ASSIGNMENT 2

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Question :

a) **Apply K mean algorithm on the given image (5 iterations only).**

- Initialize 2 cluster centers randomly.

- Make the color of first cluster as red and the second cluster as green.

- **At each iteration show the output as red and green dots, as well as the updated center of the clusters.**

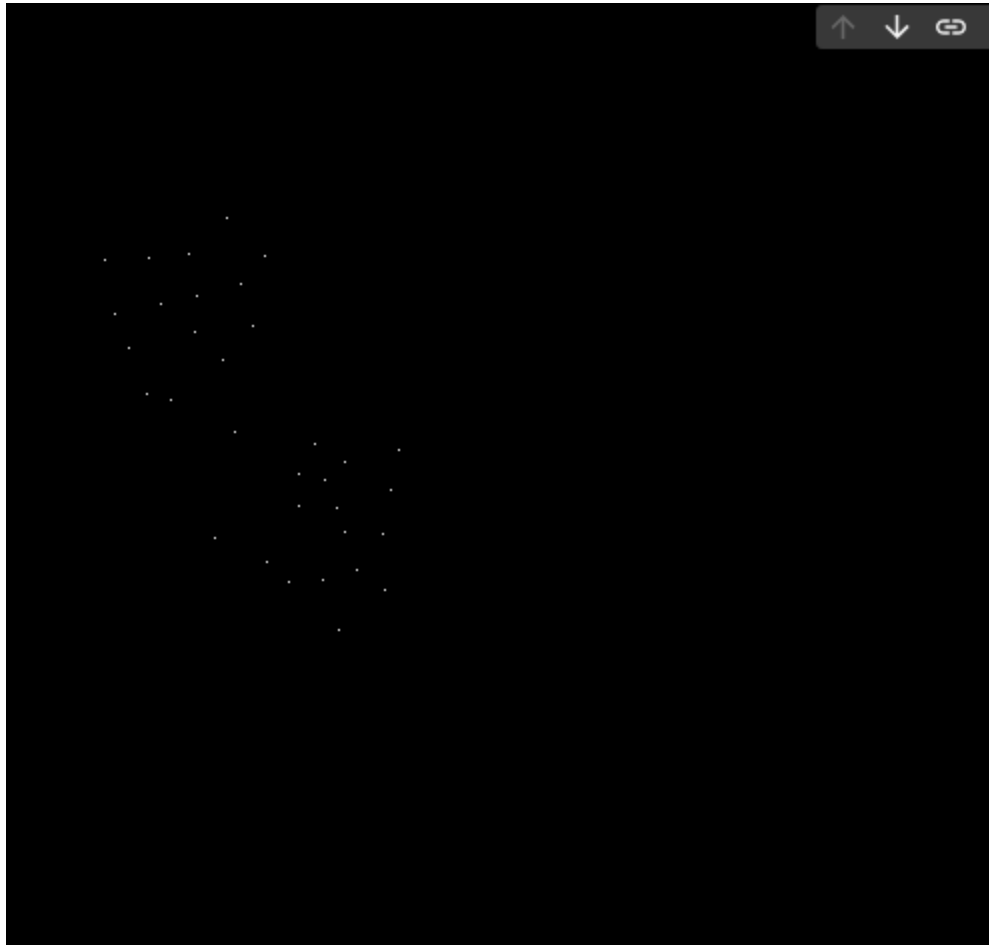- **Also, write down the coordinates of cluster centers after each iteration.**

