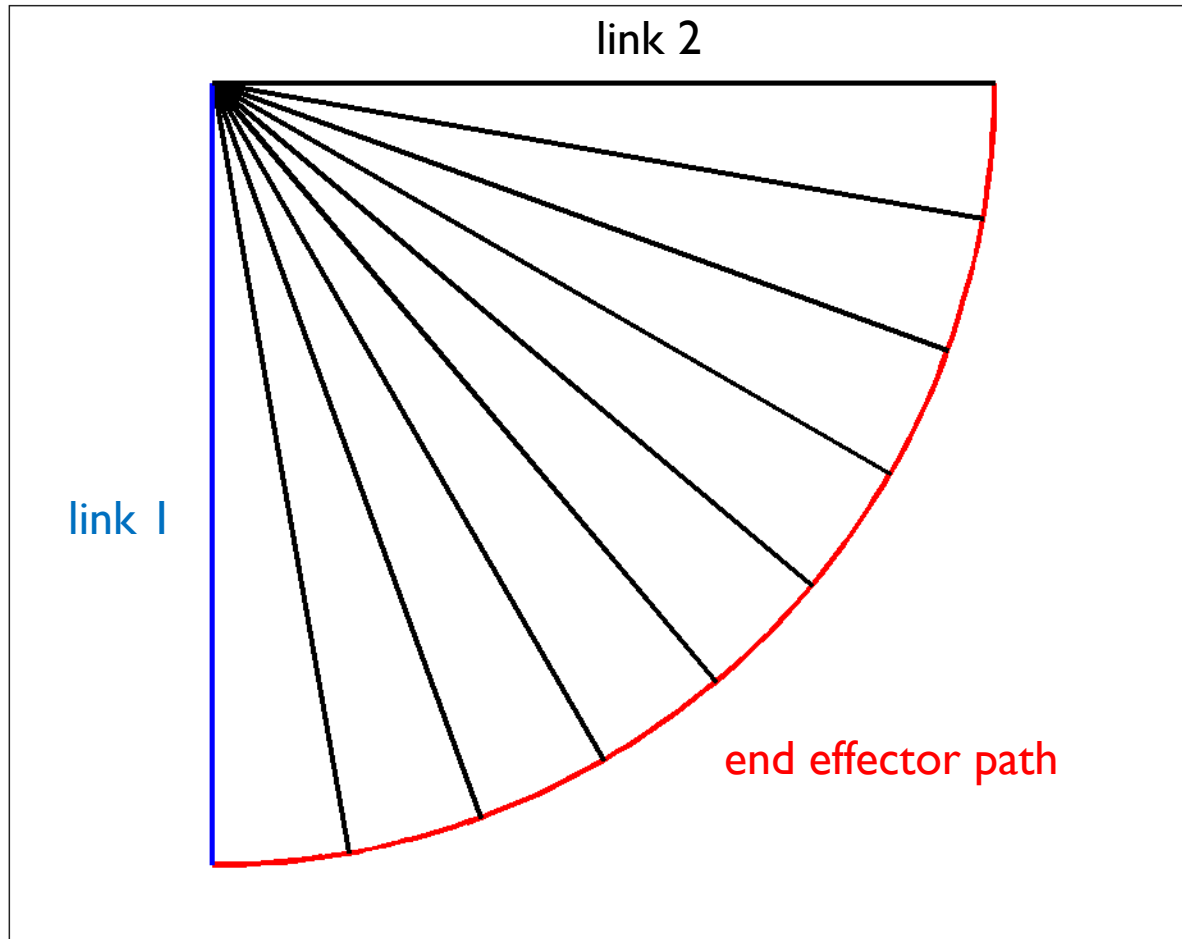


# Day 12

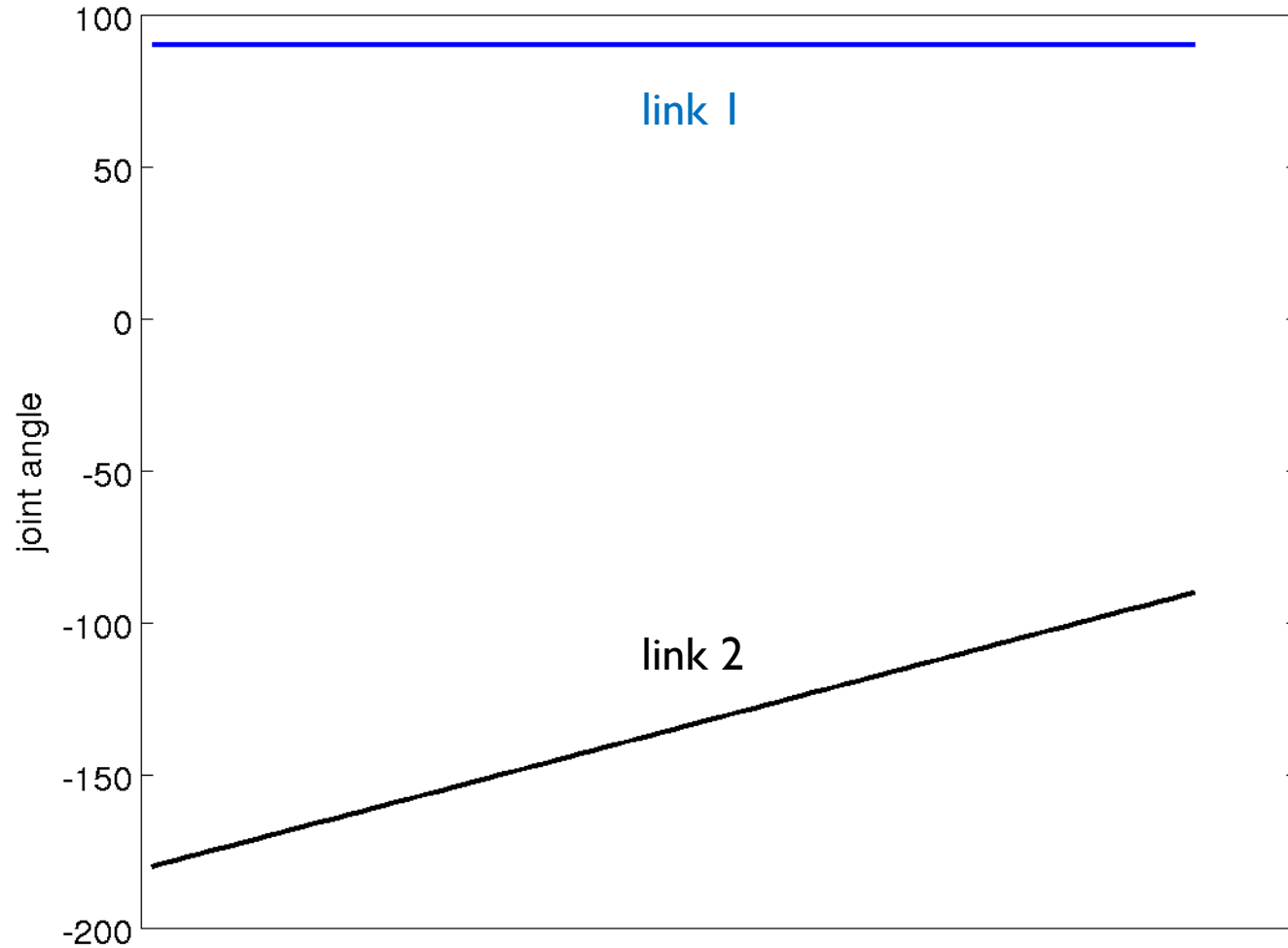
Path Generation

# Joint-Space Path

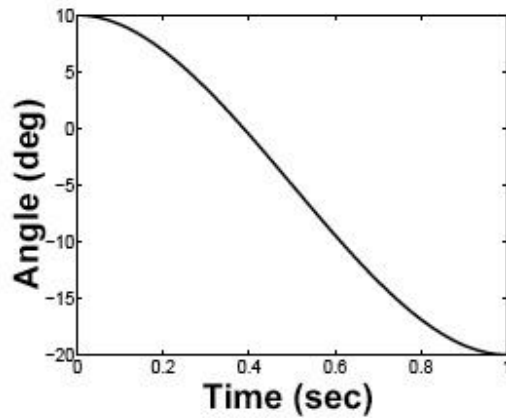
