Using Periodic B-spline Curves

- Input: knot sequence $\tau = \{\tau_0, \tau_1, \ldots, \tau_{n+1}\}$ and control points P_i
- Output: a periodic B-spline curve $\gamma(t)$
- For each t
  - *while* $t > \tau_{n+1}$ *then* $t := t - (\tau_{n+1} - \tau_0)$
  - *while* $t < \tau_0$ *then* $t := t + (\tau_{n+1} - \tau_0)$
- Evaluate $\gamma(t)$

Using Periodic B-spline Curves Example

- Order = 4
- Knot vector: $\tau = (0,1,3,4,5,7,9,10)$, $n=6$
- Floating knot vector:

$$t = (-5,-3,-1,0,1,3,4,5,7,9,10,11,13,14)$$

- Control points: $V_0 = P_4, V_i = P_{(i+4) \bmod 7}$
- Therefore,

$$V = (P_4, P_5, P_6, P_0, P_1, P_2, P_3, P_4, P_5, P_6)$$

Using Periodic B-spline Curves Example

- Order = 4
- Knot vector: $\tau = (0,1,3,4,5,7,9,10)$
- Floating knot vector:

$$t = (-1,0,1,3,4,5,7,9,10,11,13,14,15,17)$$

- Control points: $V_0 = P_6, V_i = P_{(i+6) \bmod 7}$
- Therefore,

$$V = (P_6, P_0, P_1, P_2, P_3, P_4, P_5, P_6, P_0, P_1)$$

Using Periodic B-spline Curves

- We construct a larger sequence of knots

$$t = \left(t_0 = \tau_{n-k+2} - (\tau_{n+1} - \tau_0), \ldots, t_{k-1} = \tau_{n+1} - (\tau_{n+1} - \tau_0),\right.$$
$$t_k = \tau_1, t_{k+1} = \tau_2, \ldots, t_{k+n-1} = \tau_n,$$
$$\left. t_{n+k} = \tau_0 + (\tau_{n+1} - \tau_0), \ldots, t_{n+2k-1} = \tau_{k-1} + (\tau_{n+1} - \tau_0)\right)$$

- And of control points

$$V_0 = P_{n-k+2}, \ldots, V_{k-1} = P_0, V_k = P_1, V_{k+1} = P_2, \ldots, V_{n+k-1} = P_n$$

- Define

$$\gamma(t) = \sum_{i=0}^{n+k-1} V_i B_{i,k,t}(t)$$