

# **Image Processing Lab**

**Subject Code: MCALE231**

A Project Report Submitted in Fulfilment of the Degree of

**MASTER**

**In COMPUTER APPLICATION**

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By

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**(Application Id-169593)**

Semester-II Under the Guidance of

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## CERTIFICATE

This to certify that, **“Pratibha Prashant Londhe”** appearing **Master’s in computer application (Semester II) Application ID: 169593** has satisfactory completed the prescribed practical of **MCALE231 –Image Processing Lab** as laid down by the University of Mumbai for the academic year 2022-23.

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External Examiner

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Date:  
Place:

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## Practical 1

**Aim : Programs for image enhancement using spatial domain filters. Program for Average spatial Filter.**

**Code:-**

```
import cv2
import numpy as np

# Read the image
img = cv2.imread('sample.png', 0)

# Obtain number of rows and columns
# of the image
m, n = img.shape

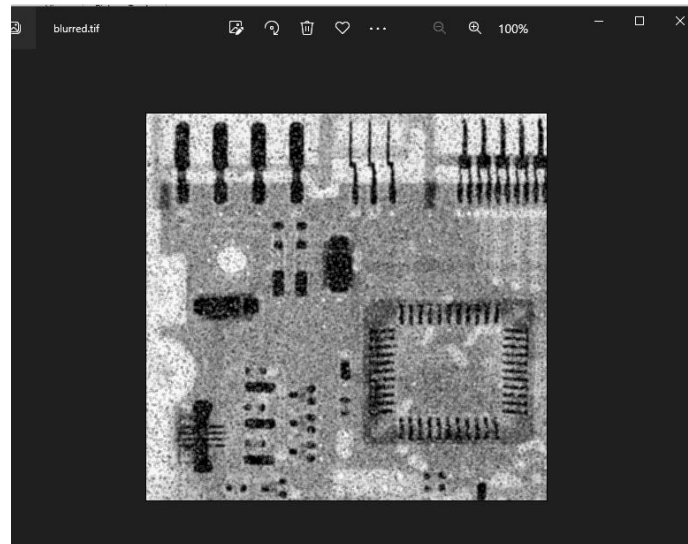
# Develop Averaging filter(3, 3) mask
mask = np.ones([3, 3], dtype = int)
mask = mask / 9

# Convolve the 3X3 mask over the image
img_new = np.zeros([m, n])

for i in range(1, m-1):
    for j in range(1, n-1):
        temp = img[i-1, j-1]*mask[0, 0]+img[i-1, j]*mask[0, 1]+img[i-1, j+1]*mask[0, 2]+img[i, j-1]*mask[1, 0]+img[i, j]*mask[1, 1]+img[i, j+1]*mask[1, 2]+img[i+1, j-1]*mask[2, 0]+img[i+1, j]*mask[2, 1]+img[i+1, j+1]*mask[2, 2]

        img_new[i, j]= temp

img_new = img_new.astype(np.uint8)
cv2.imwrite('blurred.tif', img_new)
```



```
import cv2
import numpy as np

# Read the image
img_noisy1 = cv2.imread('sample.png', 0)

# Obtain the number of rows and columns
# of the image
m, n = img_noisy1.shape

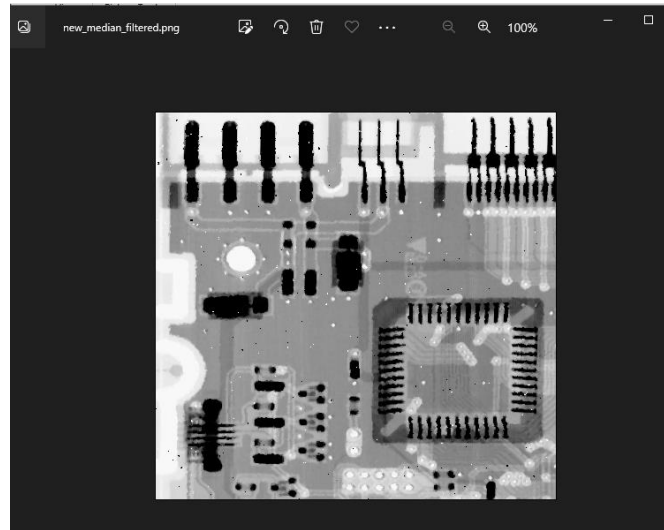
# Traverse the image. For every 3X3 area,
# find the median of the pixels and
# replace the center pixel by the median
img_new1 = np.zeros([m, n])

for i in range(1, m-1):
    for j in range(1, n-1):
        temp = [img_noisy1[i-1, j-1],
                img_noisy1[i-1, j],
                img_noisy1[i-1, j+1],
                img_noisy1[i, j-1],
                img_noisy1[i, j],
                img_noisy1[i, j+1],
                img_noisy1[i+1, j-1],
                img_noisy1[i+1, j],
                img_noisy1[i+1, j+1]]

        temp = sorted(temp)
        img_new1[i, j] = temp[4]

img_new1 = img_new1.astype(np.uint8)
```

```
cv2.imwrite('new_median_filtered.png', img_new1)
```



