Visual Recognition

Assignment - 1

Name : Shubham Gupta

Roll-No : IMT2016118

Q.1) Choose an RGB image (Image1); Plot R, G, and B separately.

Original Image

Red Channel


Green Channel

Blue Channel

Observation :

- **Red Channel** : Those places in the image where there is pure red component then pure red component becomes white and when there is no red component it becomes black and at those places in image where there is some red component then Red Channel output depends upon the intensity of red at those places.

- **Green Channel** : Those places in the image where there is pure green component then pure green component becomes white and when there is no green component it becomes black and

at those places in image where there is some green component then green Channel output depends upon the intensity of green at those places.

- **Blue Channel :** Those places in the image where there is pure blue component then pure blue component becomes white and when there is no blue component it becomes black and at those places in image where there is some blue component then Blue Channel output depends upon the intensity of Blue at those places.

Q.2) Convert Image 1 into HSL and HSV. Write the expressions for computing H, S and V/L.

HSL Component :
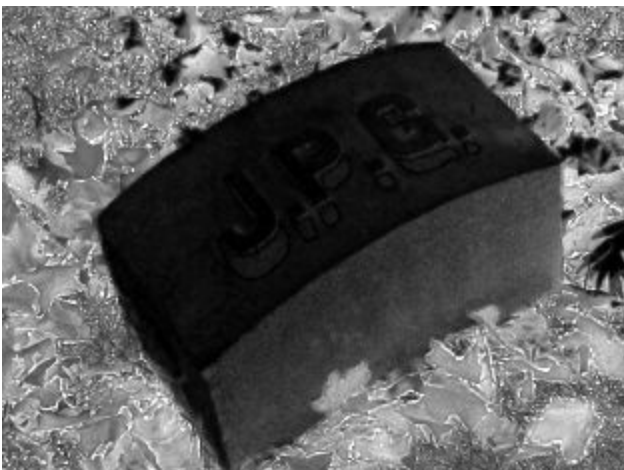
Saturation Channel
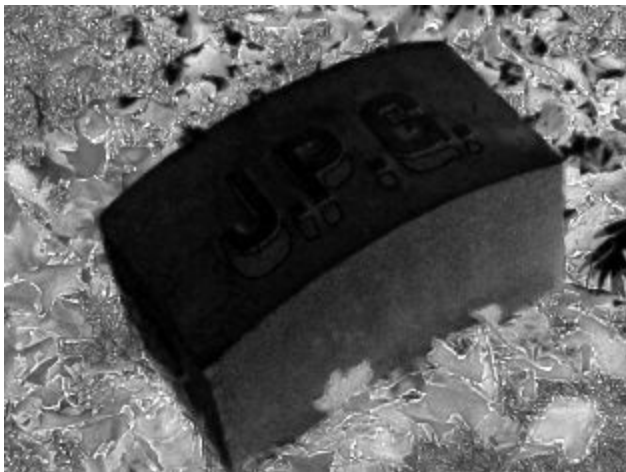

Lightness image

HSV Component :

Original Channel

Hue Channel

Saturation Channel

Variance Channel

Observation and Formulas :

$$M = \max(R, G, B)$$
$$m = \min(R, G, B)$$
$$C = M - m$$

$$H' = \begin{cases} \text{undefined}, & \text{if } C = 0 \\ \frac{G-B}{C} \bmod 6, & \text{if } M = R \\ \frac{B-R}{C} + 2, & \text{if } M = G \\ \frac{R-G}{C} + 4, & \text{if } M = B \end{cases}$$

$$H = 60° \times H'$$

$$V = M$$

$$S_{HSV} = \begin{cases} 0, & \text{if } V = 0 \\ \frac{C}{V}, & \text{otherwise} \end{cases}$$

$$S_{HSL} = \begin{cases} 0, & \text{if } L = 1 \vee L = 0 \\ \frac{C}{1-|2L-1|}, & \text{otherwise} \end{cases}$$

HSV and HSL are the different ways of representing RGB color. Hue is same for both HSV and HSL Variance of HSV is darker than lightness of HSL and saturation also takes different values.
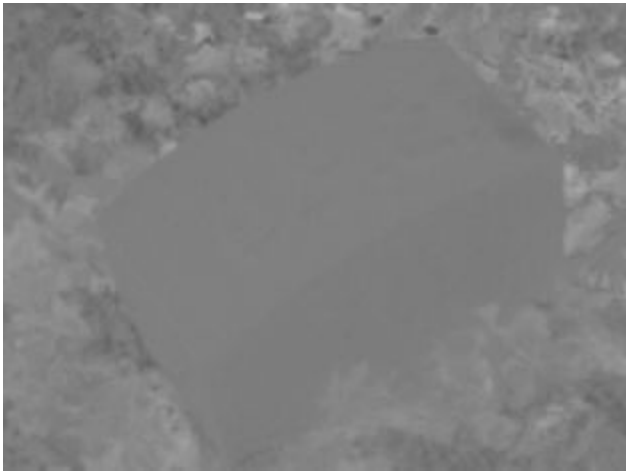
Q.3) Conversion of Image 1 into L*a*b* and plot.

