

Chapter 6

Trajectory Generation

6.1 Introduction

The majority of robots in industry perform pick and place operations. That amounts to positioning a manipulator at a certain point and orientation, grasping an object, moving it over to some other position and orientation, and releasing it. In that motion, the end-effector of the manipulator traverses some trajectory in such a way so that the rest of the structure of the manipulator does not collide with the objects in the workspace.

We can consider several variations of this problem. If we do not know anything about the environment, we can design it in such a way that the robot can move in it and perform its tasks as fast as possible. If the environment is already given (industrial workstation for example) but we have the freedom to design the robot, we might want to do it in an optimal manner with respect to some workspace requirements. Finally, if both the environment and the robot are given (e.g. a PUMA robot in an industrial workcell) we would like to calculate the best trajectory for the robot's end-effector to follow, in order to perform the tasks in question. In this Chapter we will consider this third problem.

In that framework our goal is: Move the manipulator arm from some initial position (frame $\{T_A\}$) to some desired final position (frame $\{T_C\}$)