### Result Analysis of proposed Research Work

In this section, result analysis is discussed in detail. Image basically made up of number of pixels. Any work that is related with the image can be done on the basis of number of pixels in an image, size of the image, color intensity of the image and the shape of the image. The purpose of this section is to focus on the various parameters i.e. entropy, mean intensity, time required for encryption and decryption, peak signal to noise ratio, mean square error. After performing various operations on the image, it gives different results that one has to focus. The table indicates the comparative study of image parameters.

* + - * **Analysis with respect to PSNR value, MSE, NC and Time Constraint.**

***Peak signal-to-noise ratio (PSNR***): It is an expression for the ratio between the maximum possible value (power) of a signal and the power of distorting noise that affects the quality of its representation. Because many signals have a very wide dynamic range, (ratio between the largest and smallest possible values of a changeable quantity) the PSNR is usually expressed in terms of the logarithmic decibel scale.

PSNR is most commonly used to measure the quality of reconstruction of lossy compression codecs. The signal in this case is the original data, and the noise is the error introduced by compression. When comparing compression codecs, PSNR is an approximation to human perception of reconstruction quality. Although a higher PSNR generally indicates that the reconstruction is of higher quality, in some cases it may not be. One has to be extremely careful with the range of validity of this image; it is only conclusively valid when it is used to compare results from the same codec (or codec type) and same content. PSNR can be calculated as,

PSNR= 10𝑙𝑜𝑔

2552

10 𝑀𝑆𝐸

Where, ***Mean Square Error (MSE):*** It measures the average of the square of the error. The error is the amount by which the pixel value of original image differs from the pixel value of decrypted image.

Where x (i, j) represents the original image, y (i, j) is the decrypted image and (i, j) represent the pixel positions of the MN image. Here, M and N are the height and width of image respectively.

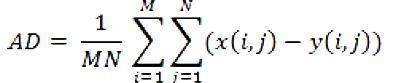
The time required for encryption and decryption of an image is also an important factor.

***Normalized Correlation (NC):*** It measures the similarity representation between the original image and decrypted image.



**Analysis with respect to AD value, MD, NAE and SC**

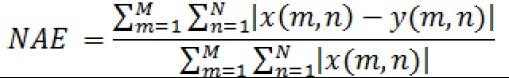
***Average Difference (AD):*** Average Difference is measurement of differences between two images. Here we calculated the average difference by the formula given. As we know that large value of maximum difference means that image is poor in quality.



***Maximum Difference (MD):*** Difference between any two pixels such that the larger pixel appears after the smallest pixel. As we know that large value of maximum difference means that image is poor in quality. MD is defined as.

MD = MAX |x(i , j)- y(I , j)|

***Normalized Absolute Error (NAE):*** The large value of normalized absolute error means that image is poor quality. NAE is defined as



***Structural Content (SC):*** The structural content measure used to compare two images in a number of small image patches the images have in common. The patches to be compared are chosen using 2D continuous wavelet which acts as a low level corner detector. As we know that large value of structural content SC means that image is poor quality. SC is defined as.