## Practical 2

**Aim :- To Find DFT/FFT forward and inverse transform of image.**

Code:-

```
import numpy as np
import cv2
from matplotlib import pyplot as plt

# read input image
img = cv2.imread('film.jpg',0)

# find the discrete fourier transform of the image
dft = cv2.dft(np.float32(img),flags = cv2.DFT_COMPLEX_OUTPUT)

# shift zero-frequency component to the center of the spectrum
dft_shift = np.fft.fftshift(dft)
magnitude_spectrum = 20*np.log(cv2.magnitude(dft_shift[:, :, 0],dft_shift[:, :, 1]))
# visualize input image and the magnitude spectrum
plt.subplot(121),plt.imshow(img, cmap = 'gray')
plt.title('Input Image'), plt.xticks([], plt.yticks([]))
plt.subplot(122),plt.imshow(magnitude_spectrum, cmap = 'gray')
plt.title('Magnitude Spectrum'), plt.xticks([], plt.yticks([]))
plt.show()
```



Input Image



Magnitude Spectrum



### Practical 3

**Aim :- To find DCT forward and inverse transform of image.**

```
import math

pi = 3.142857
m = 8
n = 8

# Function to find discrete cosine transform and print it
def dctTransform(matrix):

    # dct will store the discrete cosine transform
    dct = []
    for i in range(m):
        dct.append([None for _ in range(n)])

    for i in range(m):
        for j in range(n):

            # ci and cj depends on frequency as well as
            # number of row and columns of specified matrix
            if (i == 0):
                ci = 1 / (m ** 0.5)
            else:
                ci = (2 / m) ** 0.5
            if (j == 0):
                cj = 1 / (n ** 0.5)
            else:
                cj = (2 / n) ** 0.5

            # sum will temporarily store the sum of
            # cosine signals
            sum = 0
            for k in range(m):
                for l in range(n):

                    dct1 = matrix[k][l] * math.cos((2 * k + 1) * i * pi / (
                        2 * m)) * math.cos((2 * l + 1) * j * pi / (2 * n))
                    sum = sum + dct1

            dct[i][j] = ci * cj * sum

    for i in range(m):
        for j in range(n):
            print(dct[i][j], end="\t")
        print()
```



```
# Driver code
```

```
matrix = [[255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255],  
          [255, 255, 255, 255, 255, 255, 255, 255]]
```

```
dctTransform(matrix)
```

```
2039.9999999999995    -1.1681078033445202    1.1910101606541048    -  
1.2306043961129725    1.2892204000077006    -1.3705578971374432  
    1.480259193374122    -1.626904189710877  
-1.1681078033447012    0.000668860706007024    -0.0006819746385176018  
    0.0007046463715241202    -0.0007382100046555706  
    0.0007847840071448786    -0.0008475991738947641  
    0.000931568372211089  
1.1910101606542707    -0.00068197463848918    0.0006953456876459541    -  
0.0007184619311288998    0.0007526836253646252    -0.000800170775129061  
    0.0008642175194708557    -0.0009498330491997109  
-1.2306043961130728    0.0007046463715241202    -0.0007184619311786378  
    0.0007423466567360038    -0.0007777060254028356  
    0.0008267718496846044    -0.0008929477797785523  
    0.0009814095333116057  
1.2892204000077108    -0.0007382100047408358    0.0007526836253433089    -  
0.0007777060253886248    0.0008147496273664956    -0.0008661525492072997  
    0.0009354805634451679    -0.0010281559168010546  
-1.3705578971374133    0.0007847840071093515    -0.000800170775129061  
    0.0008267718496810517    -0.0008661525492108524  
    0.0009207985046231215    -0.000994500454542191  
    0.0010930227377929924  
1.4802591933741172    -0.0008475991738450261    0.0008642175194708557    -  
0.000892947779782105    0.0009354805634309571    -0.000994500454552849  
    0.0010741016076369903    -0.001180509746856906  
-1.6269041897109071    0.0009315683721755619    -0.0009498330491766183  
    0.000981409533283184    -0.0010281559167850673  
    0.0010930227377778934    -0.0011805097468391423  
    0.0012974594325978472
```

