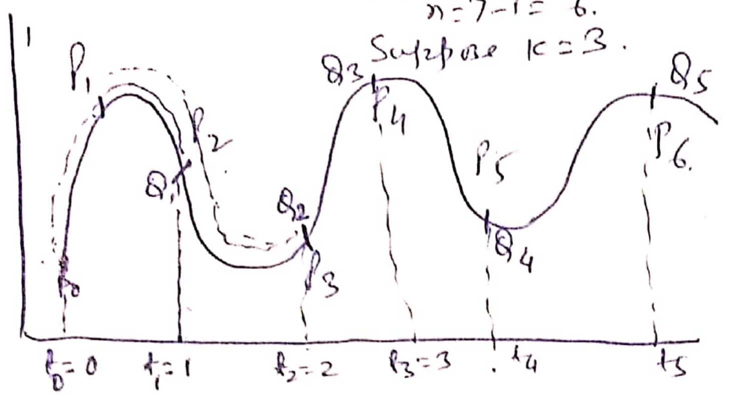
B-spline Curve-

Control Points = 7
$n = 7-1 = 6.$
Suppose $k = 3$.



1) Approximation spline curve
2) Local control Points
3) Blending fun not necessarily ~~zero~~ non-zero, it may be zero.
4) It can reduce the complexity by specifying the order of curve (k)

We divide the big curve into segments.

Segment	Control Points	Parameters
Q_1	$P_0 P_1 P_2$	$t_0=1,\ t_1=1$
Q_2	$P_1 P_2 P_3$	$t_1=1,\ t_2=2$
Q_3	$P_2 P_3 P_4$	$t_2=2,\ t_3=3$
Q_4	$P_3 P_4 P_5$	$t_3=3;\ t_4=4$
Q_5	$P_4 P_5 P_6$	$t_4=4,\ t_5=5$

Now, $Q(u) = \sum_{i=0}^{n} P_i * \underbrace{N_{i,k}(u)}$ → B-spline Basis function

Here. $N_{i,k}(u) = \dfrac{(u - X_i) \cdot N_{i,k-1}(u)}{X_{i+k-1} - X_i} + \dfrac{(X_{i+k} - u) N_{i+1,k-1}(u)}{X_{i+k} - X_{i+1}}$

where X is knot value. $(0 \le i \le n+k)$

$\therefore X_i = 0$ if $i \le k$

$X_i = i-k+1$ if $k \le i \le n$

$X_i = n-k+2$ if $i > n$; $u = n-k+2$

$N_{i,k}(u) = 1$ if $X_i \le u \le X_{i+1}$
$= 0$ otherwise.

Means:-

$N_{0,1} = 1$, $u = 0$
$= 0$, otherwise

$N_{1,1} = 1$, $0 \le u < 1$
$= 0$, otherwise

$N_{2,1} = 1$, $1 \le u \le 2$
$= 0$, otherwise

$N_{3,1} = 1$, $2 \le u < 3$
$= 0$, otherwise

$N_{4,1} = 1$, $3 \le u < 4$
$= 0$, otherwise

$N_{5,1} = 1$, $4 \le u < 5$
$= 0$, otherwise

Q. $n=5,\ K=2$

$\therefore$ The values of knots will be

$$t_i\text{'s} = \overset{t_0}{0},\ \overset{t_1}{0},\ \overset{t_2}{1},\ \overset{t_3}{2},\ \overset{t_4}{3},\ \overset{t_5}{4},\ \overset{t_6}{5},\ \overset{t_7}{5}$$

NOW,
$$N_{0,2} = \frac{(u-t_0)\,N_{0,1}(u)}{t_1-t_0} + \frac{(t_2-u)*N_{1,1}(u)}{t_2-t_1}$$

$$= \frac{(u-0)*0}{0} + \frac{(1-u)*N_{1,1}(u)}{1}$$

$$= (1-u) \qquad 0\le u<1$$

OR 0 otherwise.

$$N_{1,2} = \frac{(u-0)}{1}.\,N_{1,1}(u) + \frac{(2-u)}{1}\,N_{2,1}(u)$$

$$= u*N_{1,1}(u) + (2-u).\,N_{2,1}(u)$$

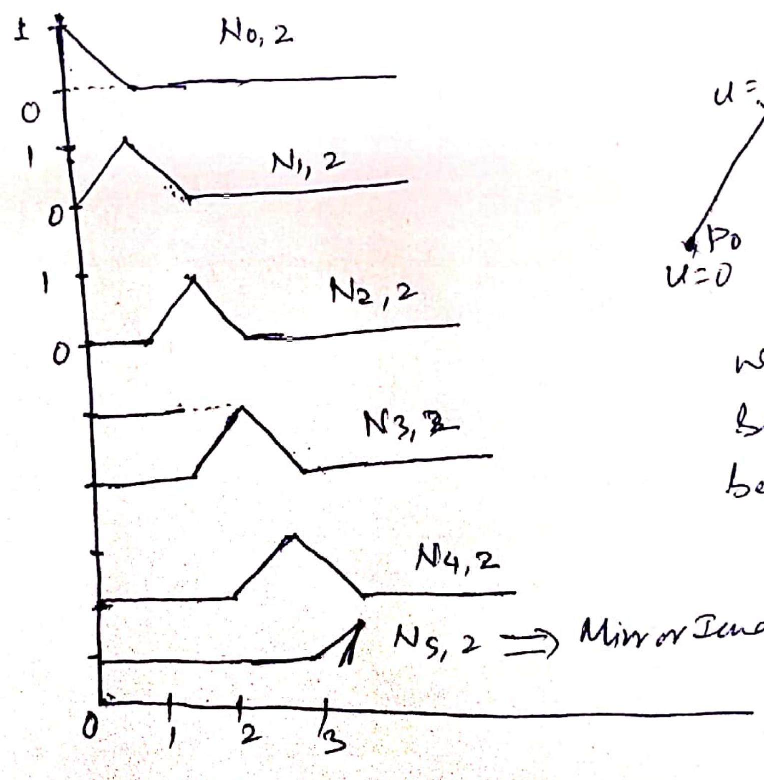
$$N_{2,2} = (u-1)*N_{2,1} + (3-u)*N_{3,1}$$

$$N_{3,2} = (u-2)*N_{3,1} + (4-u)*N_{4,1}$$

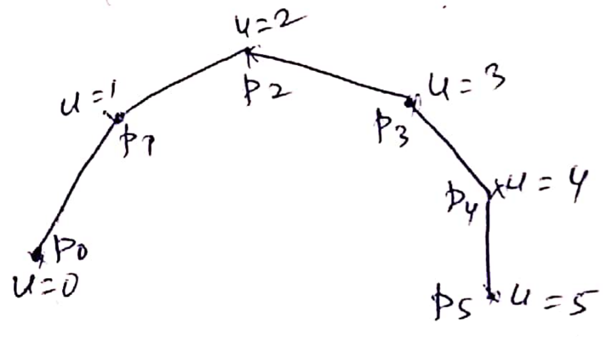
$$N_{4,2} = (u-3)*N_{4,1} + (5-u)*N_{5,1}$$

$$N_{5,2} = (u-4)*N_{5,1}$$

$p_0, p_1, p_2 \ldots$ are control points



$N_{5,2} \Rightarrow$ Mirror Image of $N_{0,2}$.



when $k=2$, all points will be selected by linear funⁿ. because the order $(n)=k-1=2-1$
$=\underline{1}$.

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