Since the scenario requires trajectory planning in order for the robot to avoid the obstacle. In this chapter trajectories that are polynomial functions are investigated. To simplify the problem a robot with a single rotary joint is used.

Firstly, trajectories without obstacles are considered.

As the robot has to be at zero velocity a cubic polynomial is need to fulfil all requirements of the trajectory. The joint angle and velocity can be described as a function of time with the coefficients .

Furthermore, there are four boundary conditions, where and are known values.

With that a system of equations can be put into a matrix to deduce the coefficients.

When using a cubic polynomial the start and end acceleration does not equal zero, which is a problem in reality, because a sudden acceleration or deceleration is impossible. To meet this a quintic polynomial function is required.

Two more boundary conditions can be formulated. The other four are still valid.

This leads to another system of equations which can be solved for the coefficients.

A MATLAB script is developed to find and visualize the trajectories. In order to deduce the coefficients for the polynomial functions, two MATLAB functions are written where the previously shown equations are implemented.