## Practical 4

**Aim : Morphological operational: Dilation, Erosion, Opening, Closing.**

```
# import the necessary packages
import cv2
import numpy as np
import matplotlib.pyplot as plt

# read the image
img = cv2.imread(r"1.jpg", 0)

# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((5, 5), np.uint8)

# invert the image
invert = cv2.bitwise_not(binr)

# erode the image
erosion = cv2.erode(invert, kernel,
                    iterations=1)

# print the output
plt.imshow(erosion, cmap='gray')
```



```
import cv2

# read the image
img = cv2.imread(r"1.jpg", 0)
```

```

# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

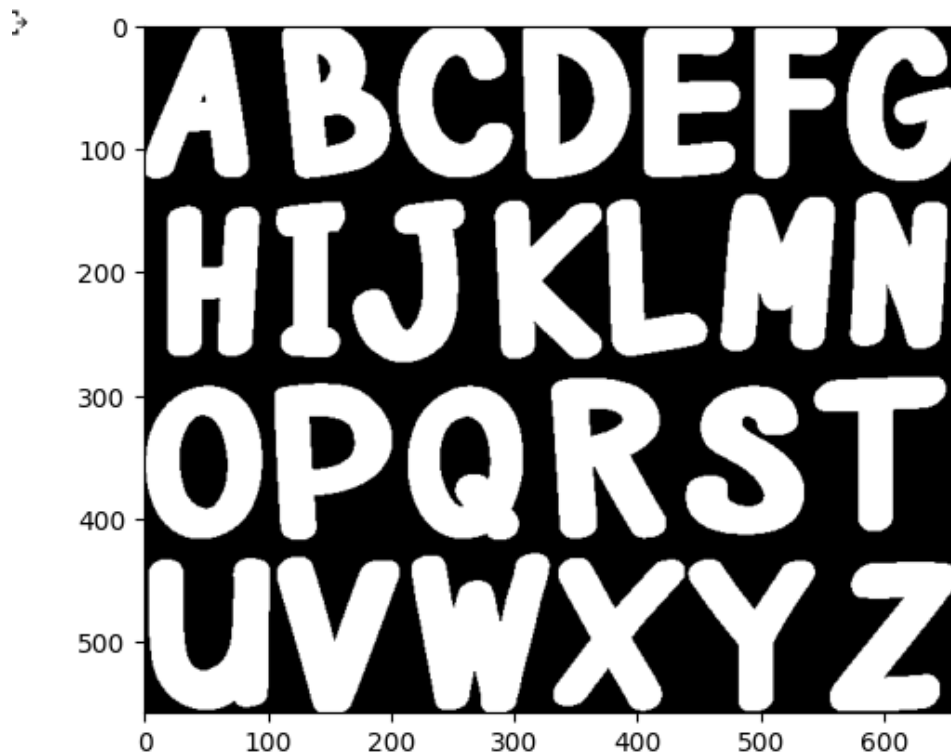
# define the kernel
kernel = np.ones((3, 3), np.uint8)

# invert the image
invert = cv2.bitwise_not(binr)

# dilate the image
dilation = cv2.dilate(invert, kernel, iterations=1)

# print the output
plt.imshow(dilation, cmap='gray')

