

**(d)Order statistics filter:**

Order statistics filters are spatial filters whose response is based on ordering the pixel contained in the image area encompassed by the filter. The response of the filter at any point is determined by the ranking result.

**(e)Median filter:**

It is the best order statistic filter; it replaces the value of a pixel by the median of gray levels in the Neighborhood of the pixel.

$$\hat{f}(x, y) = \underset{(s, t) \in S(x, y)}{\text{median}} \{g(s, t)\}$$

The original of the pixel is included in the computation of the median of the filter are quite possible because for certain types of random noise, the provide excellent noise reduction capabilities with considerably less blurring then smoothing filters of similar size. These are effective for bipolar and unipolar impulse noise.

**(e)Max and Min filter:**

Using the 100th percentile of ranked set of numbers is called the max filter and is given by the equation

$$\hat{f}(x, y) = \max_{(s, t) \in S(x, y)} \{g(s, t)\}$$

It is used for finding the brightest point in an image. Pepper noise in the image has very low values, it is reduced by max filter using the max selection process in the sublimated area sky. The 0th percentile filter is min filter.

$$\hat{f}(x, y) = \min_{(s, t) \in S(x, y)} \{g(s, t)\}$$

This filter is useful for flinging the darkest point in image. Also, it reduces salt noise of the min operation.

**(f)Midpoint filter:**

The midpoint filter simply computes the midpoint between the maximum and minimum values in the area encompassed by

$$\hat{f}(x, y) = \left( \max_{(s, t) \in S(x, y)} \{g(s, t)\} + \min_{(s, t) \in S(x, y)} \{g(s, t)\} \right) / 2$$

It comeliness the order statistics and averaging .This filter works best for randomly distributed noise like Gaussian or uniform noise.