

**7A.** When we run the algorithm in a single iteration with height 0.5 meters, we observed that the robot arm moves a little away from the desired goal position. This is due to the Jacobian pseudo-inverse being taken for one time, where as when we take a smaller step size, the Jacobian changes in each iteration correcting the course and helping the hand move a lot closer to desired goal position. The reason Jacobian plays an important role is due to the fact that its derived from robot arm end-effector body node. And we know that

$$\Delta p = \alpha * J * \Delta q$$

$$\Delta p = p_d - p_{curr}$$

$$\Delta q = q - q_o$$

$p_d$  and  $p_{curr}$  are desired and current positions,

$q$  and  $q_o$  are the current and initial configuration states,

$J$  is the Jacobian,

$\alpha$  is the step size.

Thus, making a single iteration and multiple iterations for same goal state with small step size result in two significantly different goal positions