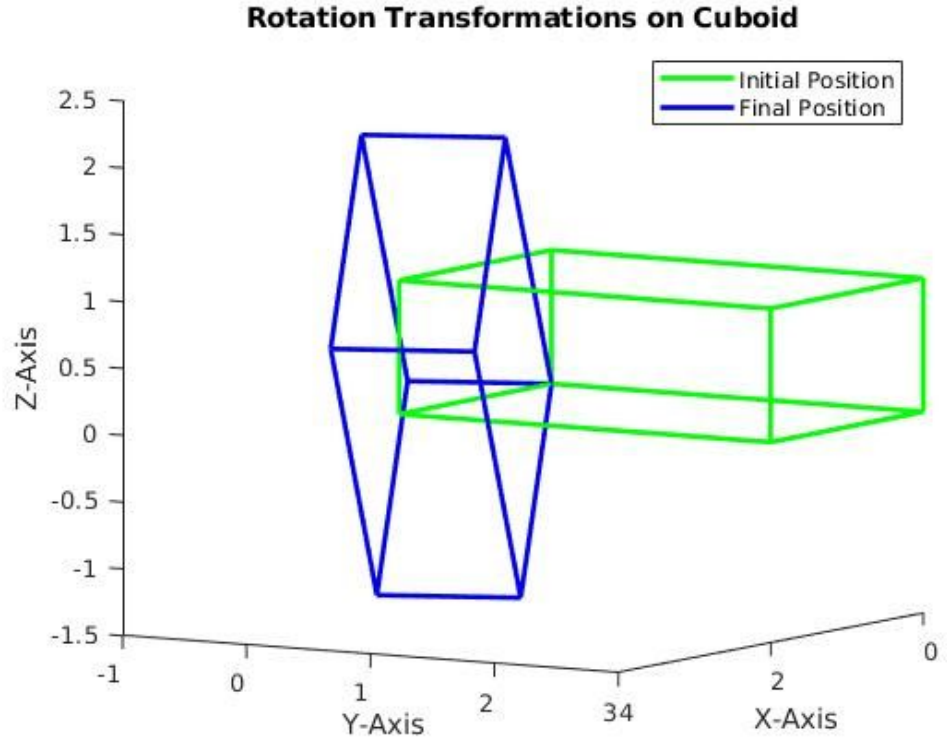
Answer 1:

Subsection 1:
I've written the required code in Matlab which takes in the following parameters as inputs. The command to run the code (in Matlab IDE) is as follows with the respective parameters:

ShowCuboid(x-coordinate of a specific corner, y-coordinate of the corner, z coordinate of the corner, length, width, height, angle of rotation about x, angle of rotation about y, angle of rotation about z axis)

Here, the angles are in degrees. The code generates a plot with two cuboids, the green one showing the initial orientation and the blue one showing the final orientation of the cuboid with respect to the coordinate axes.

Subsection 2:
The code has been submitted as 'ShowCuboid.m' file. The plot obtained after rotating the cube by 90 degrees about x, 45 degrees about y and 23 degrees about z is as follows:



Initial Coordinates:

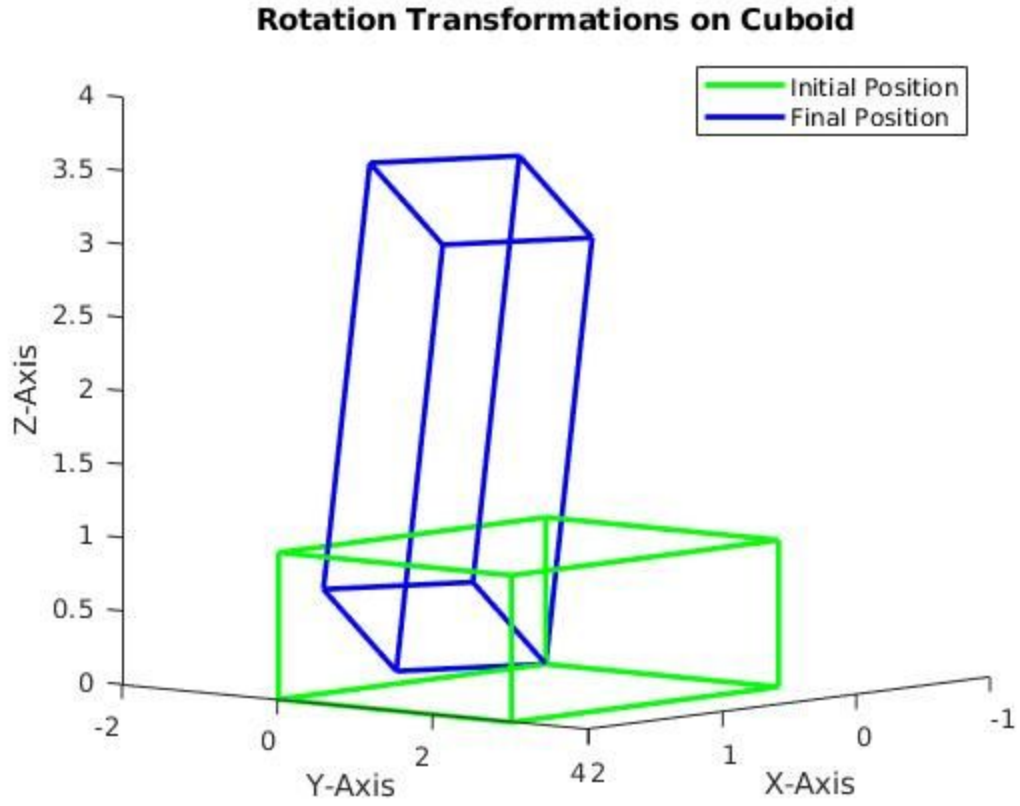
0	2	0	0	2	0	2	2
0	0	3	0	3	3	0	3
0	0	0	1	0	1	1	1

Final Coordinates:

0	1.3018	1.9527	0.3907	3.2545	2.3434	1.6925	3.6452
0	0.5526	0.8289	-0.9205	1.3814	-0.0916	-0.3679	0.4609
0	-1.4142	2.1213	0	0.7071	2.1213	-1.4142	0.7071

Here, each column represents, (x,y,z) coordinate of each of the 8 corners of the cuboid.

On applying rotation in the reverse order, that is, 23 degrees about z axis, 45 degrees about y axis and 90 degrees about x axis respectively, i obtained the following plot and coordinates:



Initial Coordinates:

0	2	0	0	2	0	2	2
0	0	3	0	3	3	0	3
0	0	0	1	0	1	1	1

Final Coordinates:

0	1.3018	-0.8289	0.7071	0.4729	-0.1218	2.0089	1.1800
0	1.3018	-0.8289	-0.7071	0.4729	-1.5360	0.5947	-0.2342
0	0.7815	2.7615	0	3.5430	2.7615	0.7815	3.5430

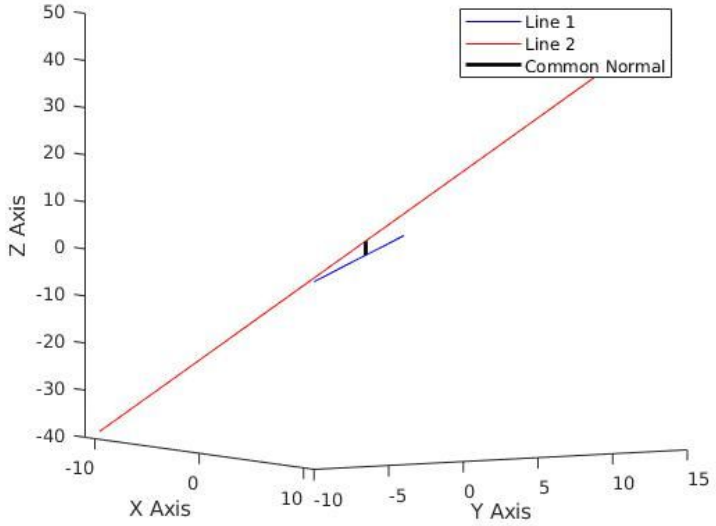
Answer 2:

The code has been attached as 'LineIntersection.m'. The function can be run as follows:

