Q. 2 REPORT

IMAGE 1 (baboonColor.png)

original

mean shifted

Centroid color labelling in segments

segmented color labels

IMAGE 2 (bird.jpg)

original

mean shifted

Centroid color labelling in segments

segmented color labels

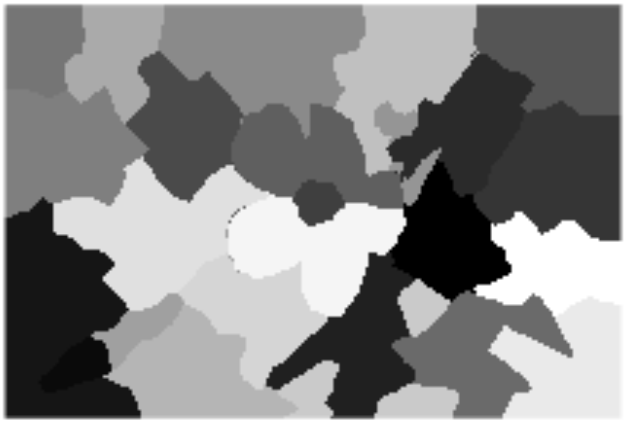
IMAGE 2 (flower.jpg)

original

mean shifted

Centroid color labelling in segments

segmented color labels



Parameters for image 1 (baboonColor.png)

HS (spatial kernel bandwidth) = 3
HR (color kernel bandwidth) = 20
Number of iterations = 30
Downsampling scale = 2
Number of clusters = 10

Parameters for image 2 (bird.jpg)

HS (spatial kernel bandwidth) = 4
HR (color kernel bandwidth) = 60
Number of iterations = 40
Downsampling scale = 2
Number of clusters = 20

Parameters for image 3 (flower.jpg)

HS (spatial kernel bandwidth) = 7
HR (color kernel bandwidth) = 36
Number of iterations = 40
Downsampling scale = 1
Number of clusters = 25

Algorithm details and notes

As we know that the idea of gradient ascent simplifies to mean shift only when the kernel is spherically symmetric and we want to retain the spatial information while making the kernel spherically symmetric so we scale each component of every data point by spatial and colour range kernel bandwidths for spatial and colour components respectively. Such a scaling of data points allows us to directly use the mean shift update for all points.
(Note that points are rescaled back after the mean shift updates)
The clusters of mean shifted image are merged and grouped to desired and appropriate number of segments using the library kmeans function on the basis of euclidean distances in 5 dimensions.
The segmented colour labels images show that the spatially disconnected but similar textures are still classified as different as expected.