(7)

Edge Detection

* Motivation

⇒ Image analysis can be simplified using Features.

Examples: lines, corners, blobs, gradient etc.

⇒ There is no best feature, they are strongly dependent on application.

* Feature

→ **Image processing**

Elements of image such as corners, lines etc.

→ **Pattern recognition**

Properties of object eg. the color of an object.

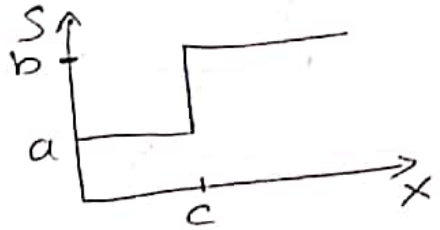
* Edge Detection

⇒ A edge is a step in the image function along a smooth line.

* Step

⇒ A step can be expressed as

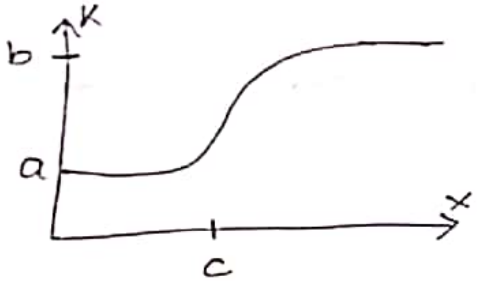
$$S(x) = \frac{1}{2}\left[(a+b)+(b-a)\,\text{Sign}(x-c)\right]$$



* Smooth Step

$$K(x) = G_\sigma(x) * S(x)$$

$G_\sigma(x)$ → Smoothing Kernel



⇒ Given a gaussian kernel

$$G_\sigma(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2}\left(\frac{x}{\sigma}\right)^2}$$

⇒ The smooth step $K(x) = G_\sigma(x) * S(x)$ is

$$K(x) = \frac{(a+b)}{2} + \frac{(b-a)}{2} \operatorname{erf}\left(\frac{x-c}{\sigma\sqrt{2}}\right)$$

With,

$$\operatorname{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt$$