LineIntersection(line1_end1_x,line1_end1_y,line1_end1_z,line1_end2_x,line1_end2_y,line1_end2_z,line2_end1_x,line2_end1_y,line2_end1_z,line2_end2_x,line2_end2_y,line2_end2_z)

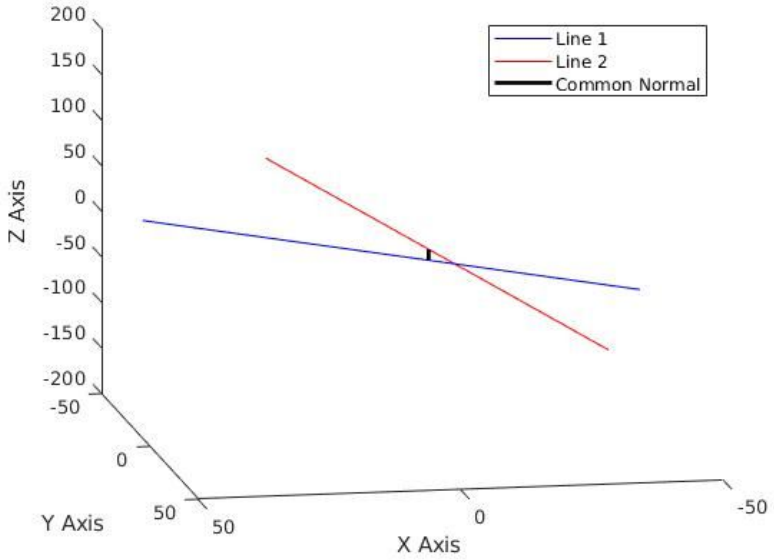
Input1: LineIntersection(1,0,0,0,1,0,-1,1,1,-2,0,-3)

Output1: (-0.5000,1.5000,0), (-0.5000,1.5000,3.0000)



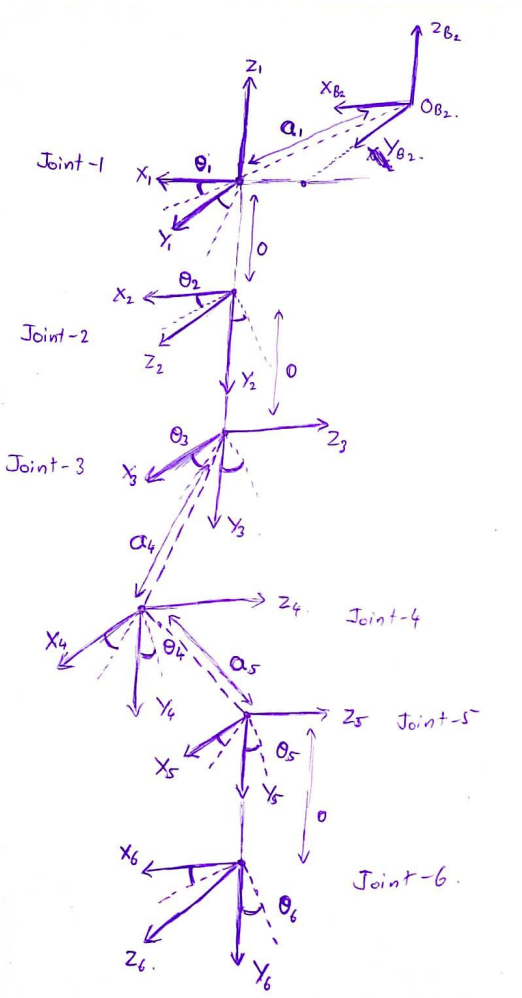
Input2: LineIntersection(4,0,0,0,4,0,-4,4,4,-8,0,-12)

Output2: (-2,6,0), (-2,6,12)



Answer 3:

The coordinate frames have been applied on each joint of the right leg as required in the following manner:



The D-H Parameters, thus obtained are as follows: (taking B2 as Joint-0)

	α(i)	a(i)	θ(i)	d(i)
1	0°	a1	θ1	0
2	-90°	0	θ2	0
3	-90°	0	θ3	0
4	0°	a4	θ4	0
5	0°	a5	θ5	0
6	+90°	0	θ6	0