```



```

import cv2

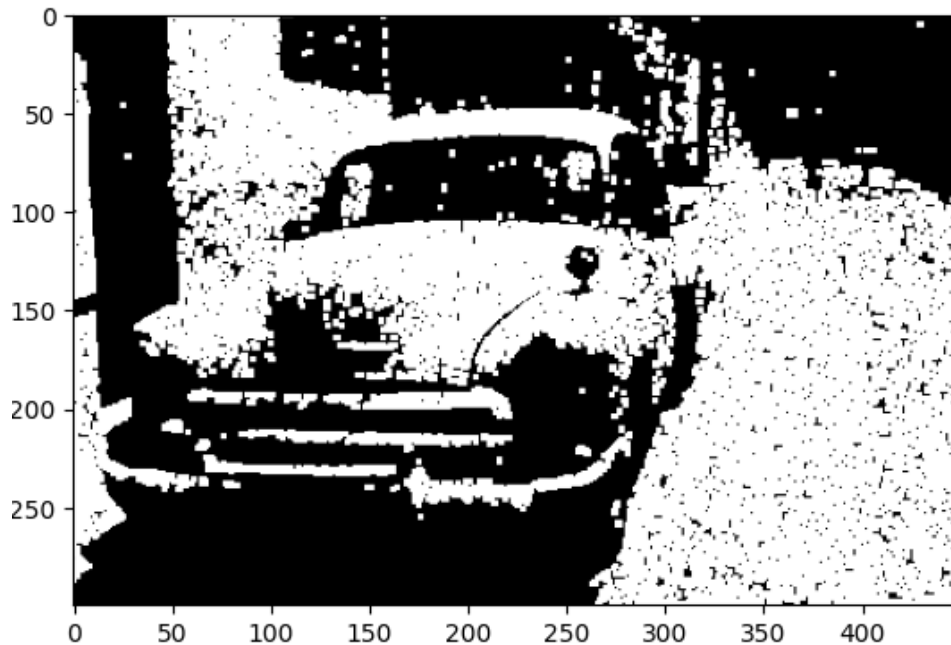
# read the image
img = cv2.imread(r"2.png", 0)

# binarize the image
binr = cv2.threshold(img, 0, 255,
                    cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((3, 3), np.uint8)