Code:

```
#Libraries Used
import cv2 #opencv
import numpy as np
import random #for generating random numbers
from google.colab.patches import cv2_imshow

img=cv2.imread("/content/Image1.bmp")
#img=cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
cv2_imshow(img)
```

```python
#Generating random coordinates for cluster 1
point1x=random.randint(0,500)
point1y=random.randint(0,500)

#Generating random coordinates for cluster 2
point2x=int(random.randint(0,500))
point2y=int(random.randint(0,500))

#Output both clusters
print("C1:",point1x,point1y)
print("C2:",point2x,point2y)

#converting image to np array
img=np.array(img)

#Assigning Clusters colors
```

```python
img[point1x][point1y]=[255,255,0]#blue represents red color cluster
img[point2x][point2y]=[0,255,255]#yellow represents green color cluster

#Create Image
img=cv2.imwrite("update.bmp",img)
```

```python
#Used Variables Initiallized
count=0
greencount=0
redcount=0
sum=0
greensumx=0
greensumy=0
redsumx=0
redsumy=0

#Outputing Original coordinates of clusters
print("C1:",point1x,point1y)
print("C2:",point2x,point2y)

#iteration occuring five times
while count!=5:
    img=cv2.imread("/content/update.bmp")
    print("Red Points:",redcount)
    print("Green Points:",greencount)
    cv2_imshow(img)

    resolution=img.shape
    img=np.array(img)

    #for each iteration these variables will be re-initiallized
    greencount=0
    redcount=0
    sum=0
    greensumx=0
    greensumy=0
    redsumx=0
    redsumy=0
    count=count+1

  #Filtering the white points in the image
    for x in range(0,resolution[0]):
```

```python
    for y in range(0,resolution[1]):
      point=img[x][y]
      sum=int(point[0])+int(point[1])+int(point[2])
      if sum!=0 and sum!=510:
        #Finding the distance of each point from both clusters
