

Question-3:

The contrast enhancement techniques I used are

- Log transformation - $s = c * \log(1+r)$
- Power - Law transformation - $s = c * r^r$
- Contrast stretching technique (also called Piecewise-Linear Transformation) - $s = 1 / (1 + (m / (r+\epsilon))) ^ E$
where E = slope function
 m = mid-line of switching from dark value to light value
- Histogram equalization
- Combination of log and power law transformations

RESULTS:

Original Image



Log transform



Power-law transform



Contrast stretching



Histogram equalization



Power law and log



OBSERVATIONS:

- Contrast has increased in all the cases and the maker of the chip is readable.
- In log transformation ($s = c * \log(1+r)$), as the value of c increases, better result is obtained.
- In case of power-law transformation ($s = c * r^c$), better results were obtained for $0.08 < r < 0.5$.

Question-4:

Steps illustrating high boost filtering:

- First smoothen the image.
- Smoothing is done by convolving the below normalized filter with the original image
$$S = 1/9 [1 \ 1 \ 1; 1 \ 1 \ 1; 1 \ 1 \ 1]$$

The size of the filter can be changed.
- Subtract the smoothened image from the original image so we obtain
$$g_{\text{mask}}(x,y) = f(x,y) - f_s(x,y)$$

where $f(x,y)$ is the original image
- High boost filtered image is obtained by
$$g(x,y) = f(x,y) + k * g_{\text{mask}}(x,y) \quad (\text{generally } k > 1)$$

where the original image is added to a scaled $g_{\text{mask}}(x,y)$
- For a color image, the above process is done in the 3 channels separately and finally are concatenated to get the output sharpened image.

Results:

1. Keeping the value of $k = 2$ (constant) and varying the window sizes
 - As the window size is increased, the sharpness of the image is increased and the ringing effect in the background is predominantly increased.

Original Image

3x3

5x5



10x10

15x15

20x20



Keeping the window size constant and varying the values of k .

- As the value of k is increased, the sharpness of the image increases and also observed that the noise in the image is increased and the ringing effect in the background increased.

Original Image



$k = 2$



$k = 5$



$K = 7$



$k = 9$



$k=10$