```

```
# opening the image
opening = cv2.morphologyEx(binr, cv2.MORPH_OPEN,
                           kernel, iterations=1)
# print the output
plt.imshow(opening, cmap='gray')
```



```
import cv2

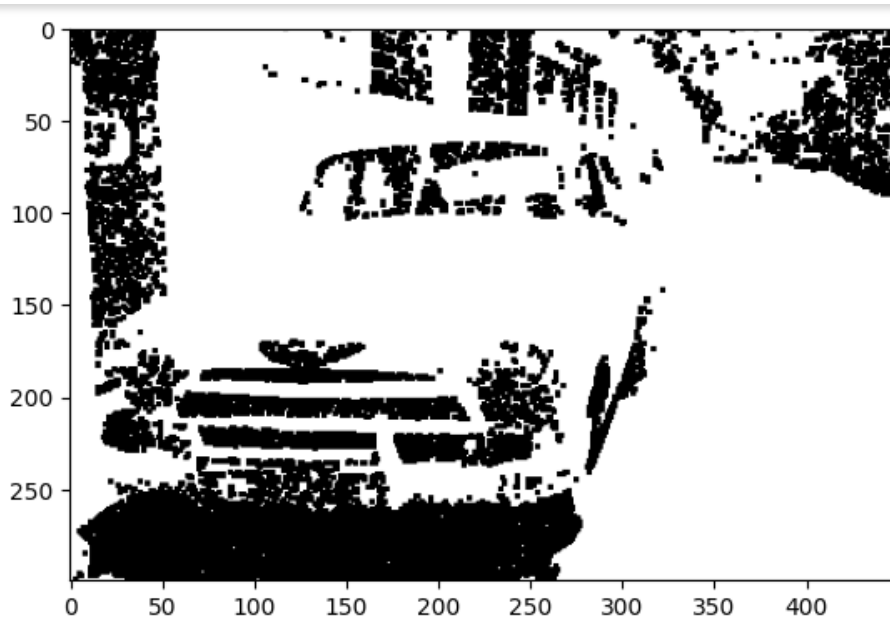
# read the image
img = cv2.imread(r"2.png", 0)

# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((3, 3), np.uint8)

# opening the image
closing = cv2.morphologyEx(binr, cv2.MORPH_CLOSE, kernel, iterations=1)

# print the output
plt.imshow(closing, cmap='gray')
```



```
import cv2

# read the image
img = cv2.imread(r"1.jpg", 0)

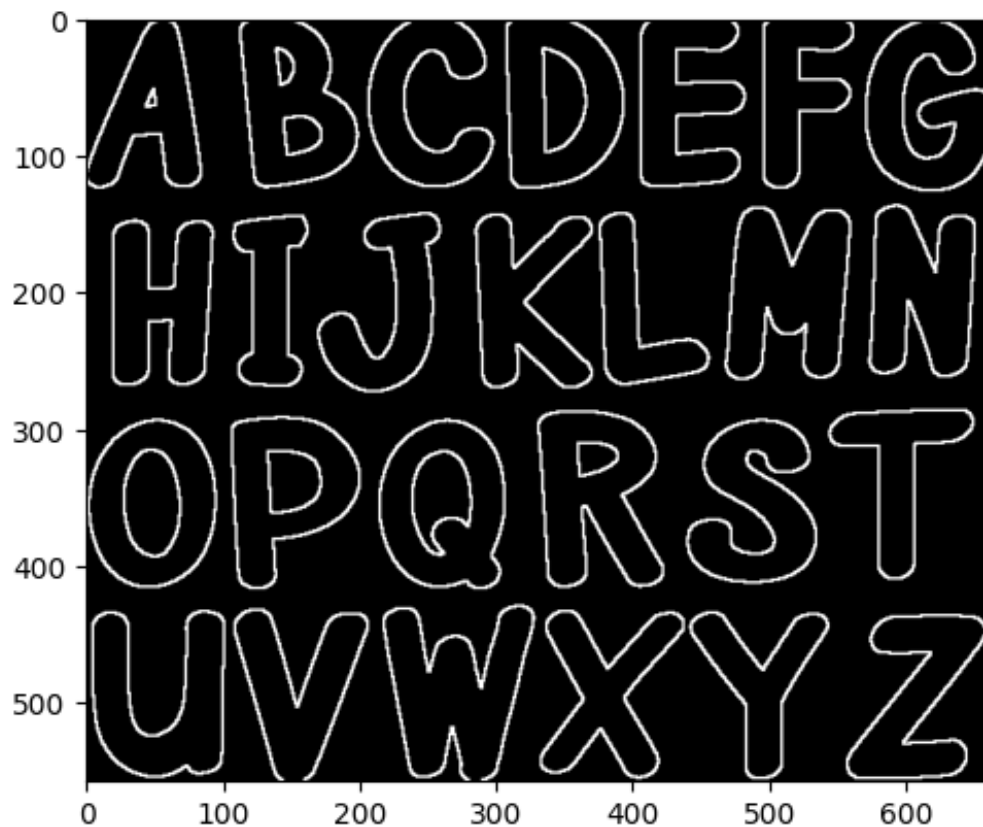
# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((3, 3), np.uint8)

# invert the image
invert = cv2.bitwise_not(binr)

# use morph gradient
morph_gradient = cv2.morphologyEx(invert,
                                   cv2.MORPH_GRADIENT,
                                   kernel)

# print the output
plt.imshow(morph_gradient, cmap='gray')
```



```
# import the necessary packages
import cv2

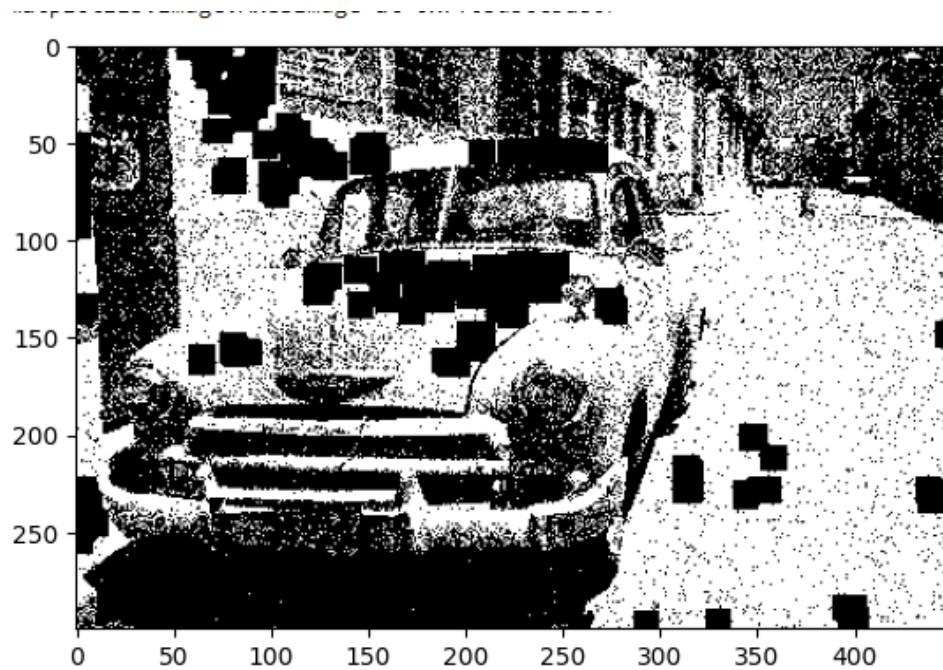
# read the image
img = cv2.imread("2.png", 0)

# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((13, 13), np.uint8)

# use morph gradient
morph_gradient = cv2.morphologyEx(binr,
                                   cv2.MORPH_TOPHAT,
                                   kernel)

# print the output
plt.imshow(morph_gradient, cmap='gray')
```



```
# import the necessary packages
import cv2

# read the image
img = cv2.imread("2.png", 0)

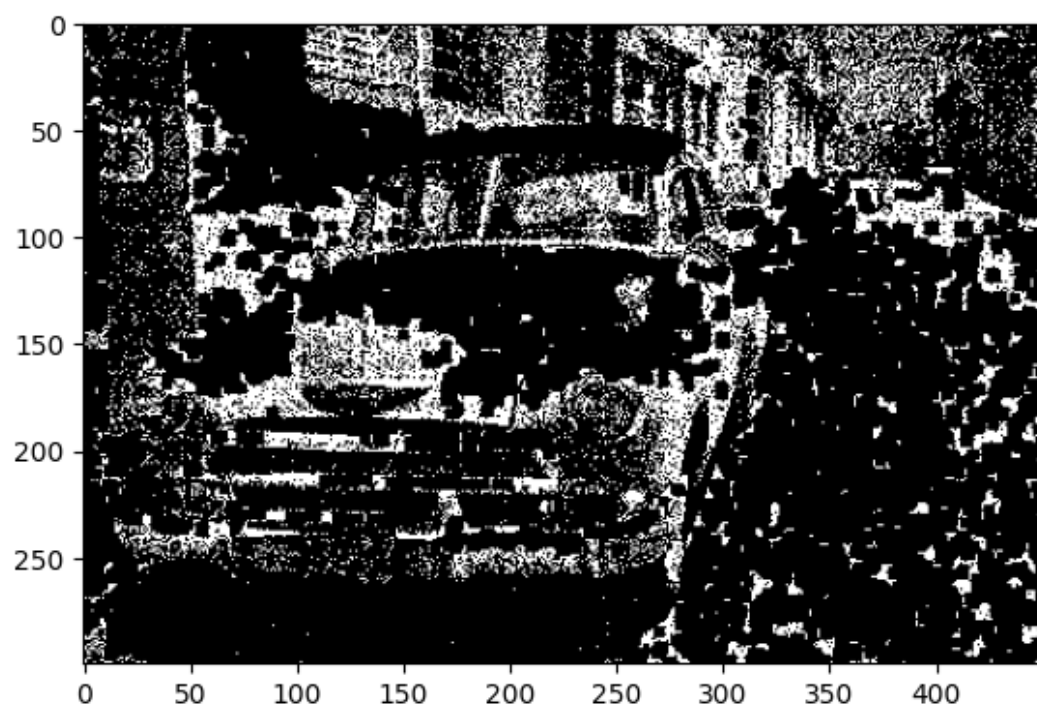
# binarize the image
binr = cv2.threshold(img, 0, 255, cv2.THRESH_BINARY+cv2.THRESH_OTSU)[1]

# define the kernel
kernel = np.ones((5, 5), np.uint8)

# invert the image
invert = cv2.bitwise_not(binr)

# use morph gradient
morph_gradient = cv2.morphologyEx(invert,
                                   cv2.MORPH_BLACKHAT,
                                   kernel)

# print the output
plt.imshow(morph_gradient, cmap='gray')
```





