Question 1

Ignoring the gripper, the simulation robot has 6 DOF

Question 2

The kinematic arrangement of the robot without gripper is RRRR, and with gripper is RRRR(R)

Question 3

Symbolic representation of robot in the zero configuration:

Robot in vertical configuration. Robot in starting Configuration

Gripper

θ_4

WRIST

ELBOW

θ_3

SHOULDER

θ_2

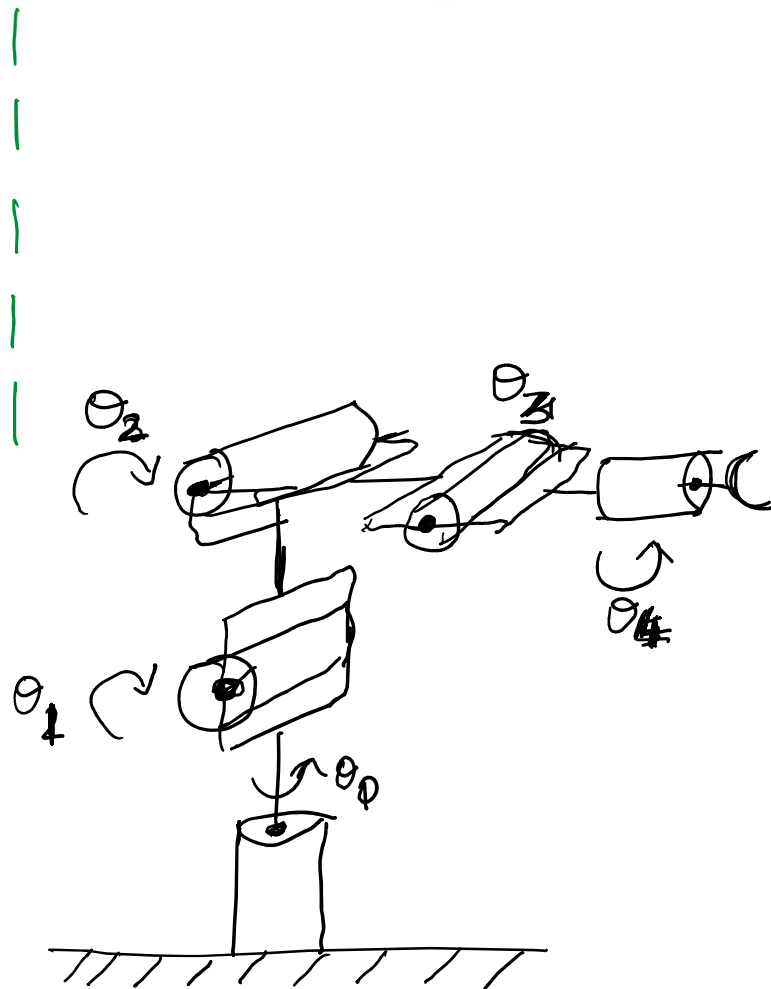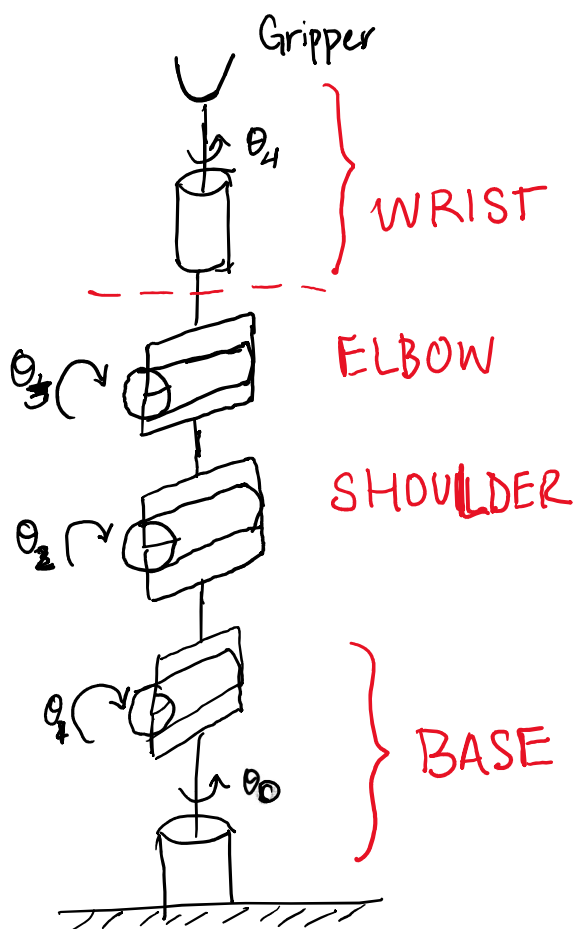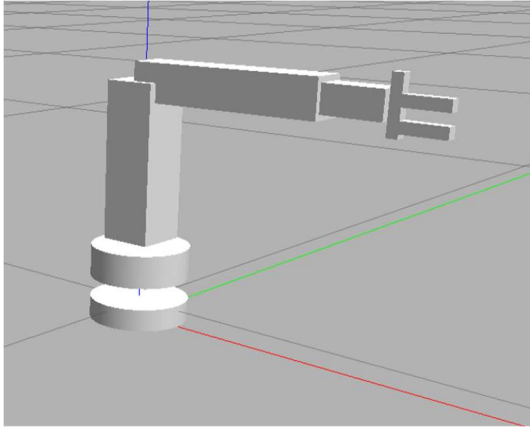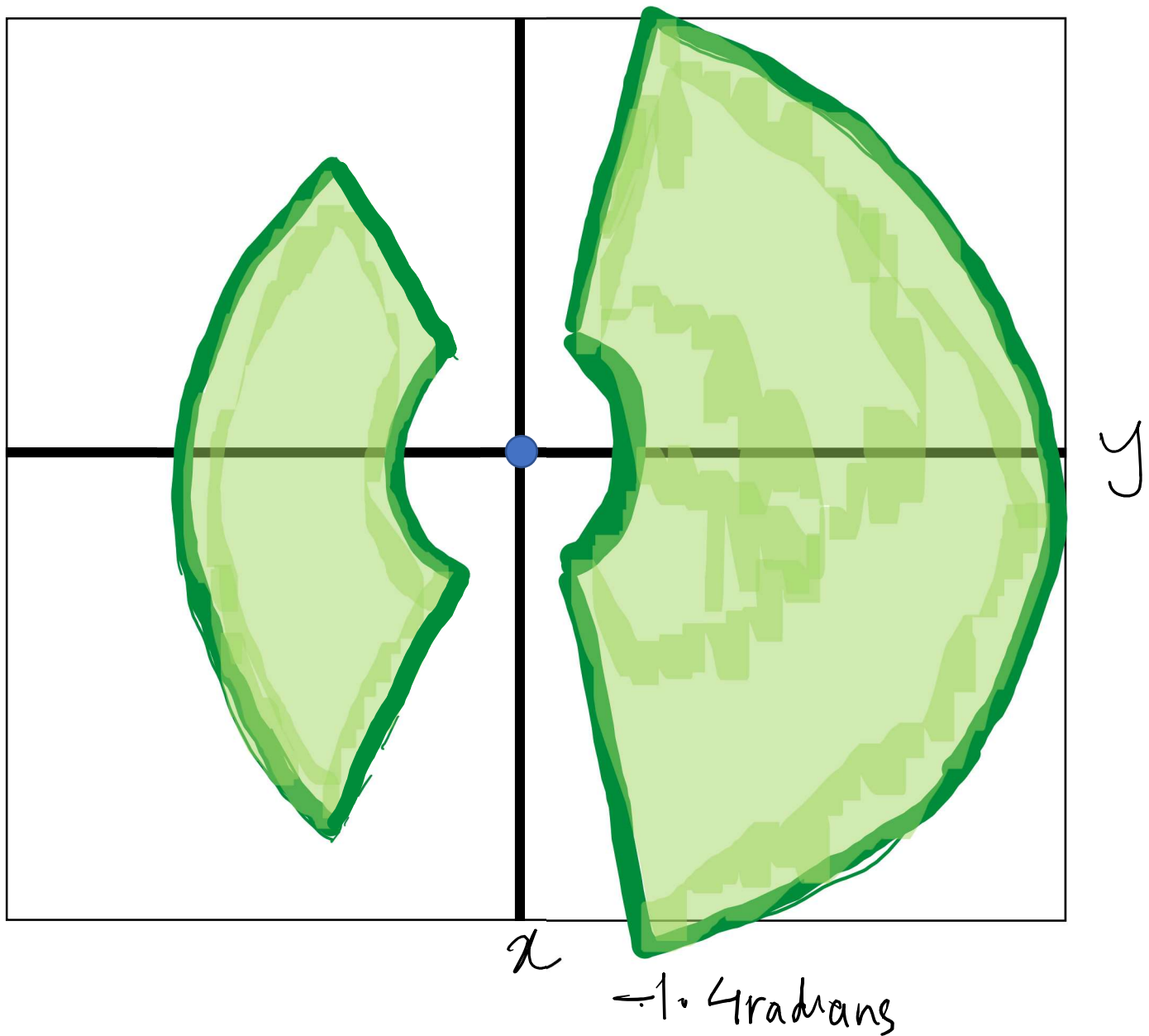θ_1

