BASIC IMAGE PROCESSING TOOLS

CORRELATION

- It is a measure of similarity between two signals.

- Let f(x,y) be an image containing objects. If we want to determine whether f contains the object in which we are interested, we will use a window or a kernal h(x,y). If there is match, correlation will be maximum at that point.
- Used for image alignment and image matching.

Let $f(t)$ and $g(t)$ be one-dimensional functions in continuous time domain; the correlation R_{fg} between f and g is given by

$$R_{fg}(t) = f(t) \circ g(t) = \int_{-\infty}^{+\infty} f(\alpha) g(t+\alpha) d\alpha$$

• Its discrete function is described as follows:

Suppose a(m) and b(m) are one-dimensional discrete signals where m is an integer.

Correlation between a and b is given by:-

$$r_{ab}(m) = a \circ b(m) = \sum_{h=-\infty}^{+\infty} a(h)b(h+m)$$

where h is an integer.

• Correlation between two-dimensional continuous function f(x,y) and g(x,y) is given as follows:

$$R_{fg}(x,y) = f(x,y) \circ g(x,y) = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} f(\alpha,\beta)g(x+\alpha,y+\beta)\,d\alpha\,d\beta$$

• Its discrete form is described as follows:-

Suppose the corresponding discretised form for the two-dimensional signals are denoted as $a(m, n)$ and $b(m, n)$, where m and n are integers. The correlation between a and b is given by

$$r_{ab}(m,n) = a(m,n) \circ b(m,n) = \sum_{h=-\infty}^{+\infty} \sum_{l=-\infty}^{+\infty} a(h,l) b(m+h, n+l)$$

where h and l are integers.