National Yang Ming Chiao Tung University

Department of Electrical Engineering

Robotics: Homework 4

Due 12/8/22   Fall 2022

1. Referring to the class note, solve the corresponding position, velocity, and acceleration equations to meet the following six boundary conditions. Please also draw the acceleration profile. Note: the acceleration profile needs to be symmetrical.

Six boundary conditions:

$$q_A(t^+) = q_A(t^-), \qquad q_{B'}(t^+) = q_{B'}(t^-)$$

$$\dot{q}_A(t^+) = \dot{q}_A(t^-), \qquad \dot{q}_{B'}(t^+) = \dot{q}_{B'}(t^-)$$

$$\ddot{q}_A(t^+) = \ddot{q}_A(t^-), \qquad \ddot{q}_{B'}(t^+) = \ddot{q}_{B'}(t^-)$$

2. Read and summarize the **Configuration Space Approach** described in "A Simple Motion-Planning Algorithm for General Robot Manipulators", T. Lozano-Perez, *IEEE J. Robotics and Automation*, Vol. 3(3), pp. 224-238, 1987. Especially, please describe the main concept on how to formulate obstacles in the robot workspace, how to simplify the search process, how to organize the database for the collision-free space, and the algorithm for finding a feasible path. Please do not just copy the paragraphs.