The Way Dr. Swift thinks about Cubic Bézier Curves

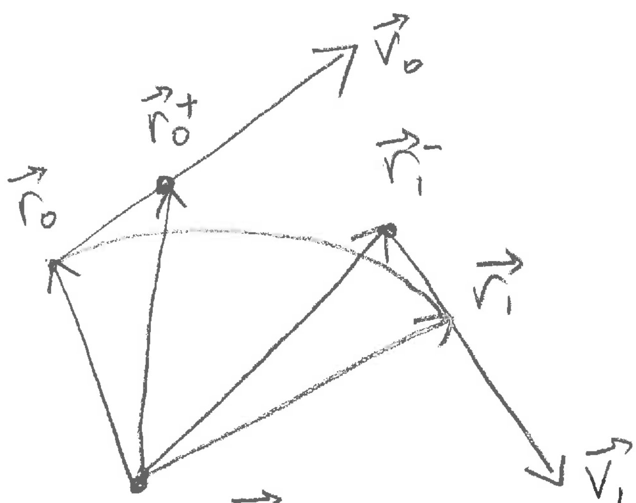
A Bézier curve in the plane $\mathbb{R}^2$ is

$$\{\vec{r}(t) \mid 0 \le t \le 1\}$$

where $\vec{r}(t) = \vec{a} + \vec{b}t + \vec{c}t^2 + \vec{d}t^3$.

The vector constants $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ are chosen to satisfy given data $\vec{r}_0, \vec{r}_1, \vec{v}_0, \vec{v}_1$, where the velocity vectors are given "in code" based on guide points $\vec{r}_0^{\,+}$ and $\vec{r}_1^{\,-}$.

$$\vec{r}(0) = \vec{r}_0$$
$$\vec{r}(1) = \vec{r}_1$$
$$\vec{r}\,'(0) = \vec{v}_0 = 3(\vec{r}_0^{\,+} - \vec{r}_0)$$
$$\vec{r}\,'(1) = \vec{v}_1 = 3(\vec{r}_1 - \vec{r}_1^{\,-})$$



The constants are

in terms of position & velocity

$$\vec{a} = \vec{r}_0$$
$$\vec{b} = \vec{v}_0$$
$$\vec{c} = 3(\vec{r}_1 - \vec{r}_0) - \vec{v}_1 - 2\vec{v}_0$$
$$\vec{d} = -2(\vec{r}_1 - \vec{r}_0) + \vec{v}_1 + \vec{v}_0$$

or, in terms of guide points:

$$\vec{a} = \vec{r}_0$$
$$\vec{b} = 3(\vec{r}_0^{\,+} - \vec{r}_0^{\,-})$$
$$\vec{c} = 3(\vec{r}_0 + \vec{r}_1^{\,-} - 2\vec{r}_0^{\,+})$$
$$\vec{d} = \vec{r}_1 - \vec{r}_0 + 3\vec{r}_0^{\,+} - 3\vec{r}_1^{\,-})$$