## Practical 5

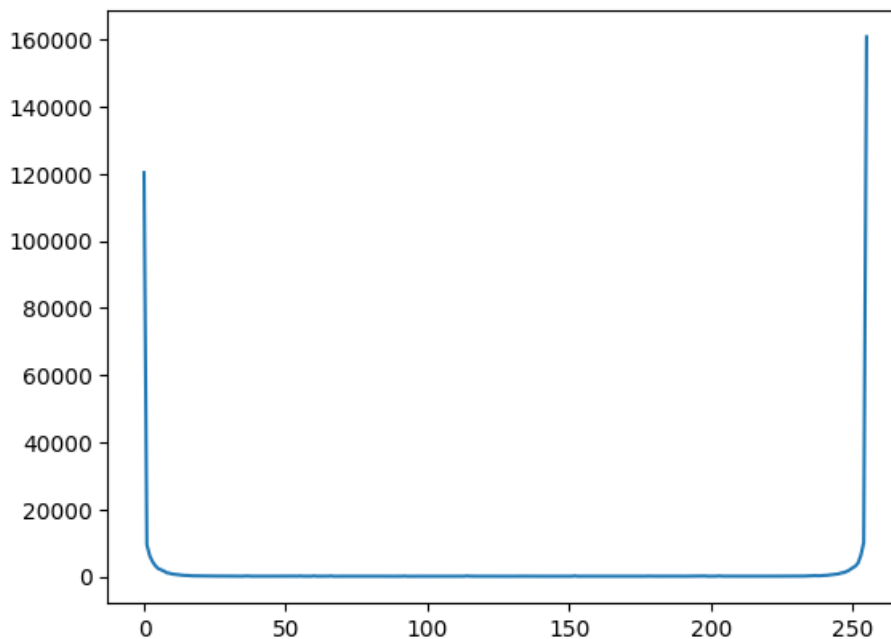
**Aim :- The detection of discontinuities – Point, Line and Edge detections, Hough transform, Thresholding, Region based segmentation chain codes**

