Arithmatic Mean Filter:

- An arithmatic mean filter operation on an image removes short tailed noise such as uniform and Gaussian type noise.
- The arithmatic mean filter is defined as the average of all pixels within a local region or a filter mask of an image
- The arithmatic mean is defined as,

$$x' = \frac{1}{n} \sum_{i=0}^{n} z_n$$

- The larger the filter mask becomes the blurring of the image becomes predominent and less high spatial frequency details remains in the image.

Geometric Mean Filter:

- In the geometric mean filter, the value of each pixel is replaced with the geometric mean of the values of the pixels surrounding the region or the filter mask.
- A larger filter mask yeelds a stronger filter effect with the drawback of some blurring.
- The geometric mean is defined as,

$$G = \sqrt[n]{a_1 . a_2 \dots a_n}$$

- The geometric mean filter is better at removing Gaussian type noise and preserving the edge features than the arithmatic mean filter.

Harmonic Mean Filter:

- In harmonic mean filter method, the value of each pixel is replaced with the harmonic mean of the values of the pixels in the surrounding region.
- The harmonic mean filter is defined as,

$$H = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \dots + \frac{1}{x_n}}$$

- A larger filter mask size yields a stronger filter effect with the drawback of some blurring.
- The harmonic mean filter is very good at removing positive outliers.

Contraharmonic Mean Filter:

- In contraharmonic mean filter, the value of each pixel is replaced with the contraharmonic mean of values of pixel in the surrounding region.
- The contraharmonic mean with order Q is defined as,

$$C_Q = \frac{x_1^{Q+1} + x_2^{Q+1} + \dots + x_n^{Q+1}}{x_1^Q + x_2^Q + \dots + x_n^Q}$$

- A contraharmonic mean filter reduces or virtually eliminates the effects of salt-and-pepper noise.
- For positive value Q it eleminates the pepper noise and for negative value of Q it eleminates the Salt noise