BASE

θ_0

θ_2

θ_3

θ_1

θ_4

θ_0

Image of robot in zero configuration

Question 4

Reachable workspace of simulated robot:

1. 4 radians

y

x

-1. 4 radians

Question 5

End effector is pointing up, as shown below:
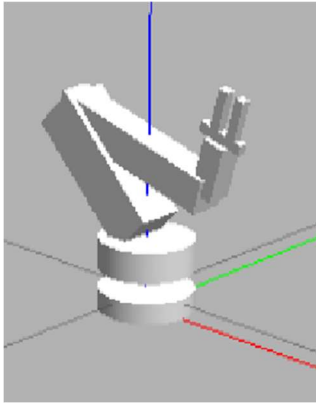
Question 6

Joint limits for each of the joints (all angles in radians):

Joint 0	[-1.4, 1.4]
Joint 1	[-1.2, 1.4]
Joint 2	[-1.8, 1.7]
Joint 3	[-1.9, 1.7]
Joint 4	[-2, 1.5]

Question 7

q specifies positions for each of the 6 motors—units for 0-4 are in radians, last input is opening of gripper in mm

q = [0, 0,-pi/2,-pi/2,-pi/2,pi/2]

Question 8

Aspects captured by the simulation	Aspects not captured by the simulation
Motion planning from current location of arm to target position	Smooth motions from one location to another—the simulation tends to time out and needs multiple runs, creating jerky motions
Joint limits are the same	Does not capture the reason joint limits exist where they do—can get a better sense of this from the real robot

Question 9
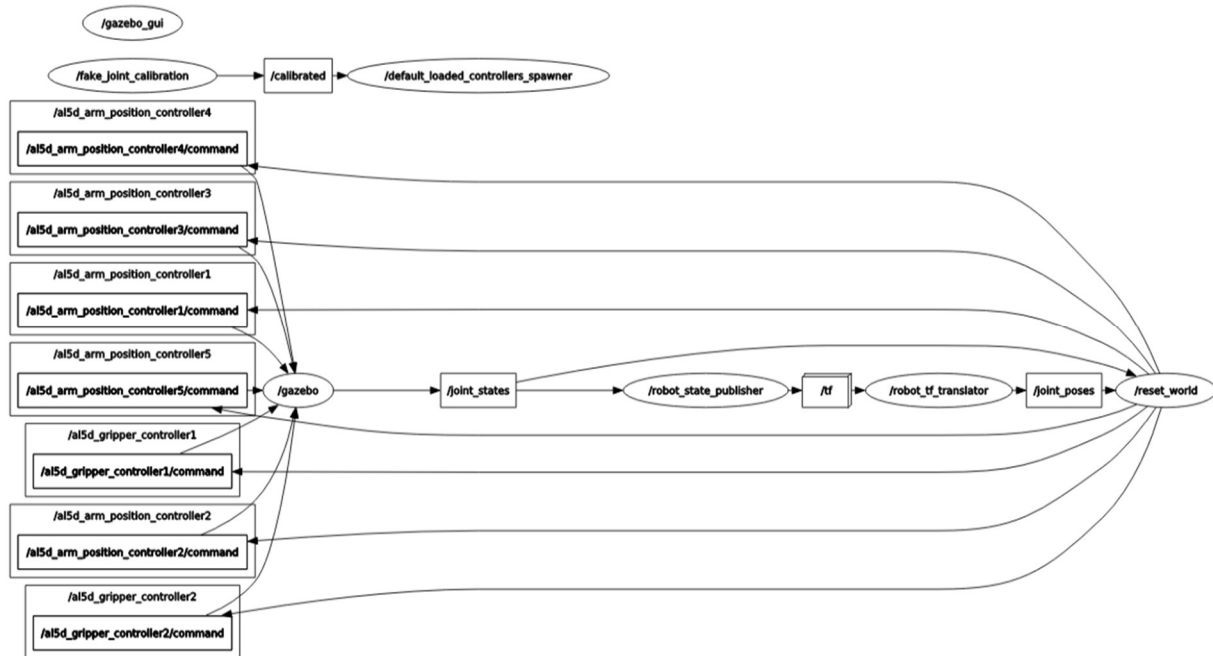
Question 10

These commands provide more context on the flow of information between controllers and robot arms, as described in the above ROS node graph.