Code:-

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

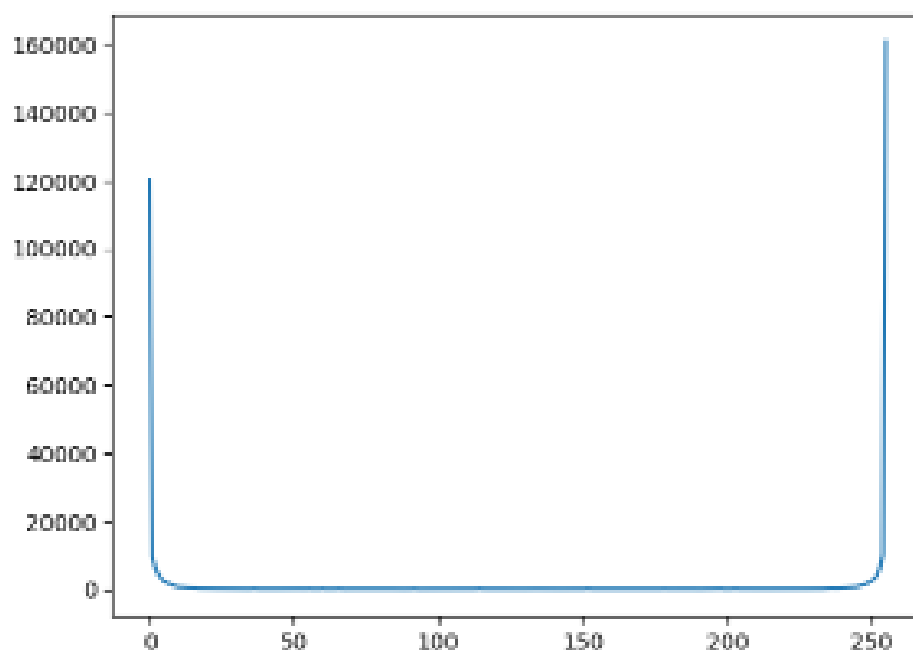
img = cv2.imread('1.jpg')
img_gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
histogram,bin_edges = np.histogram(img_gray,bins=256,range=(0,256))
fig = plt.plot(histogram)
plt.show()
threshold_value = 130

ret,imgt = cv2.threshold(img_gray,threshold_value,255,cv2.THRESH_BINARY)
cv2_imshow(imgt)
```