        redpoint=min(abs(point1x-x),abs(point1y-y))
        greenpoint=min(abs(point2x-x),abs(point2y-y))
        #assigning the appropriate cluster color to the white point
        if (greenpoint<redpoint):
          img[x][y]=[0,255,0]
          greencount=greencount+1
        else:
          img[x][y]=[0,0,255]
          redcount=redcount+1


#assigning new coordinates to the clusters
#, after calculating the mean of coordinates
    for x in range(0,resolution[0]):
      for y in range(0,resolution[1]):
        point=img[x][y]
        sum=int(point[0])+int(point[1])+int(point[2])
        if sum==255 and point[2]==255: #if red, then sum of x,y red coordi
nates
          redsumx=redsumx+x
          redsumy=redsumy+y
        elif sum==255 and point[1]==255: #if green, then sum of x,y green
coordinates
          greensumx=greensumx+x
          greensumy=greensumy+y

#removing the old cluster by making then black
    img[int(point1x)][int(point1y)]=[0,0,0]
    img[int(point2x)][int(point2y)]=[0,0,0]

#Re-calculating clusters values for each iteration
    if (redcount!=0 and greencount!=0):
      point1x=round(redsumx/redcount,0)
      point1y=round(redsumy/redcount,0)
      point2x=round(greensumx/greencount,0)
      point2y=round(greensumy/greencount,0)

#New Cluster values assigned
    img[int(point1x)][int(point1y)]=[255,255,0]
```
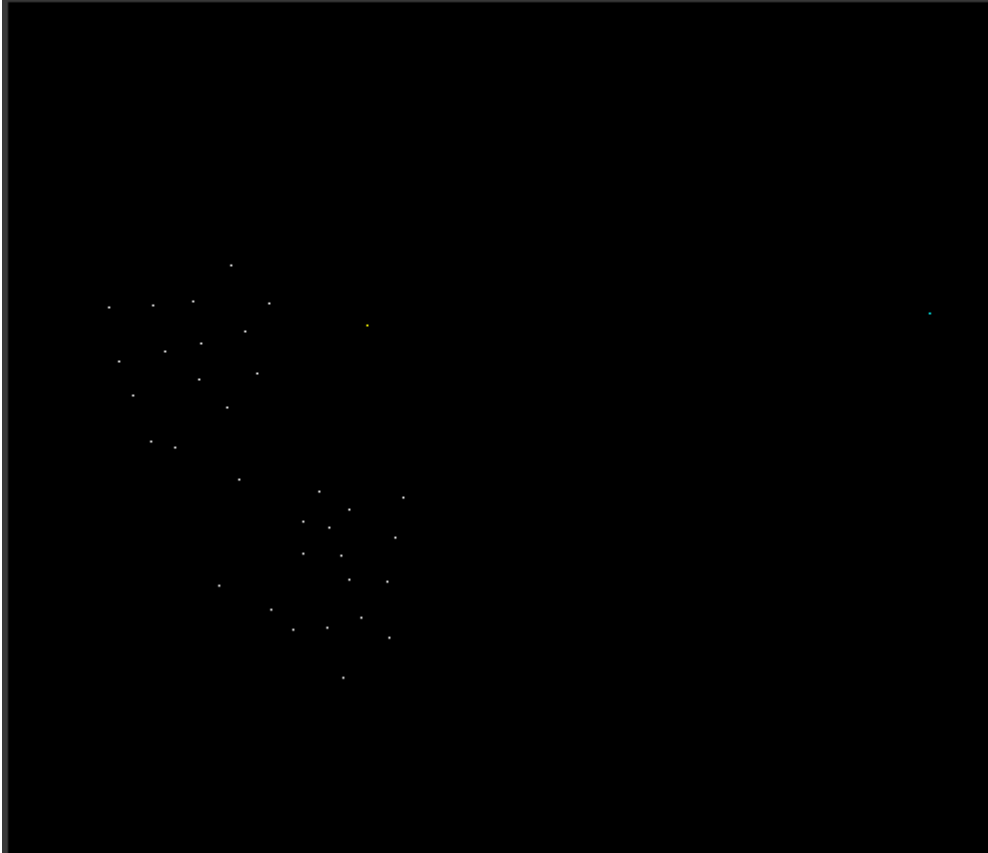
```
    img[int(point2x)][int(point2y)]=[0,255,255]

#Outputing Details of Each iteration
    print("-----------------------------------------------")
    print("Interation:",count)
    print("C1:",point1x,point1y)
    print("C2:",point2x,point2y)

    img=cv2.imwrite("update.bmp",img)
```

```
C1: 155 460
C2: 161 179
Red Points: 0
Green Points: 0
```
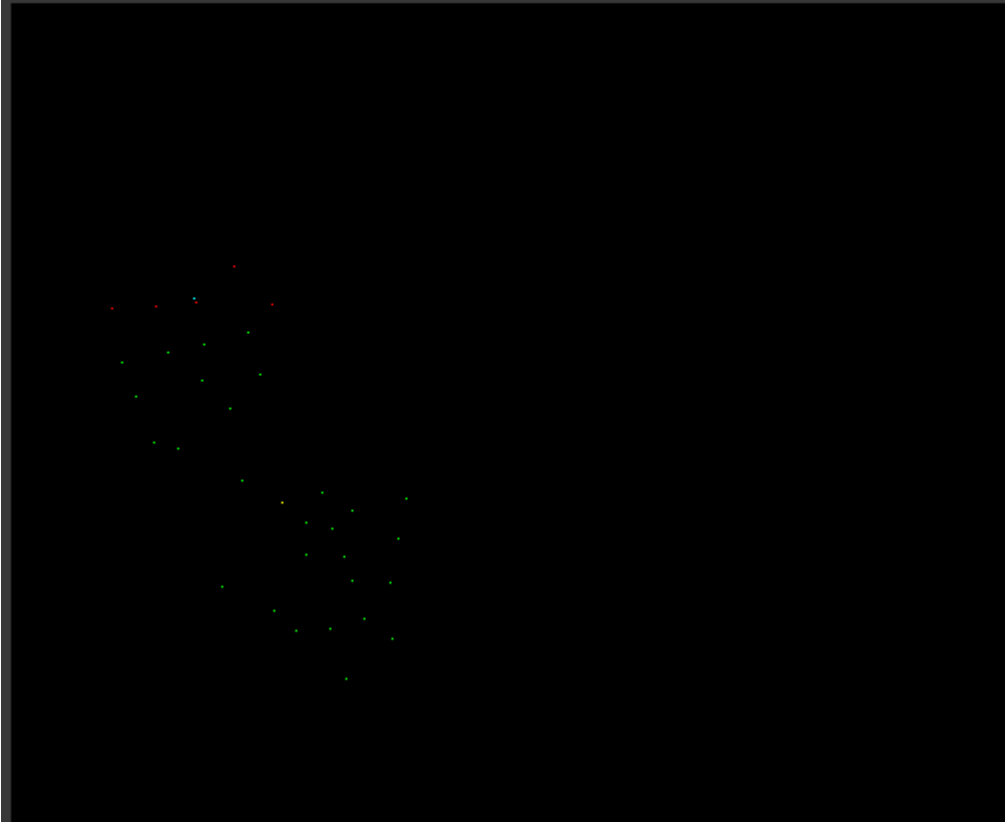
After Iteration 1:

C1 have coordinate x= 147 y= 91 and C2 have coordinate x=249 y= 135

Red Points = 5 and Green Points = 28

After Iteration 2:

C1 have coordinate x= 183 y= 88 and C2 have coordinate x=276 y= 161

Red Points = 15 and Green Points = 18

```
Interation: 2
C1: 183.0 88.0
C2: 276.0 161.0
Red Points: 15
Green Points: 18
```
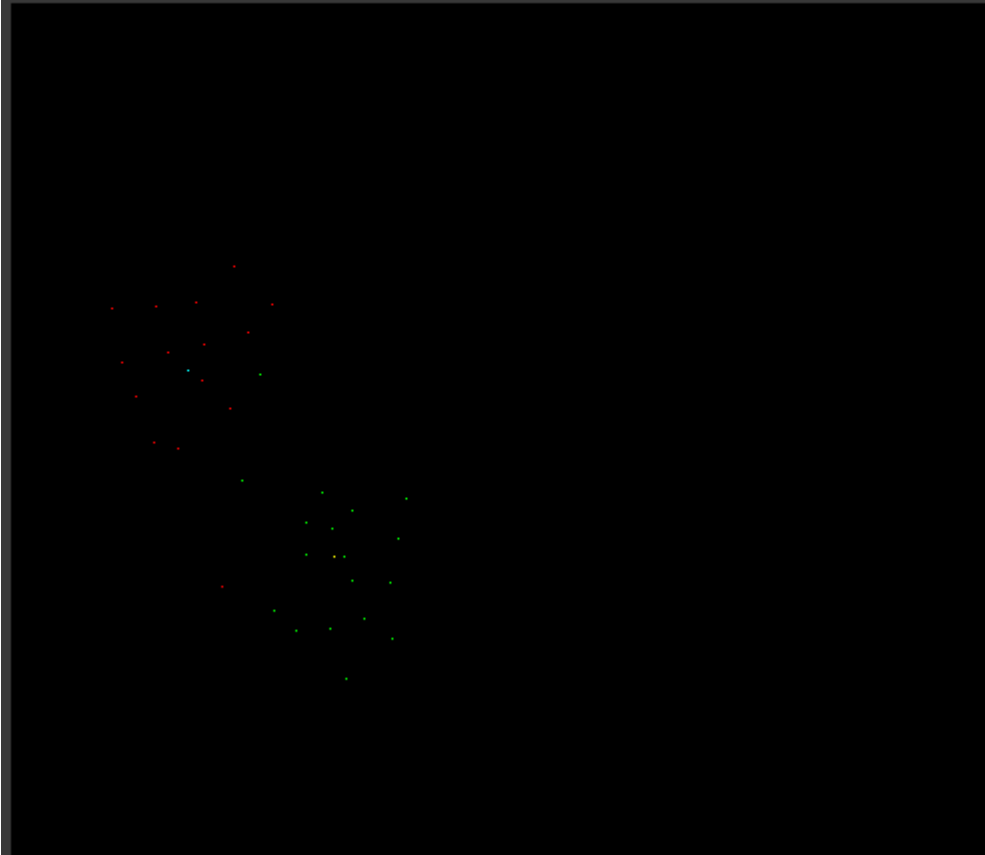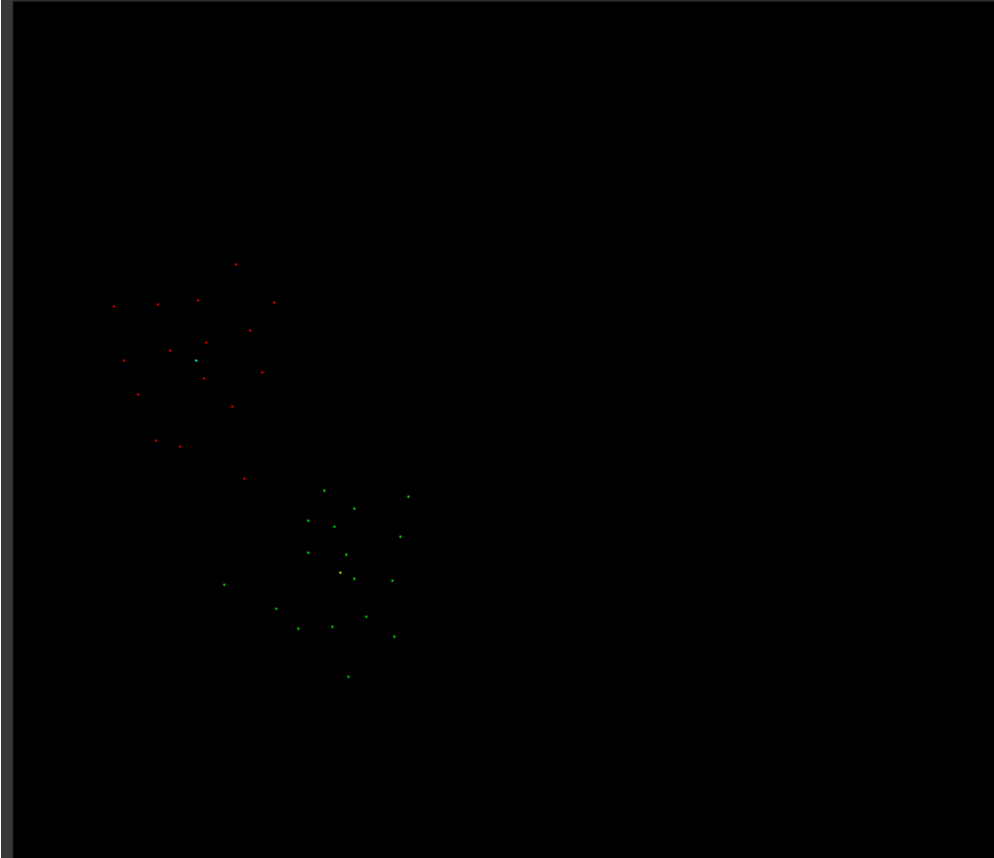
After Iteration 3:

