

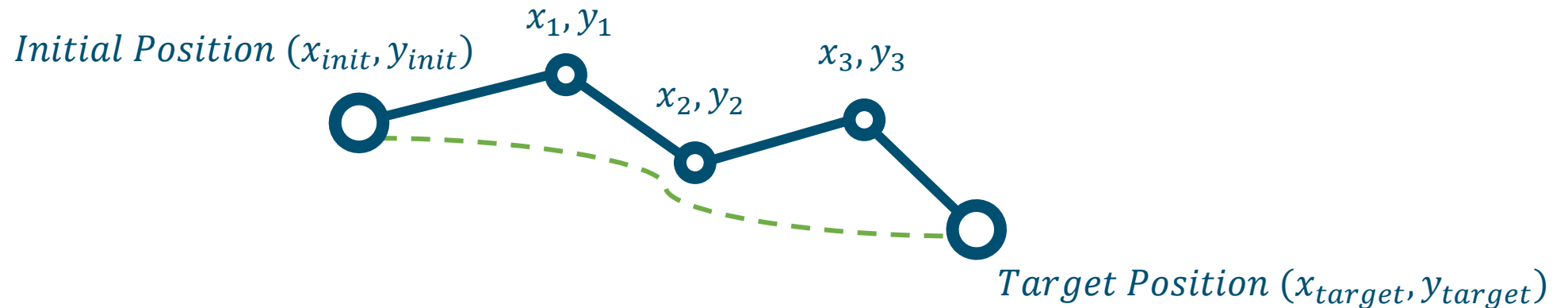
# Bézier Curve

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The Bézier curve is a parametric curve used in computer graphics and related fields. The curve associated with the Bernstein polynomial is named after Pierre Bézier, who used it in the 1960s to design curves for Renault car bodies.

Other uses include computer font design, animation, and motion planning. Bézier curves can be combined in the form of a Bézier-Spline or generalized to higher dimensions in the form of a Bézier surface.

If we want to save a curve or surface, it is impractical to save each point. The solution is to somehow represent entire curves using a small amount of data.

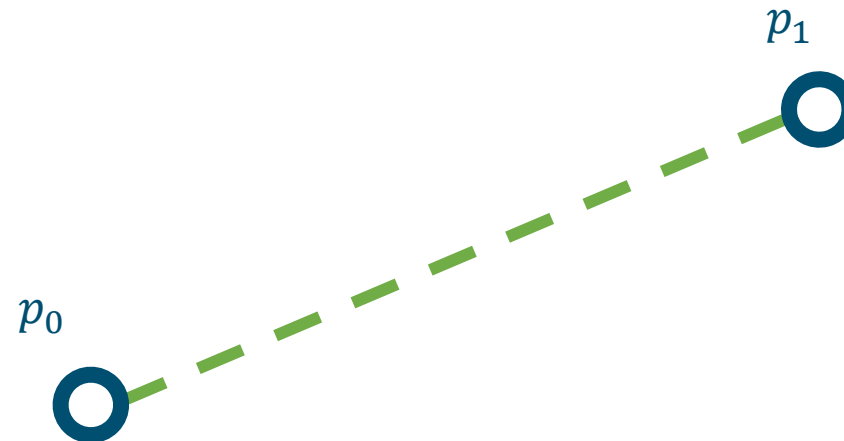


# Linear Bezier Curve

## Definition.

Given two control points  $p_0$  and  $p_1$  we define the linear Bezier curve to be the curve parametrized by:

$$p(t) = (1 - t)p_0 + tp_1, t \in [0, 1]$$

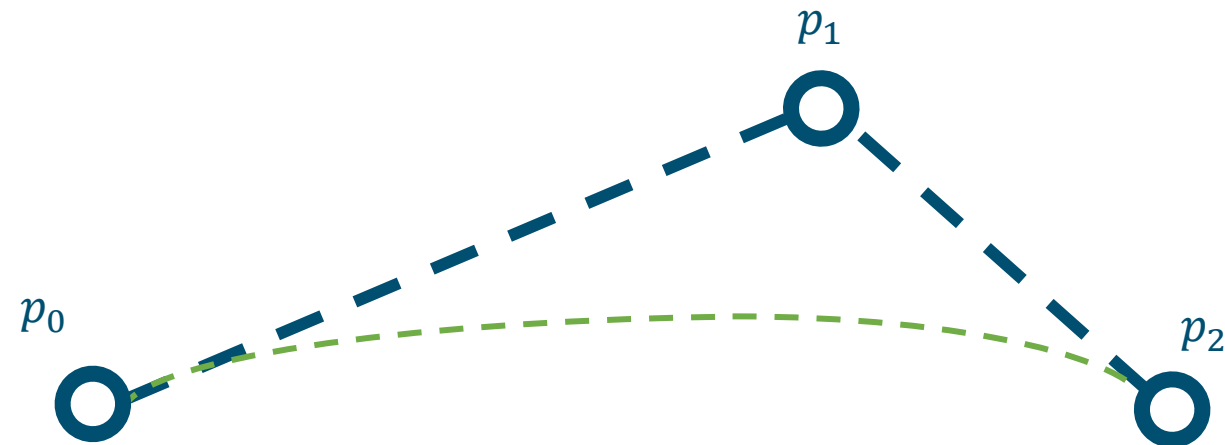


# Quadratic Bezier Curves

## Definition.

Given three control points  $p_0$ ,  $p_1$  and  $p_2$  we define the quadratic Bezier curve (degree 2 Bezier curve) to be the curve parametrized by:

$$p(t) = (1 - t)^2 p_0 + 2t(1 - t)p_1 + t^2 p_2, t \in [0, 1]$$



# Cubic Bezier Curve

## Definition.

Given four control points  $p_0, p_1, p_2$  and  $p_3$  we define the cubic Bezier curve (degree 3 Bezier curve) to be the curve parametrized by:

$$p(t) = (1 - t)^3 p_0 + 3t(1 - t)^2 p_1 + 3t^2(1 - t) p_2 + t^3 p_3, t \in [0, 1]$$

