Interpolation -

Let

$f(i)$ → function of i and $f(i)$ is known.

$c(t)$ → function of t, where $c(t)$ is unknown and $c(t)$ can be derived with help of $f(i)$.

$$c(t) = \sum_{i=0}^{n} f(i) * B_{i,d}(t)$$

n → number of point which will help to find $c(t)$.

i → $[0, 1, 2, 3 \dots n-1]$

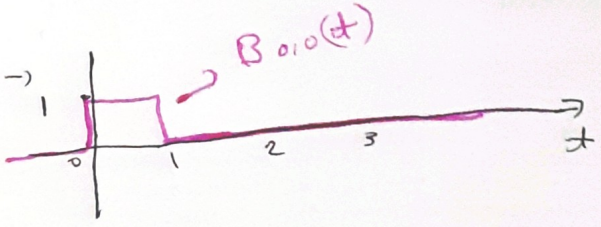
$B_{i,d}(t)$ → B spline function of degree d.

i → index of point which help to find $B_{i,d}(t)$.

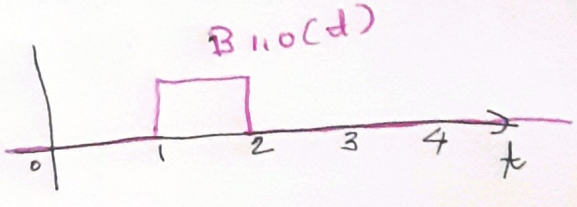
Case-1 → $d = 0$ [In this case we will use 0 th degree interpolation to find $c(t)$ [For unknown point].

$$B_{i,0}(t) = \begin{cases} 1 & \text{if } i \le t < i+1 \\ 0 & \text{otherwise} \end{cases}$$

$B_{0,0}(t)$ →



$B_{1,0}(t)$ →



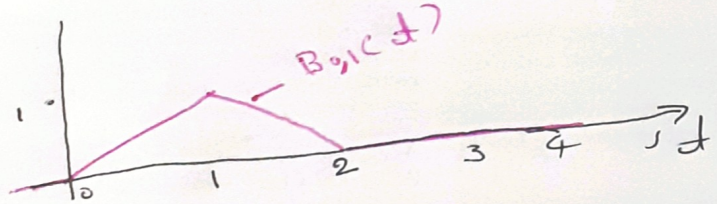
for 0th degree interpolation

$$c(t) = f(0) * B_{0,0}(t) + f(1) * B_{1,0}(t) + f(2) * B_{2,0}(t) \cdots f(n) * B_{n,0}(t)$$

1st degree Bspline function

$$B_{i,1} = \begin{cases} \dfrac{t - t_i}{t_{i+1} - t_i} & \text{if } t \in [t_i, t_{i+1}) \\ \dfrac{t_{i+2} - t}{t_{i+2} - t_{i+1}} & \text{if } t \in [t_{i+1}, t_{i+2}) \\ 0 & \text{otherwise} \end{cases}$$

$B_{0,1}(t)$



$B_{1,1}(t)$

$$c(t) = f(0) * B_{0,1}(t) + f(1) * B_{1,1}(t) + f(2) * B_{2,1}(t) \cdots f(n) * B_{n,1}(t)$$

Similarly we can use 3-degree Bspline function

Assignment 2 Q-1

Find value of $f(2.5)$ using

(a) 0-degree B-spline function

(b) 1-degree B spline function

(c) 3 degree B-spline function

given

$f(0) = 2$

$f(1) = 3$

$f(2) = 4$

$f(3) = 2$

$f(4) = 5$

Submit your written answer in pdf format.

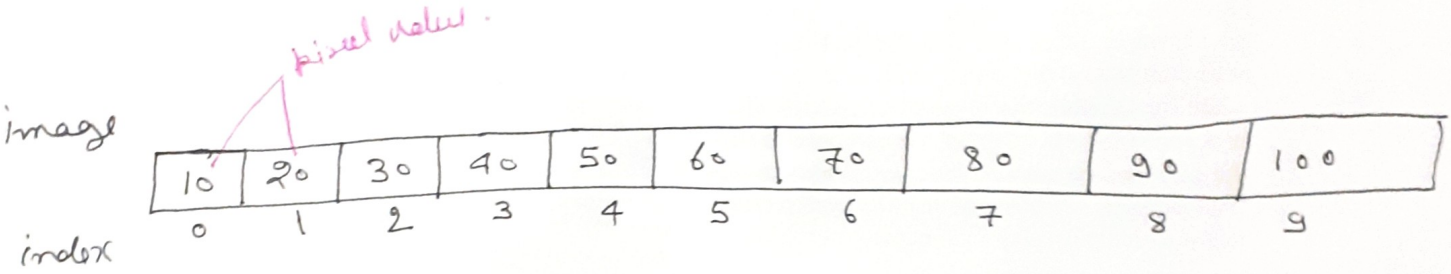
Assignment 2.02 - [Implement and submit ipynb file.]

Scale the image 2-times in x-direction. and fill vacant index with help of-

(a) 0th degree Bspline Interpolation

(b) 1st degree " "

(c) 3rd " " "



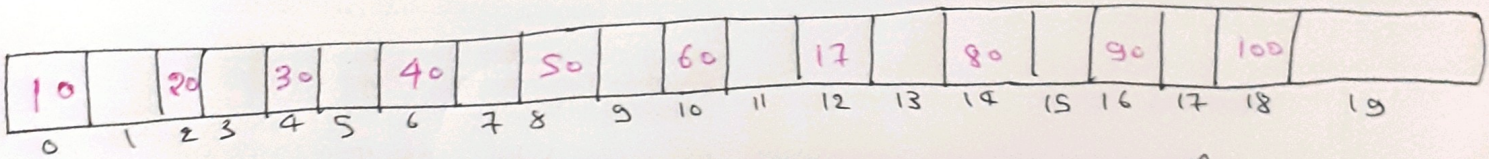
$f(0) = 10$ $f(4) = 50$ $f(8) = 90$

$f(1) = 20$ $f(5) = 60$ $f(9) = 100$

$f(2) = 30$ $f(6) = 70$

$f(3) = 40$ $f(7) = 80$

Hint → After scaling 2-times in x-direction size of image will be 1 X 20.



pixel value of i^{th} index of scaled-image will be correspond to pixel value of i/scaling factor of original image. In this quest scaling factor = 2 so * i-index of scaled-image depend on i/2 index of original image. So we need to find $f(1/2)$ for index 1 $f(3/2)$ for index 3, ...