K-Means

September 16, 2018

In [2]:
```
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
```

In [3]:
```
### Clustering
def Clustering(centroids,img):
    b = []
    c = []
    for i in range(len(img)):
        for j in range(len(img[0])):
            a = []
            for k in range(len(centroids)):
                a.append(np.linalg.norm(centroids[k]-img[i][j]))
            b.append(a.index(min(a)))
            c.append(img[i][j])
    return np.array(b),(np.array(c,dtype=float))
```

In [4]:
```
### Centroid for new cluster
def centroid(b,c,K,points_p_clus):
    cent = 0
    cent1 = []
    for j in range(K):
        cent = np.mean(c[np.argwhere(b==j)],axis=0)
        cent1.append(cent)
    return np.array(cent1)
```

In [5]:
```
def Cluster_plotting(centroids,img,cluster_index):
    b = []
    c = []
    d = np.full(img.shape,0)
    for i in range(len(img)):
        for j in range(len(img[0])):
            a = []
            for k in range(len(centroids)):
                a.append(np.linalg.norm(centroids[k]-img[i][j]))
            if a.index(min(a)) == cluster_index:
                d[i][j] = img[i][j]
#     print(d[20][55])
    plt.imshow(d)
```

```
In [6]: ### Access the image
        pic = Image.open('wildlife-bears2.jpg')
        img = np.array(pic)

In [7]: ### Asking inputs
        print("Give number of clusters :")
        K = int(input())
        print("Give threshold E :")
        E = float(input())

        ### Initialize random centroids
        ### The way im initializing the centroids is a bit bizzare
        ### I'm choosing K [i,j] pixels which are a part of gaussian applied with standard dev
        ### Also, randomly picking pixels is causing issues sometimes.

        Cent = []
        for i in range(K):
            (w,h)=int(np.random.normal(len(img)/2,len(img)/10)),int(np.random.normal(len(img[0
            Cent.append(img[w][h])
        # Cent = np.array([[37,35,255],[215,0,24],[0,221,255]])

Give number of clusters :
2
Give threshold E :
1


In [8]: b,c = Clustering(Cent,img)

In [9]: print(b.shape,c.shape)
        points_per_cluster = []
        for i in range(K):
            points_per_cluster.append(np.count_nonzero(b==i))
        print(points_per_cluster)

(197450,) (197450, 3)
[138897, 58553]


In [10]: # New_Cent = centroid(b,c,K,points_per_cluster)
         # print(New_Cent)

In [11]: New_Cent = []
         diff = E+1
         while(diff>E):
             b,c = Clustering(Cent,img)
             points_per_cluster = []
             for i in range(K):
                 points_per_cluster.append(np.count_nonzero(b==i))
```

```
            New_Cent = centroid(b,c,K,points_per_cluster)
            diff = np.linalg.norm(New_Cent-Cent)
            print(diff)
            Cent = New_Cent
```

```
258.98791526462344
36.603150301224666
7.5827922075166585
4.69640996054719
3.6594179005934153
2.8321196162515556
2.268283899828228
1.8270070595638896
1.4207574791581161
1.0623246843736192
0.8194727661864228
```

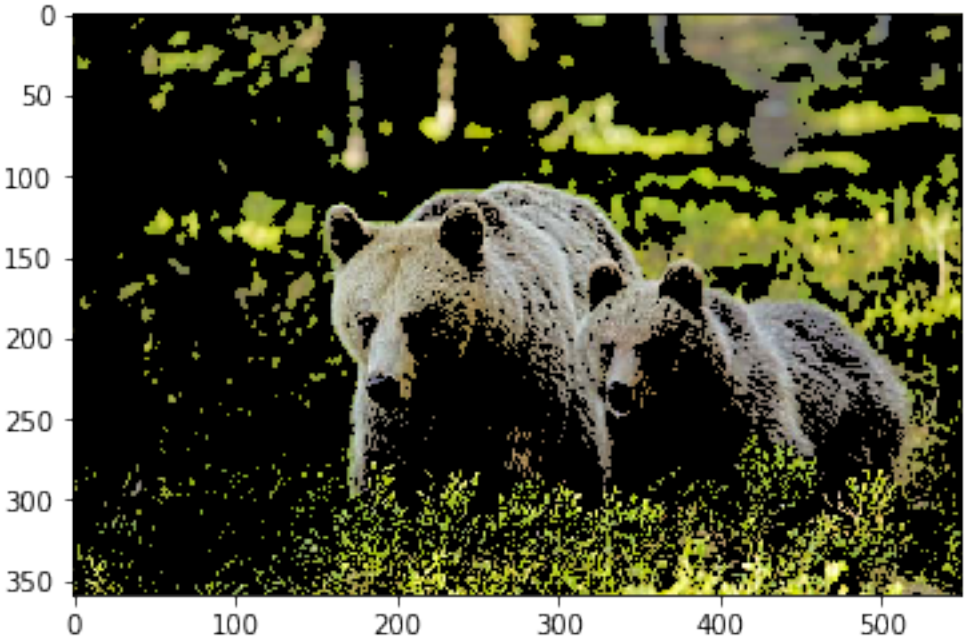
In [12]:
```
points_per_cluster = []
for i in range(K):
    points_per_cluster.append(np.count_nonzero(b==i))
print(points_per_cluster)
```

```
[66979, 130471]
```

In [13]:
```
plt.imshow(img)
```

Out[13]:
```
<matplotlib.image.AxesImage at 0x7f94a2690438>
```

In [15]: Cluster_plotting(Cent,img,0)



In [16]: Cluster_plotting(Cent,img,1)