- ▶ a joint-space path is computed considering the joint variables



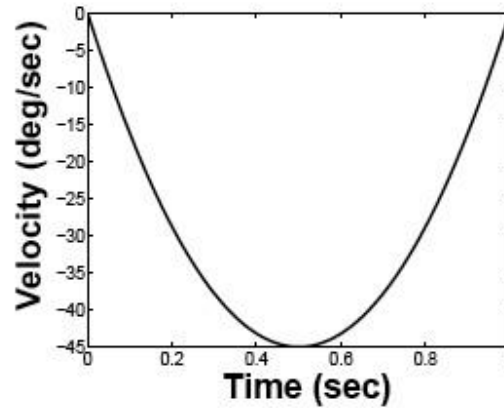
# Joint-Space Path Joint Angles



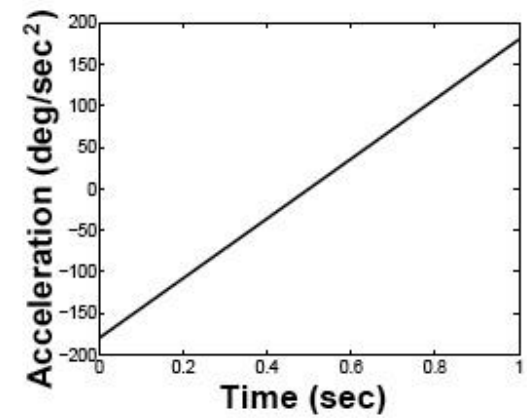
# Cubic Polynomial Path



(a)



