**Course: Advanced Bioinformatics**

**Module title: Enhancement- Neighborhood Processing**

**Module no. : 21**

Image Enhancement is the approach for enhancing the quality of the image. Enhanced image is further processed to attain useful information which can be further used for important tasks. Best way to enhance the image is based on the values of its neighbors. When we change the value of current pixel based on its neighbors. The technique is called neighborhood processing.

There are several options for neighborhood operations such as **Min:** where current pixel value is set to the minimum in the neighborhood.

**Max:** where current pixel value is set to the maximum in the neighborhood.

**Median:** where current pixel value is set to the median in the neighborhood.

**Average:** where current pixel value is set to the average in the neighborhood.

**Sharpening Spatial Filters:** Highlight or enhance details in images by removing blurring from the images. It further highlights edges.

Sharpening filters are based on spatial differentiation which means that next values of pixels are compared against current values and their difference is saved.

Spatial Differentiation can be defined as rate of change of function

1st order derivate gives difference between subsequent values, whereas 2nd order provides values both before and after the current value

It has stronger response to fine detail and very simple to implement.

Laplacian filter: It is based on 2nd order derivative. It gives details of edges and inner fine details.

Frequency Domain Filters: They work on the principal of modifying the spectral transform of an image. Frequency is directly related rate of change. It is not difficult intuitively to associate frequencies with pattern of intensity variations in an image. High frequencies correspond to pixel values that change rapidly across the image (e.g., text, texture, leaves, etc.). Strong low frequency components correspond to large scale features in image (e.g., a single, homogenous object that dominates the image)