```
img = cv2.imread('1.jpg')
img = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
hist,bin_edges = np.histogram(img,bins=256,range=(0,256))
plt.plot(hist)
plt.show()
```

D



A B C D E F G  
H I J K L M N  
O P Q R S T  
U V W X Y Z

---

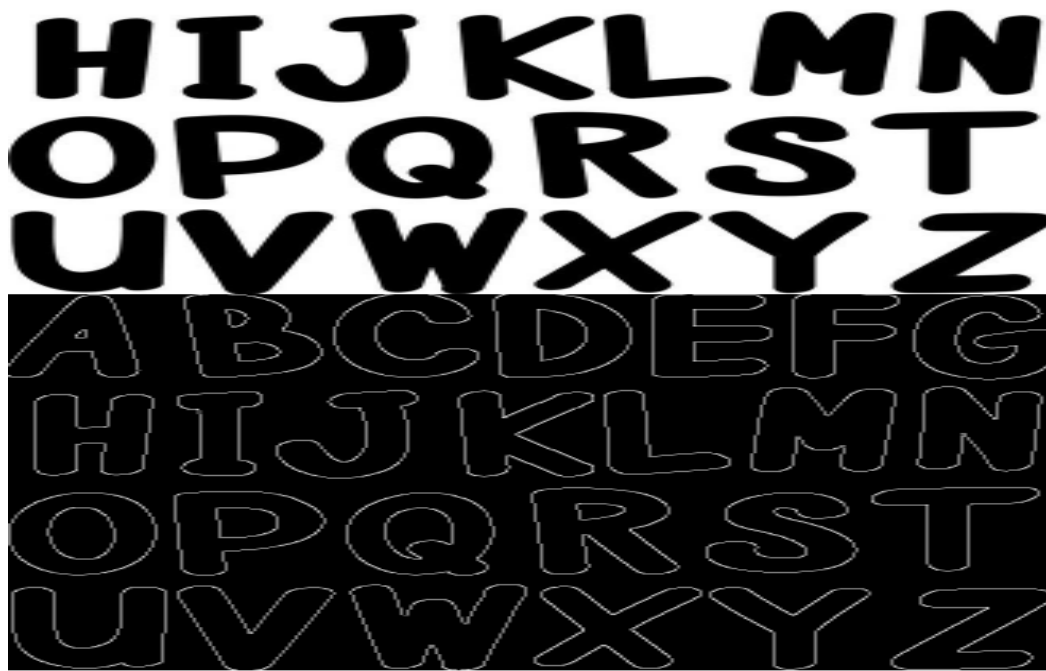
```
threshold2 =  
cv2.adaptiveThreshold(img,255,cv2.ADAPTIVE_THRESH_MEAN_C,cv2.THRESH_  
BINARY,13,5)  
cv2_imshow(threshold2)
```



```
import cv2  
image = cv2.imread('1.jpg')  
#cv2.imshow(image)  
image_edges = cv2.Canny(image,100,200)  
cv2_imshow(image_edges)
```



```
img = cv2.imread('1.jpg')  
#Converting the image into gray-scale  
img = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)  
cv2_imshow(img)  
#Finding edges of the image  
edge_image = cv2.Canny(img,250,200)  
cv2_imshow(edge_image)
```



```
#Loading the image
img = cv2.imread('1.jpg')
#Converting the image into gray-scale
img = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
cv2_imshow(img)
#Output
edge_image = cv2.Canny(img,250,200)
#showing Edged image
cv2_imshow(edge_image)
# Finding all the lines in an image based on given parameters
contours, hierarchy = cv2.findContours(edge_image,
    cv2.RETR_LIST, cv2.CHAIN_APPROX_SIMPLE)
#Reverting the original image back to BGR so we can draw in colors
img = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)
#parameter -1 specifies that we want to draw all the contours
cv2.drawContours(img, contours, -1, (0, 255, 0), 3)
cv2_imshow(img)
```

---

A B C D E F G  
H I J K L M N  
O P Q R S T  
U V W X Y Z

```
# code

import numpy as np
import matplotlib.pyplot as plt
from skimage.feature import canny
from skimage import data,morphology
from skimage.color import rgb2gray
import scipy.ndimage as nd
plt.rcParams["figure.figsize"] = (12,8)
%matplotlib inline

# load images and convert grayscale
rocket = data.rocket()
rocket_wh = rgb2gray(rocket)

# apply edge segmentation
# plot canny edge detection
edges = canny(rocket_wh)
plt.imshow(edges, interpolation='gaussian')
plt.title('Canny detector')

# fill regions to perform edge segmentation
```

```
fill_im = nd.binary_fill_holes(edges)
plt.imshow(fill_im)
plt.title('Region Filling')
```

```
# Region Segmentation
# First we print the elevation map
elevation_map = sobel(rocket_wh)
plt.imshow(elevation_map)
```

```
# Since, the contrast difference is not much. Anyways we will perform it
markers = np.zeros_like(rocket_wh)
markers[rocket_wh < 0.1171875] = 1 # 30/255
markers[rocket_wh > 0.5859375] = 2 # 150/255
```

```
plt.imshow(markers)
plt.title('markers')
```

```
# Perform watershed region segmentation
segmentation = morphology.watershed(elevation_map, markers)
```

```
plt.imshow(segmentation)
plt.title('Watershed segmentation')
```

```
# plot overlays and contour
segmentation = nd.binary_fill_holes(segmentation - 1)
label_rocks, _ = nd.label(segmentation)
# overlay image with different labels
image_label_overlay = label2rgb(label_rocks, image=rocket_wh)
```

```
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 16), sharey=True)
```

```
ax1.imshow(rocket_wh)
ax1.contour(segmentation, [0.8], linewidths=1.8, colors='w')
ax2.imshow(image_label_overlay)

fig.subplots_adjust(**margins)
```