(b)



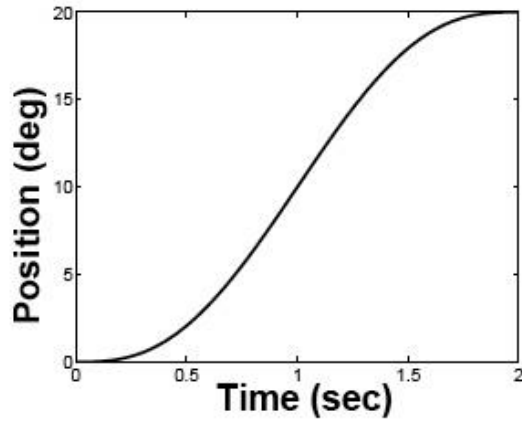
(c)

Figure 5.13: (a) Cubic polynomial trajectory. (b) Velocity profile for cubic polynomial trajectory. (c) Acceleration profile for cubic polynomial trajectory.

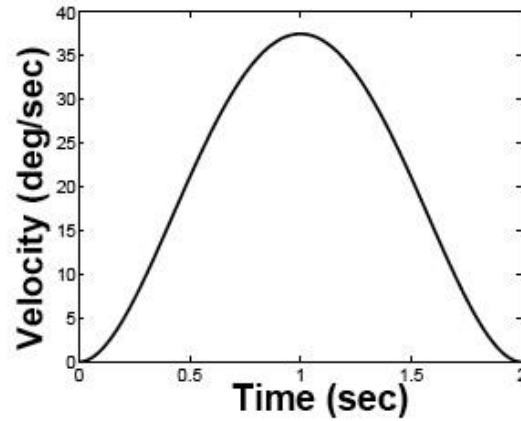
# Quintic Polynomial Path

$$\begin{bmatrix} 1 & t_0 & t_0^2 & t_0^3 & t_0^4 & t_0^5 \\ 0 & 1 & 2t_0 & 3t_0^2 & 4t_0^3 & 5t_0^4 \\ 0 & 0 & 2 & 6t_0 & 12t_0^2 & 20t_0^3 \\ 1 & t_f & t_f^2 & t_f^3 & t_f^4 & t_f^5 \\ 0 & 1 & 2t_f & 3t_f^2 & 4t_f^3 & 5t_f^4 \\ 0 & 0 & 2 & 6t_f & 12t_f^2 & 20t_f^3 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \end{bmatrix} = \begin{bmatrix} q_0 \\ v_0 \\ \alpha_0 \\ q_f \\ v_f \\ \alpha_f \end{bmatrix}$$

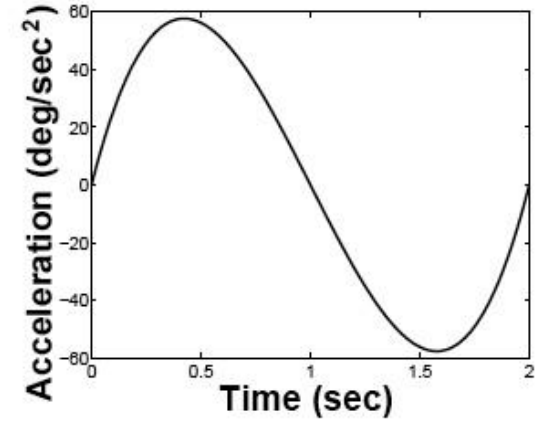
# Quintic Polynomial Path



(a)



(b)



(c)

Figure 5.14: (a) Quintic polynomial trajectory, (b) its velocity profile, and (c) its acceleration profile.

