CS 663 - Fundamentals of Digital Image Processing
Assignment 3

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1 Spatially Varying Blurring

1.1 Algorithm Explanation for Mask Generation

The idea behind the algorithm is that the segmented image has clusters which are very well contained and classified. One (or more) of these clusters correspond to the foreground generally. So, those clusters can be chosen for creating the mask discarding the rest.

- Given the input image, we compute the mean shift segmented image (done in part 2 of this assignment) for the given images.

- It is important to note that the mean shift segmented image has clusters of similar regions in the image together. So, we use the K-means clustering algorithm to classify the clusters of intensities we obtain in the image.

- In our case, we observe that there are two prominent clusters for both the images and thus we set the parameter K = 2. In general, this is tunable and should be tuned by looking at the intensity plot of the segmented image.

- Now, since we need to know which cluster(s) contains the foreground region, we manually mark a point in each of the regions which correspond to the foreground. (In our case, there is only one cluster which corresponds to the foreground for both the images).

- We create a binary mask of the same shape as the image which has all the intensity values zero except for the foreground region, whose value we set to one.

- Now, we do element-wise multiplication with the three channels of the segmented image to generate the masked image.

1.2 Bird Image

Figure 1: Input

Figure 2: Segmented Image

Figure 3: Mask for the Image

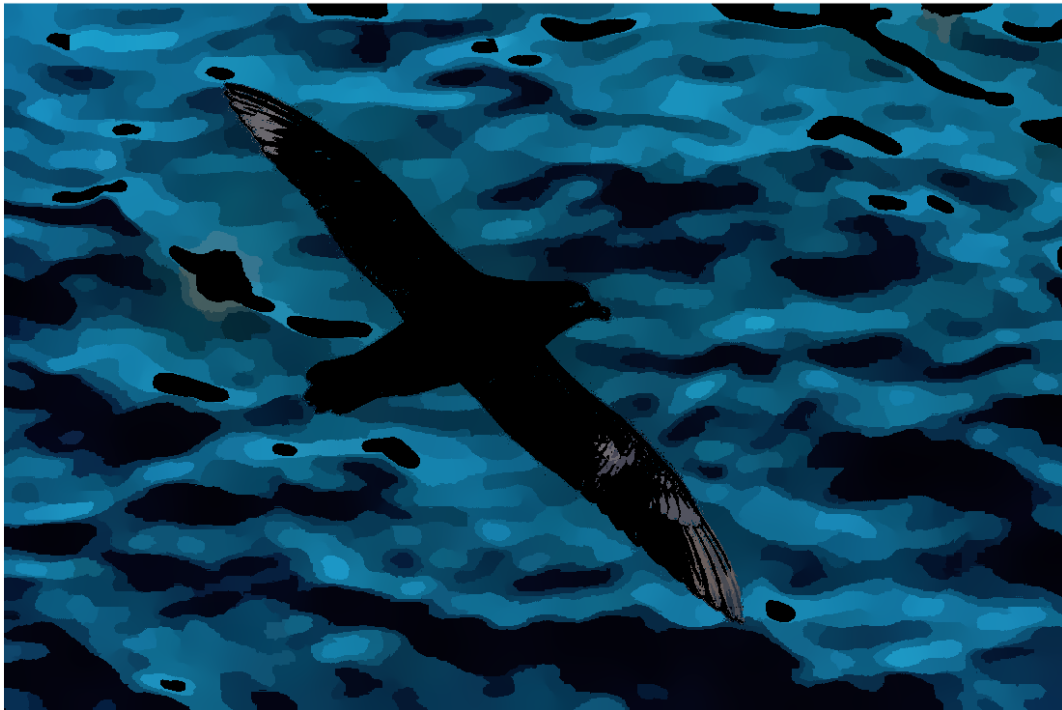Figure 4: Mask applied to the Image

Figure 5: Reverse Mask applied to the Image

1.3 Flower Image

Figure 6: Input

Figure 7: Segmented Image

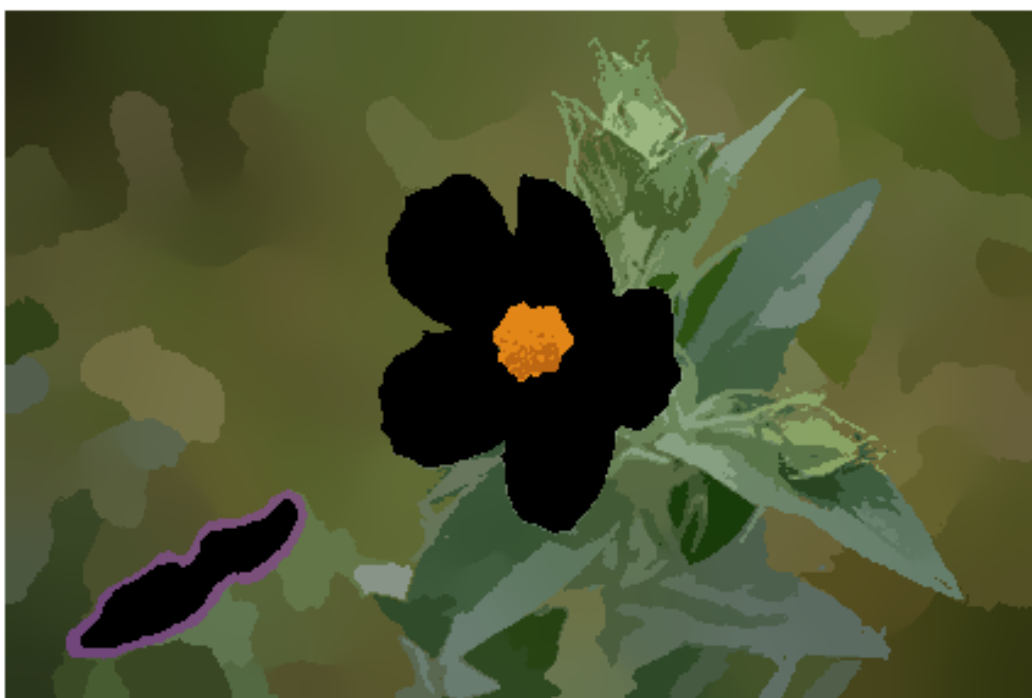Figure 8: Mask for the Image

Figure 9: Mask applied to the Image

Figure 10: Reverse Mask applied to the Image

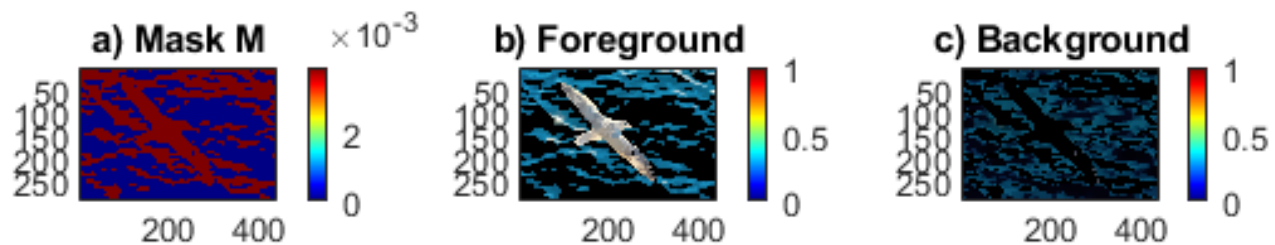## 1.4 Spatial Blurring using Disc Kernel
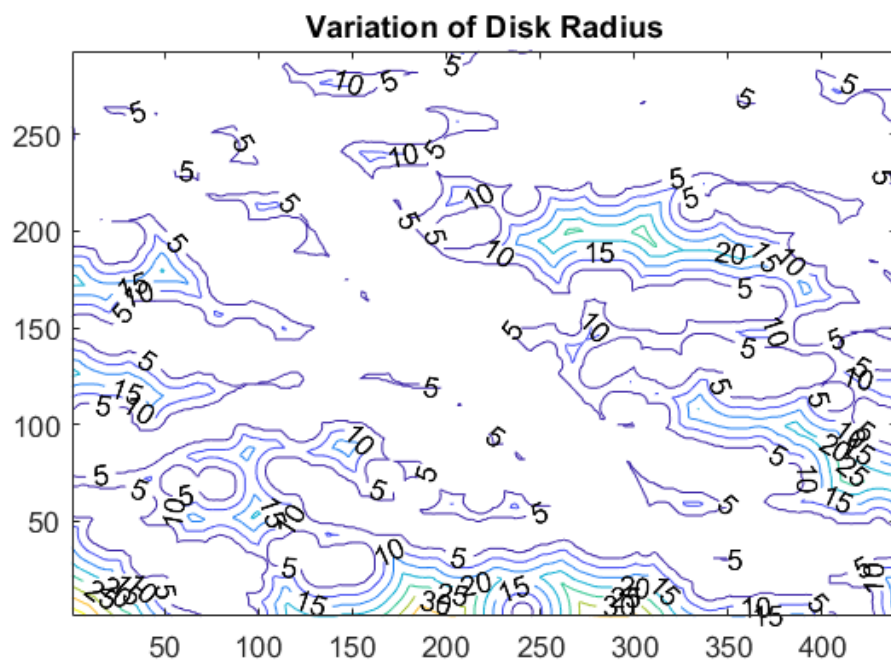
1.4.1 Bird Image

