Image Processing: Filter

Filter Vs Point Operation

- Point operation is the methods that operate with ‘a pixel’.
- Filter is the methods that operate with ‘group of pixel’.

Size of Filter

- Determines how many pixels contribute to each resulting pixel values.

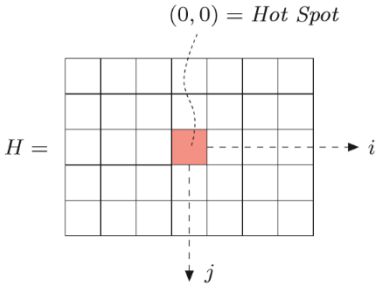
Shape of Filter

- Another option to assign difference weights to the pixels, not necessary.

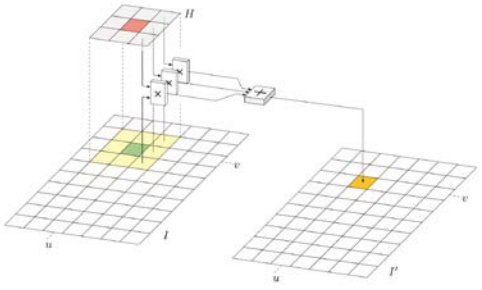
Linear Filter

- Combine the pixel value in linear function.
- Another name is *‘Smooth Filter’.*
- Filter matrix; $H(i,j)$ present size and shape of filter.

  Has its own coordinate, generally, origin of coordinate is in a center.



- Applying the filter
  1. Move hot spot of filter to interested pixel of an image.
  2. Multiply all coefficients of filter with image element to find average.
  3. Resulting is stored at current position in the new image.



- Type of linear filter
  - Smooth filter *find average of neighbor pixel to be a new pixel value.*
  - Box filter
  - Gaussian filter *use Gaussian equation to calculate a new pixel value.*
  - Different filter *use when some of coefficient is negative.*

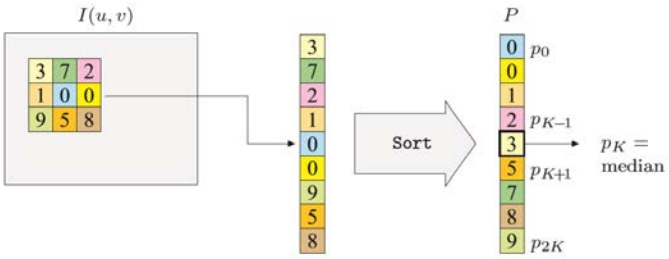
    I' = sum of positive coefficient – sum of negative coefficient
- Convolution
  - To get a output image, operation of input image and filter call *'CONVOLUTION'*
  - Symbol of convolution $I' = I * H$
  - Properties >> Linearity, Commutatively, Associativity.
- Disadvantage >> all structures of an image are blur.

Non-Linear Filter

- Has weak support theory.
- Maximum – minimum filter

  Find max or min of pixel value in a filter region and give it into new image
- Median filter

  Replace every pixel by median of pixel in filter region.



- Weight median filter

  Multiple pixel in filter region with weight matrix then find the median.