C1 have coordinate x= 181 y= 89 and C2 have coordinate x=277 y= 161

Red Points =15 and Green Points = 18
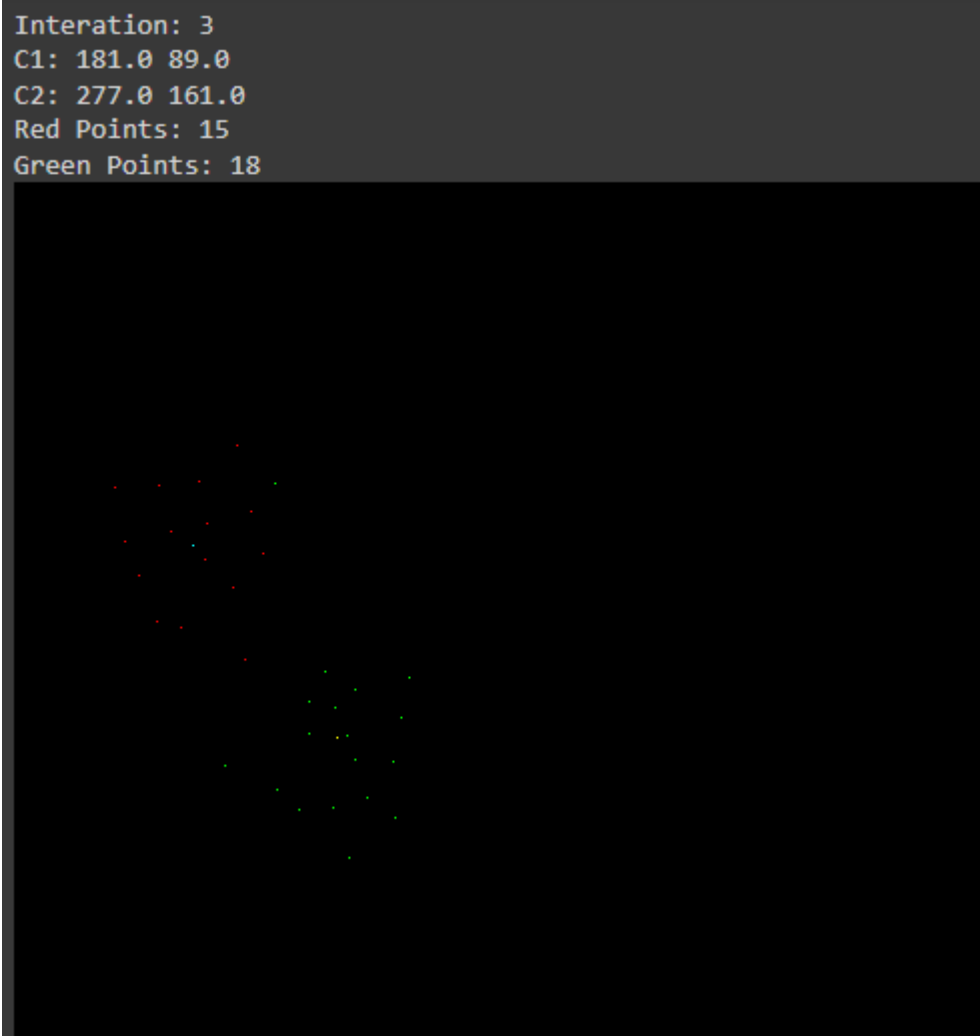
```
Interation: 3
C1: 181.0 89.0
C2: 277.0 161.0
Red Points: 15
Green Points: 18
```

After Iteration 4:

C1 have coordinate x= 179 y= 91 and C2 have coordinate x=285 y= 163

Red Points = 16 and Green Points = 17

After Iteration 5

```
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Interation: 5
C1: 179.0 91.0
C2: 285.0 163.0
```

```python
img=cv2.imread("/content/update.bmp")
print("Red Points:",redcount)
print("Green Points:",greencount)
cv2_imshow(img)
```

```
Red Points: 16
Green Points: 17
```

C1 have coordinate x= 179 y= 91 and C2 have coordinate x=285 y= 163

Red Points = 16 and Green Points = 17
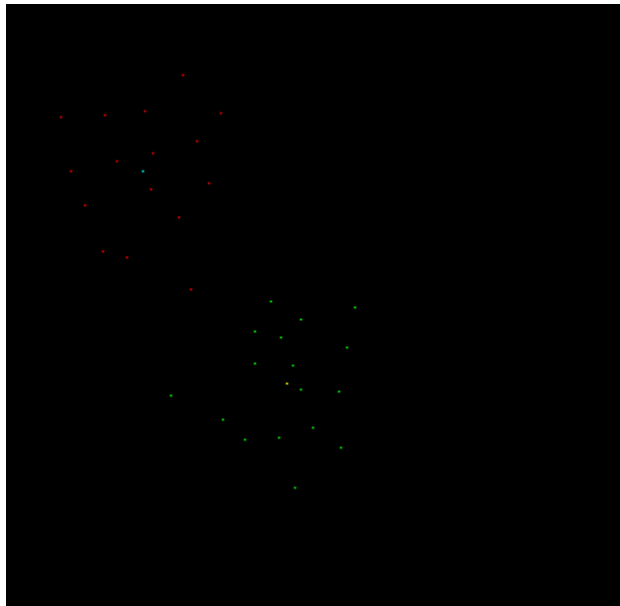
(b) Repeat the same process with another random initialization of the 2 cluster centers.