# 4 Via Points with Cubic Polynomials

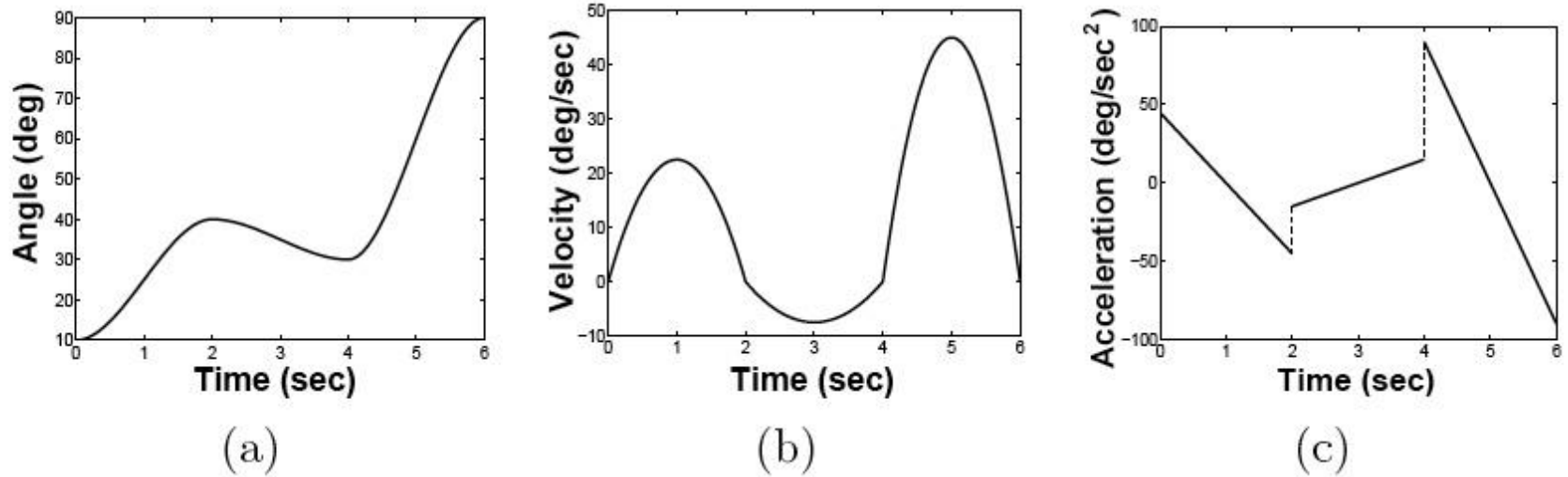
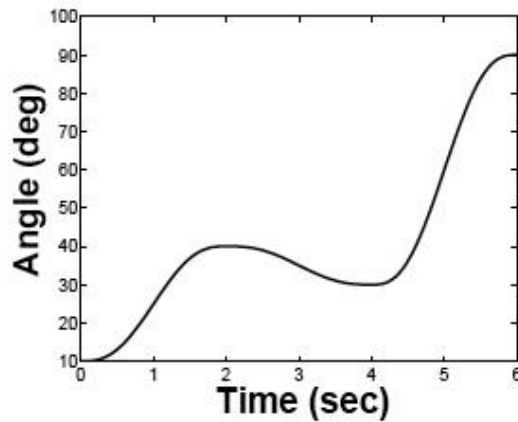
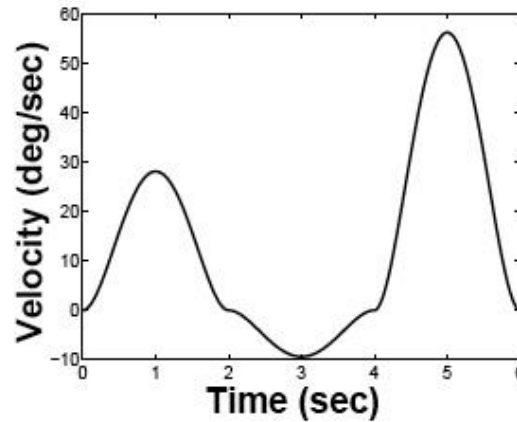


Figure 5.18: (a) Cubic spline trajectory made from three cubic polynomials. (b) Velocity profile for multiple cubic polynomial trajectory. (c) Acceleration profile for multiple cubic polynomial trajectory.

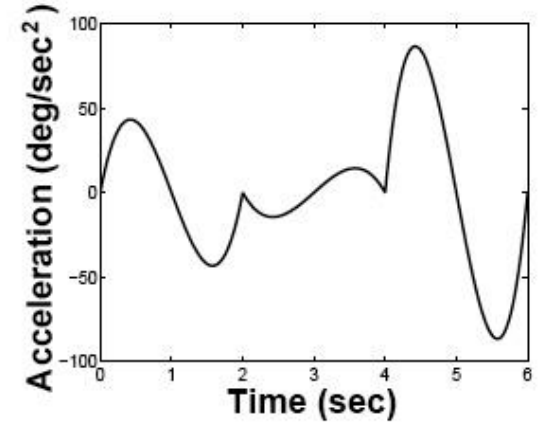
# 4 Via Points with Quintic Polynomials



(a)



(b)



(c)

Figure 5.19: (a) Trajectory with multiple quintic segments. (b) Velocity profile for multiple quintic segments. (c) Acceleration profile for multiple quintic segments.