Figure 11: Mask, Foreground and Background

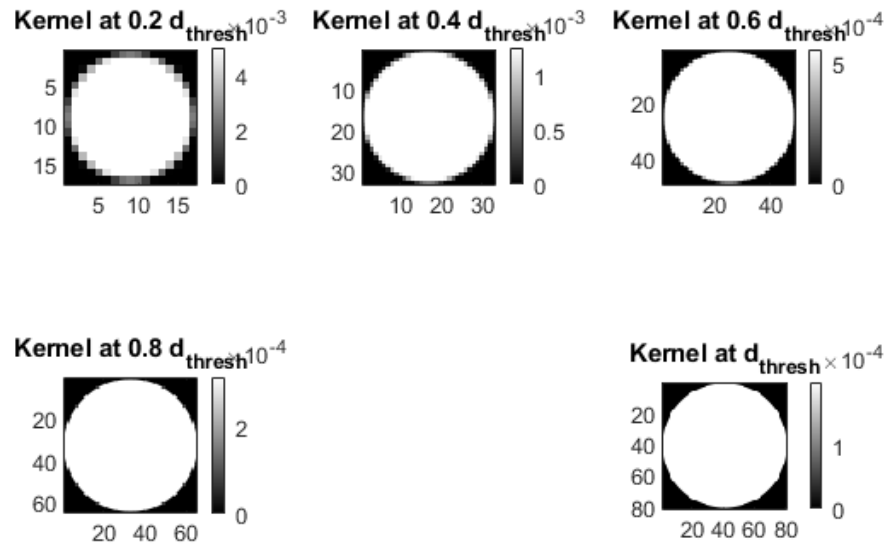Figure 12: Contour for variation of radius wrt distance from foreground