Original

L Channel

a channel	b channel

Q.4) Conversion of Original Image into Grayscale using the default OpenCV Function. And the expressions used for the conversion.

Sol. Expression used for conversion is :

```
image = cv2.imread('/home/iiitb/Desktop/watch.jpg')
gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
```


Original	Grayscale channel

Q.5) Whitening and Histogram Equalization of Grayscale Image.

Sol.   1) Whitening :   2) Histogram Equalization :

1) Whitening Illustration :

Grayscale Channel   Whitened Image

2) Histogram Equalization :

Grayscale Channel   Histogram Equalization

Q.6) Gaussian smoothing performed on noisy image at different scale.

Gaussian Smoothing at scale of (1-15)

Gaussian Smoothing at scale of (5-5)

Gaussian Smoothing at scale of (15-5)

Gaussian Smoothing at scale of (15-15)
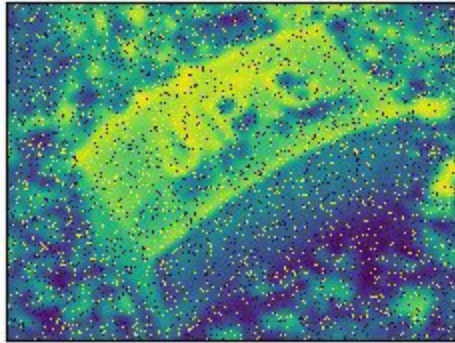
Observation :

On increasing the scale image becomes smoother or blurring will increase and if our 'a' scale in (a,b) is greater then 'b' then it will leads to horizontal blurring and if our 'b' scale in (a,b) is greater then 'a' then it will leads to vertical blurring. Which we can observe in the output images.

Q.7) Salt-and-pepper noise is added to the image after Gaussian Smoothing of image and then median filtering of the output image to remove that noise.

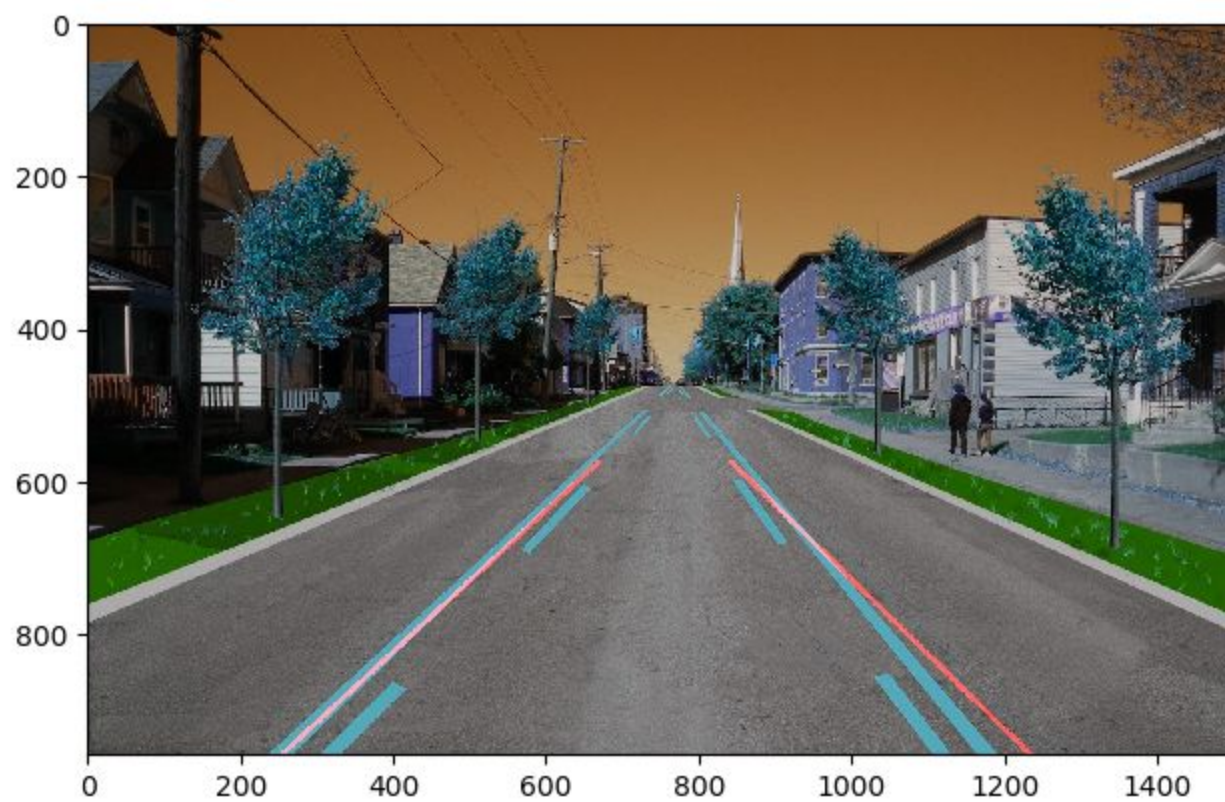Original Image

salt_and_pepper_image | Median_filtered_image

Q.8) Road Lane marker detection

Original Road Image

Road Lane Marker Detected Image