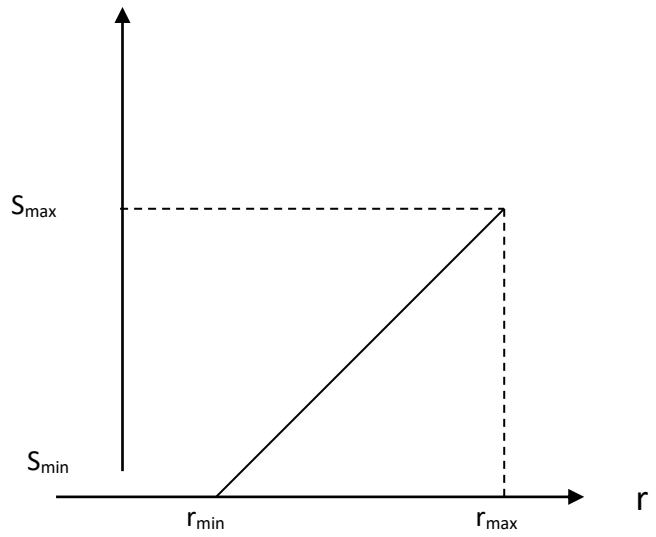
AIM: To Perform Histogram Stretching

THEORY:

Histogram Stretching

It is a method to increase the dynamic range of the image. Here we do not alter the basic shape of the histogram, but we spread it so as to cover the entire dynamic range. We do this by using a straight line equation having a slope

$(s_{max} - s_{min})/ (r_{max} - r_{min})$



s_{max} = Maximum grey level of output image

s_{min} = Minimum grey level of output image.

r_{max} = Maximum grey level of input image

r_{min} = Minimum grey level of input image.

$$S = T(r) = \frac{(smax - smin)}{(rmax - rmin)} (r - r_{min}) + smin$$

This transformation stretches and shifts the grey level range of input image to occupy the entire dynamic range (s_{max}, s_{min}).

RESULT:

1] The intitial was less diverse in contrast as compared to the resultant image. The initial image didn't have a wide and extreme ranges of grey.

2] The range of grey levels in final image has increased more resulting in a better image in terms of visibility

3] The histogram though has not changed.

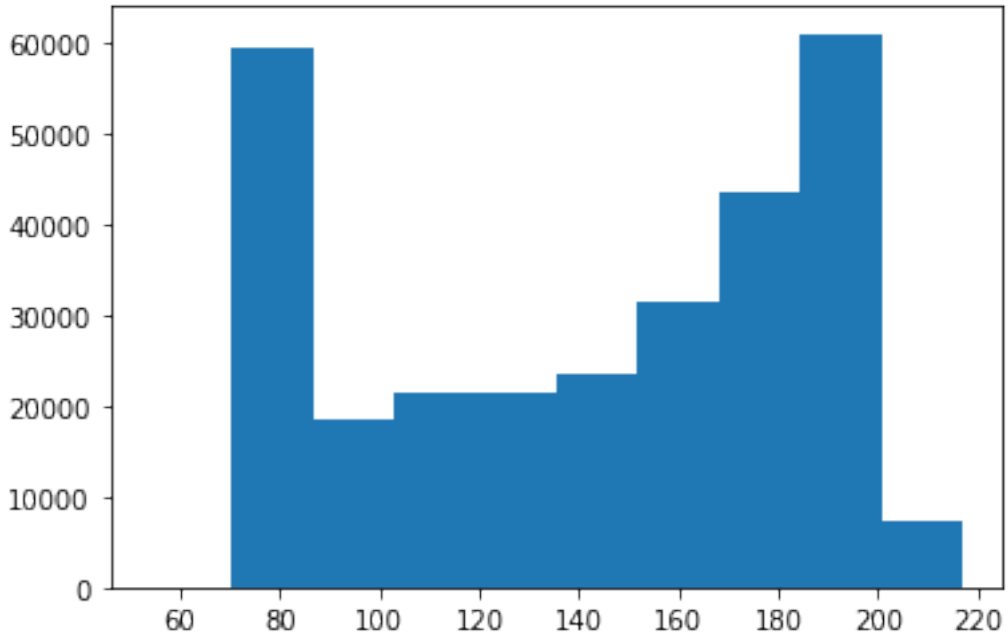
```
import cv2
import numpy as np
import matplotlib.pyplot as plt
from google.colab.patches import cv2_imshow

img = cv2.imread('/content/deer2.jpg',0)
cv2_imshow(img)
```

```
new = np.ravel(img)

plt.hist(new)
```

```
(array([5.8000e+01, 5.9546e+04, 1.8589e+04, 2.1425e+04, 2.1511e+04,
        2.3601e+04, 3.1480e+04, 4.3496e+04, 6.0960e+04, 7.3340e+03]),
 array([ 54. ,  70.3,  86.6, 102.9, 119.2, 135.5, 151.8, 168.1, 184.4,
        200.7, 217. ]),
 <BarContainer object of 10 artists>)
```




```
print(img.min(),img.max())
```

```
54 217
```

```
minn = img.min()
maxx = img.max()

row,col = img.shape

k = (255-0)/(maxx-minn)

for i in range(0,row-1):
   for j in range(0,col-1):
     pixel = img[i,j]
     pixel = k*(pixel-minn)

     img[i,j] = pixel

cv2_imshow(img)
```