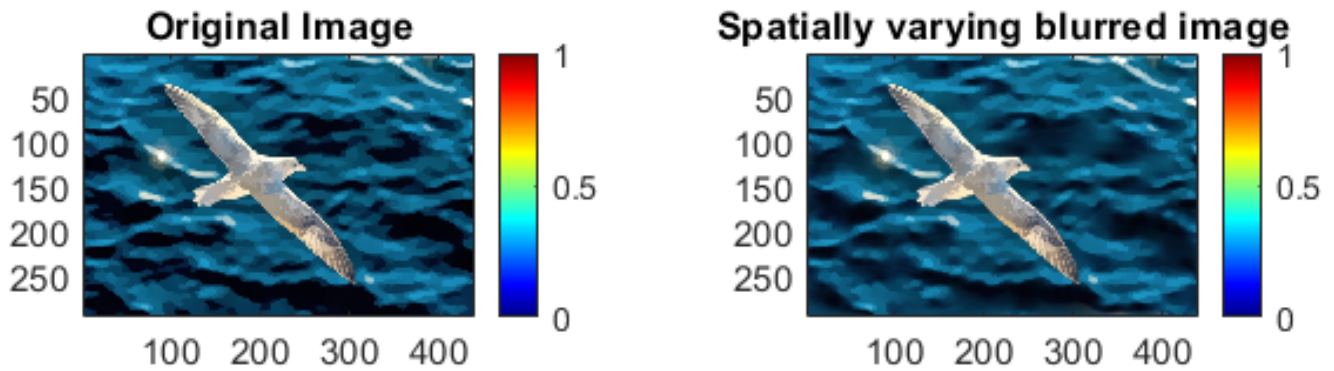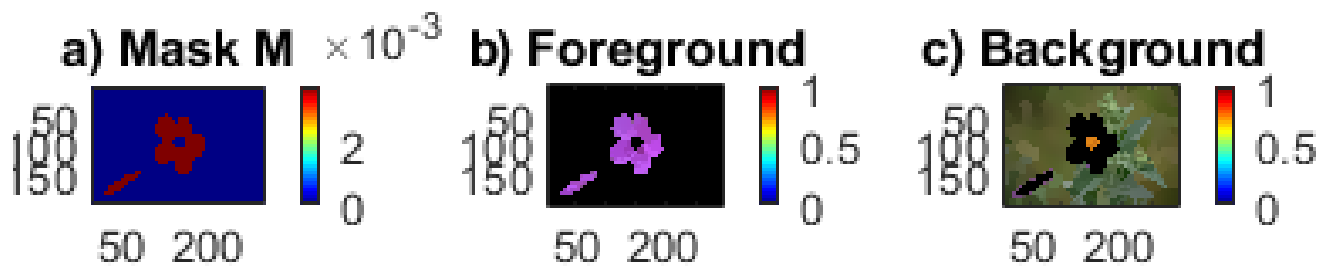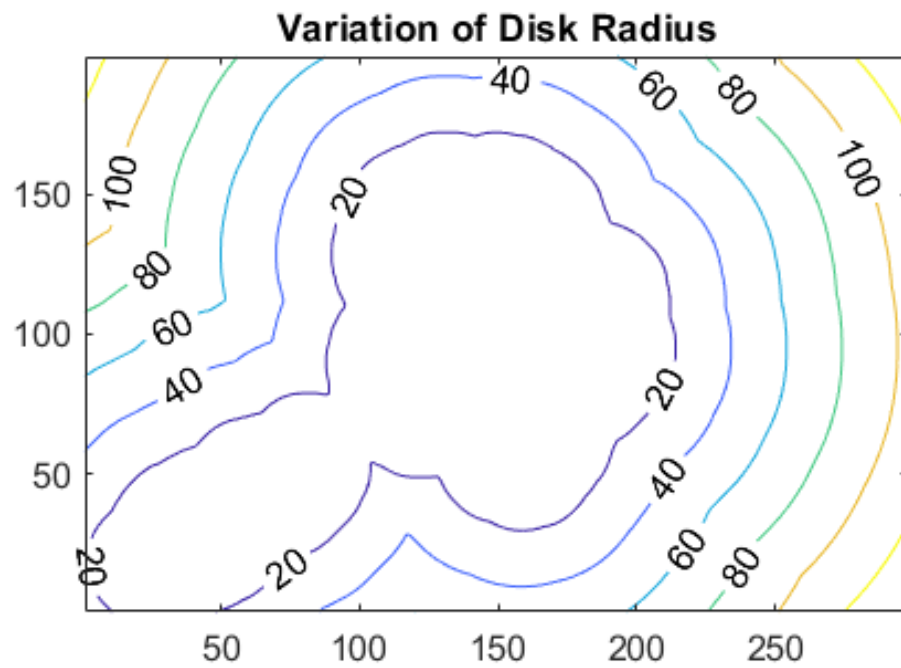
Figure 13: Kernels at different α