After Iteration 1:

C1 have coordinate x= 147 y= 91 and C2 have coordinate x=249 y= 135

Red Points = 5 and Green Points = 28

```
Interation: 1
C1: 282.0 160.0
C2: 175.0 90.0
Red Points: 18
Green Points: 15
```
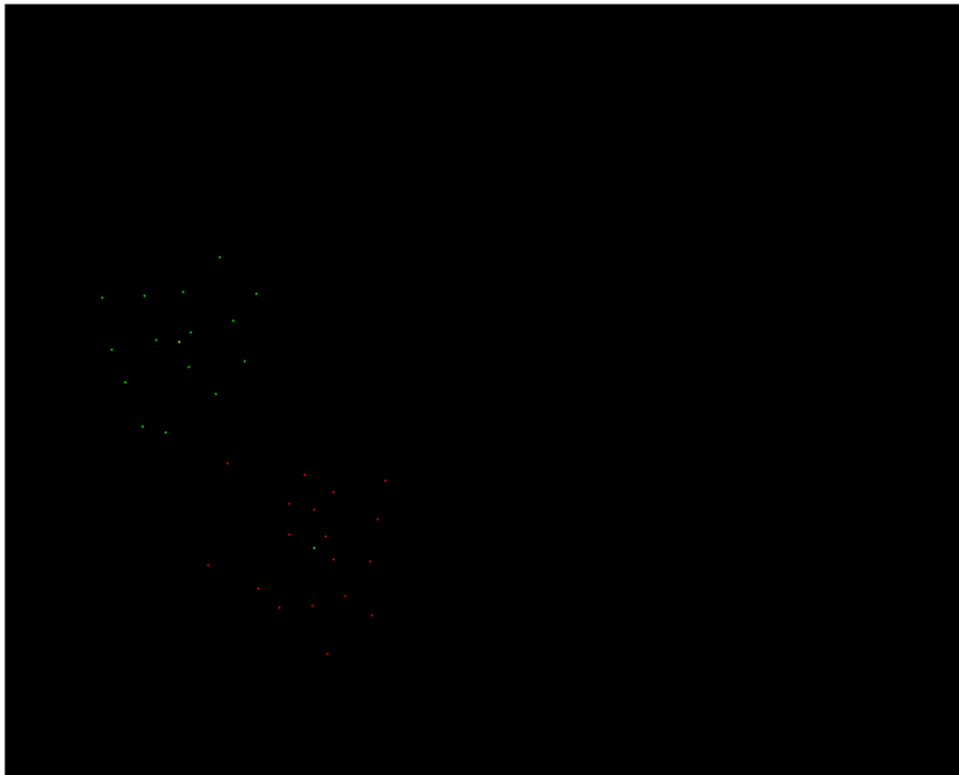

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After Iteration 2:

C1 have coordinate x= 285 y= 163 and C2 have coordinate x=179 y= 91

Red Points = 17 and Green Points = 16

```
Interation: 2
C1: 285.0 163.0
C2: 179.0 91.0
Red Points: 17
Green Points: 16
```
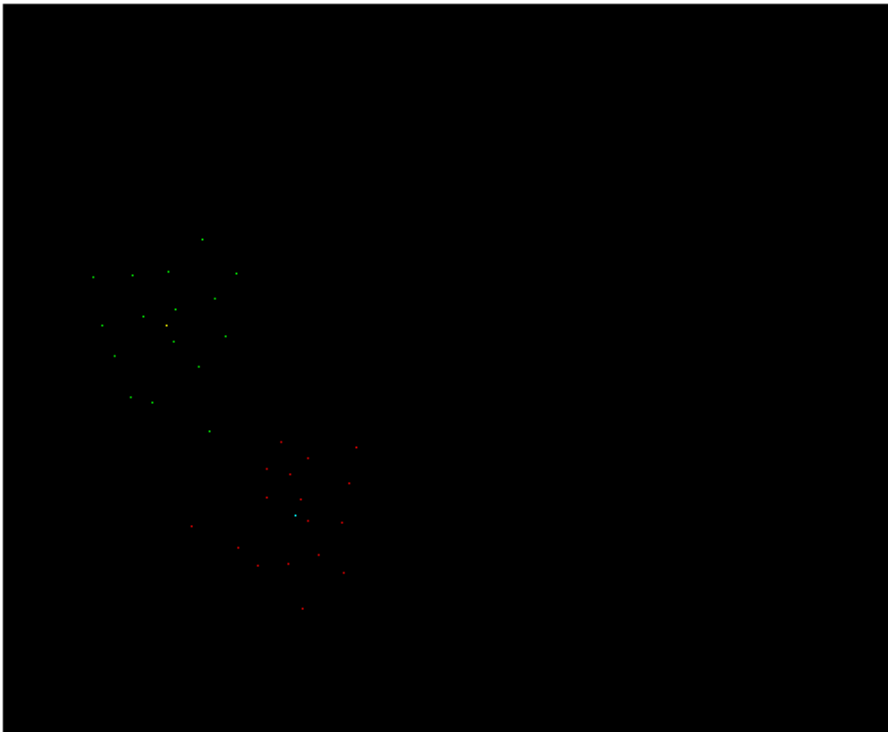
After Iteration 3:

C1 have coordinate x= 286 y= 163 and C2 have coordinate x=179 y= 91

Red Points =17 and Green Points = 16

```
Interation: 3
C1: 285.0 163.0
C2: 179.0 91.0
Red Points: 17
Green Points: 16
```
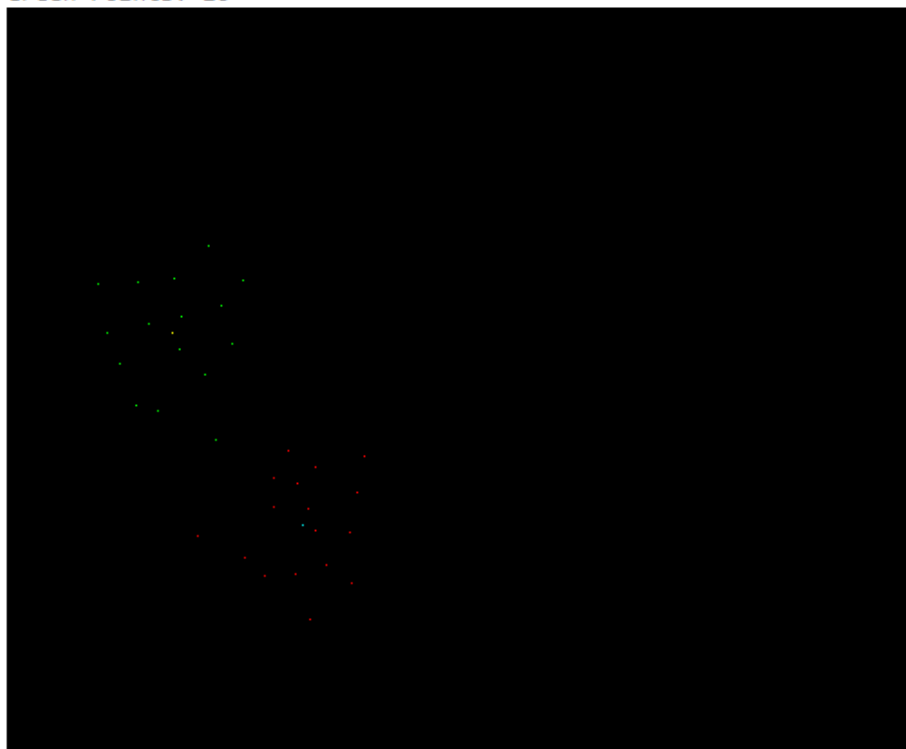
After Iteration 4:

C1 have coordinate x= 285 y= 163 and C2 have coordinate x=179 y= 91

Red Points = 17 and Green Points = 16

```
Interation: 4
C1: 285.0 163.0
C2: 179.0 91.0
Red Points: 17
Green Points: 16
```
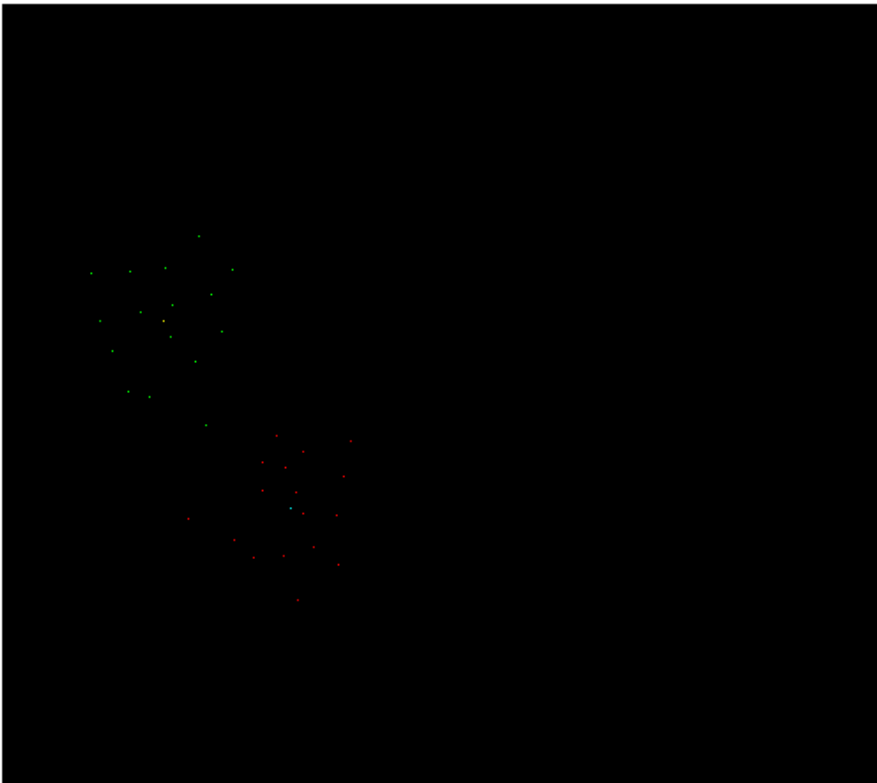
After Iteration 5:

```
--------------------------------------------------
Interation: 5
C1: 285.0 163.0
C2: 179.0 91.0
```

```python
img=cv2.imread("/content/update.bmp")
print("Red Points:",redcount)
print("Green Points:",greencount)
cv2_imshow(img)
```

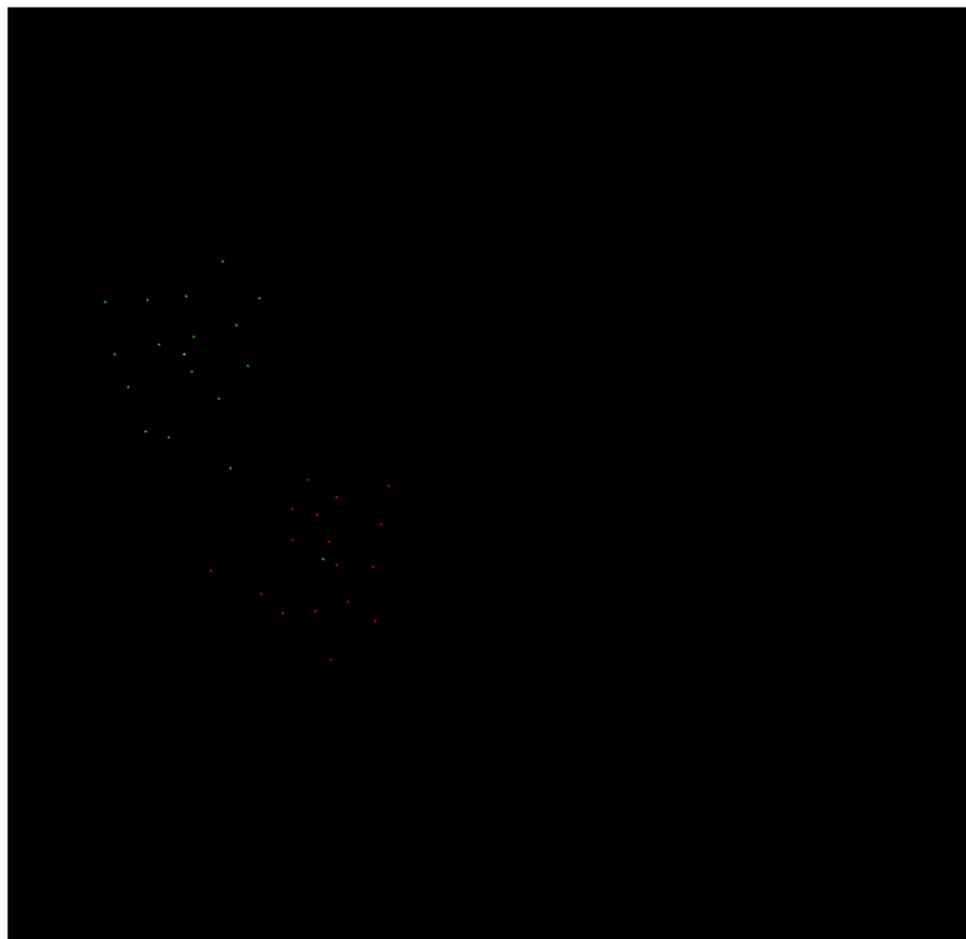C1 have coordinate x= 285 y= 163 and C2 have coordinate x=179 y= 91

Red Points = 17 and Green Points = 16

Red Points: 17
Green Points: 16

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