

**Gaussian blur of the grayscale image:**

It is the image processing algorithm that enables image manipulations. Gaussian functions are used for several purposes. Both grayscale and color images contain a lot of noise or random variation in brightness or tint among pixel values. The pixels in these images have a high standard deviation which implies that there is a lot of variation within groups of pixels. Since a photo is two-dimensional Gaussian blur uses two mathematical functions (one for the x axis and one for y) to create a third function, also known as a convolution. The third function creates a normal distribution of those pixel values, smoothing out a few of the randomness. How much smoothing depends on the measure of the blur radius you choose. Each pixel will choose up a new value set to a weighted average of its surrounding pixels, with more weight given to the closer ones than to those further away. The result of all this math is that the image is hazier.

**Otsu's thresholding:**

Image thresholding is used in many applications as a pre-processing step. Thresholding is used to binarize the image based on pixel intensities. Otsu's thresholding strategy includes iterating through all the possible threshold values and calculating a degree of spread for the pixel levels on each side of the threshold i.e the pixels that either drop in foreground or background. The point is to discover the threshold value where the sum of foreground and background spreads is at its minimum. The input to such thresholding calculation is usually a gray scale image and the output is a binary image. If the intensity of a pixel is greater than a threshold, the output pixel is marked as white (foreground), and if the intensity of a pixel is less than or equal to the threshold, the output pixel is marked as black (background).

**Morphological transform:**