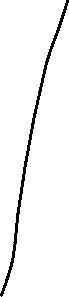
## ECE 555 Spring 2022



## Pavel Koprov

# Sawyer project



Part 1 A.

Poses of the targets were created as SE3 objects in Matlab using their poses and Roll-Pitch Yaw-angles from Gazebo environment. These were target1 [0.75, -0.35, 1.014, 0, 0, -0.785], target2 [1, 0, 1.014, 1, 0, 1.014] and target3 [0.85, 0.25, 1.014, 0, 0, 0.586931].

To calculate their poses with respect to robot I multiplied inverse transformation matrix of robot pose to each target pose.

sawyerTtarget1 =

1 0 0 0.75

0 1 0 -0.35

0 0 1 0.084

0 0 0 1

sawyerTtarget2 =

0.7074 0.7068 0 1

-0.7068 0.7074 0 0

0 0 1 0.084

0 0 0 1

sawyerTtarget3 =

0.8326 -0.5538 0 0.85

0.5538 0.8326 0 0.25

0 0 1 0.084

0 0 0 1

Part 1. B. To find inverse kinematics I used Serial Link class from the robotic tool box and robot FH table from the article.

I rotated each target pose around their y and z axes by 90 degrees to get gripper position.

Function ikine yielded joint angles for each position.

in\_radians =

q1 q2 q3 q4 q5 q6 q7

pos1dwn -0.36642 -0.55917 -0.74016 0.99382 -0.78784 -1.0055 -0.28228

pos2dwn 0.016076 -0.098902 -0.84517 -0.053642 -0.60174 0.84959 -0.17939

pos3dwn 0.36526 -0.43363 -0.83871 0.8286 -0.66369 -0.82339 -0.22415

pos4dwn 1.0891 -0.22987 -1.1957 1.015 -1.262 0.23996 0.87751

in\_degrees =

q1 q2 q3 q4 q5 q6 q7

pos1dwn -20.994 -32.038 -42.408 56.942 -45.14 -57.609 -16.173

pos2dwn 0.92109 -5.6667 -48.424 -3.0735 -34.477 48.678 -10.278

pos3dwn 20.928 -24.845 -48.055 47.475 -38.026 -47.177 -12.843

pos4dwn 62.4 -13.17 -68.511 58.157 -72.305 13.749 50.277

Part 2.

Attached run.cpp, planning.cpp and planning.h.

I was able to pass angles for each position and call the position for each target from the command line. Unfortunately, robot is dropping from the final pose and I cannot fix it (something wrong with URDF or simulator). Also, when moving from one pose to another, arm sometimes dragging on the table and wiping targets from their poses.