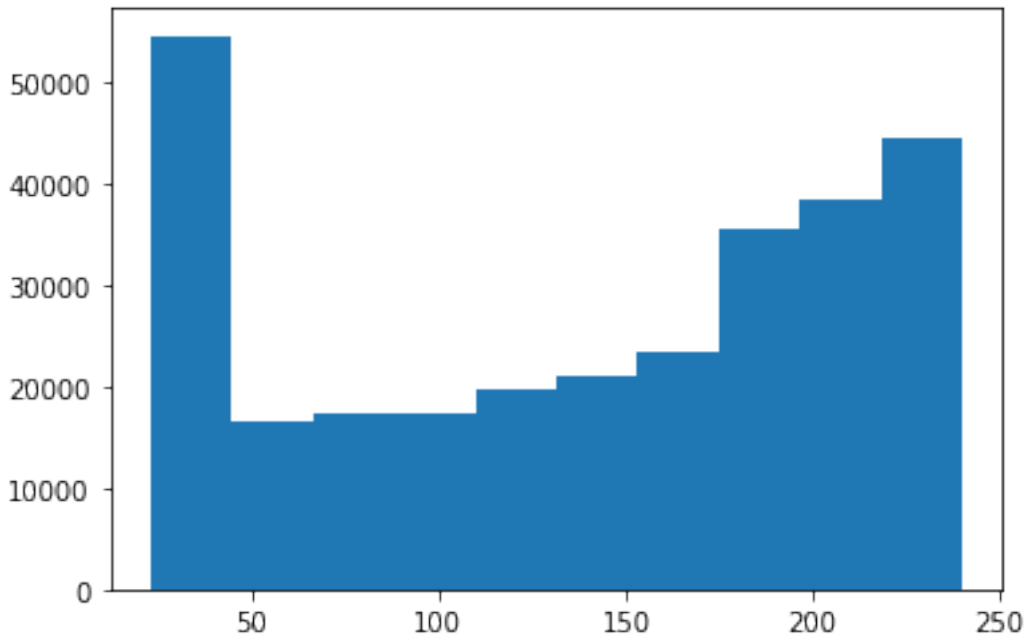
```
new = np.ravel(img)
```

```
print(img.min(),img.max())
```

```
23 240
```

```
plt.hist(new)
```

```
(array([54492., 16495., 17429., 17234., 19734., 21040., 23312.,
35406.,
        38358., 44500.]),
 array([ 23. ,  44.7,  66.4,  88.1, 109.8, 131.5, 153.2, 174.9, 196.6,
        218.3, 240. ]),
 <BarContainer object of 10 artists>)
```


50000
40000
30000
20000
10000
0
50
100
150
200
250