Figure 14: Spatial Blurring

1.4.2 Flower Image

Figure 15: Mask, Foreground and Background

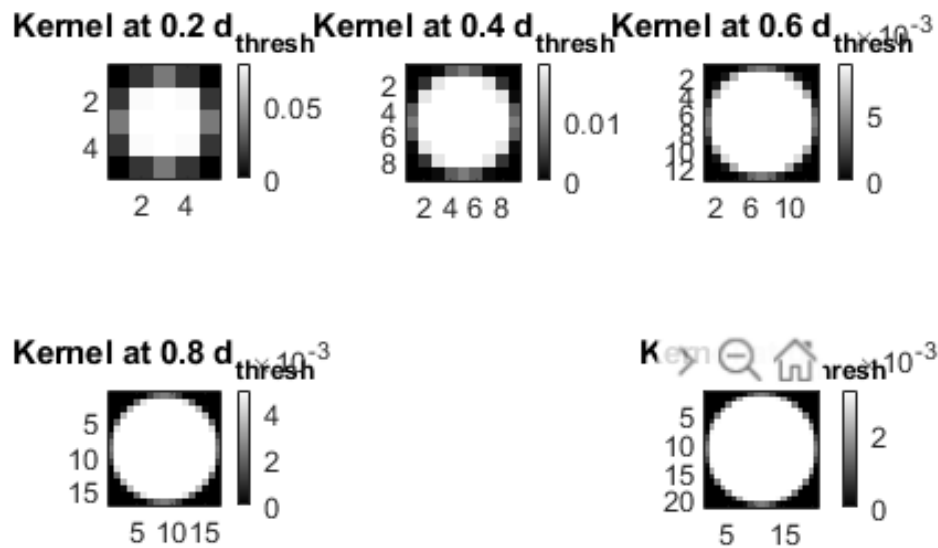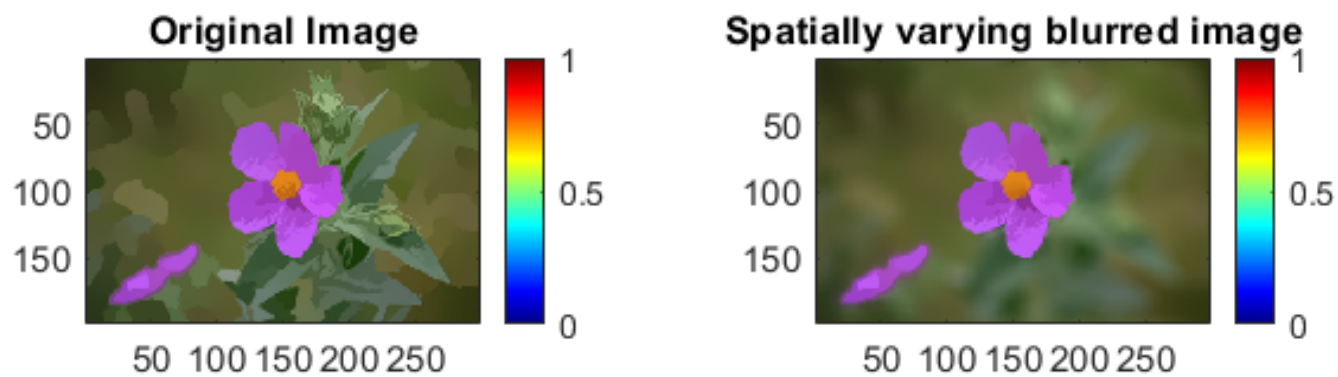Figure 16: Contour for variation of radius wrt distance from foreground

Figure 17: Kernels at different α

Figure 18: Spatial Blurring