CS 663 : Digital Image Processing : Assignment 2

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Question 1: Spatially Varying Blurring

(i) **Generating Image Mask**

Process adopted to achieve a foreground mask

- For each image we take parameters stating the window size that the object (of interest to the user) is contained as well as the threshold value for image intensity.

- We convert the image to grayscale and apply the first histogram equalization on the entire image. This allows the grayscale foreground object to be distinguishable from the background.

- We extract the object using window size parameters and apply median filter twice to smoothen noise.

- We apply the second histogram equalization to allow us to distinguish the object from the local background in the extracted window. It is easier to perform thresholding due to increased contrast.

- Running the Spatially Varying blurring function takes a cumulative time of 254 seconds after downsizing `bird.jpg` by factor of 0.4 and `flower.jpg` by a factor of 0.7. This is against a cumulative of 22 minutes taken with the original image sizes.
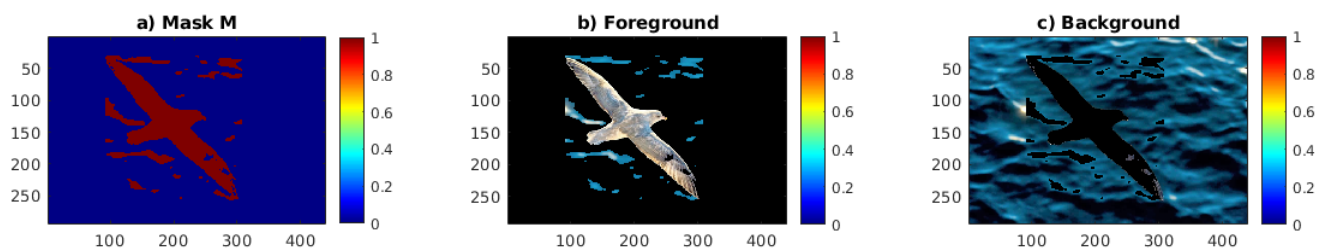

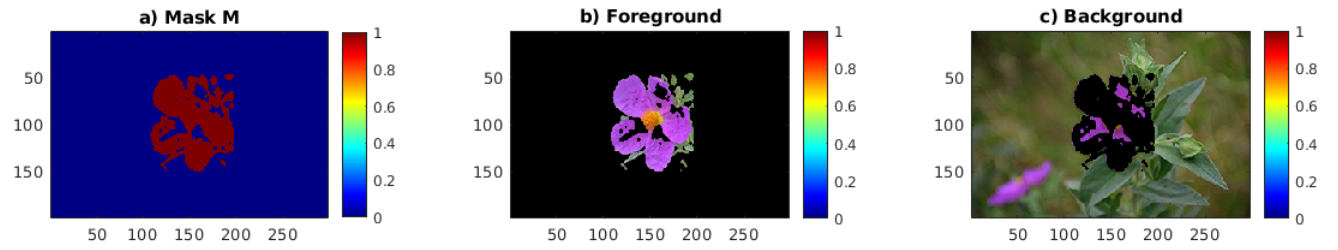Figure 1: Mask, Foreground & Background for `bird.jpg`

Figure 2: Mask, Foreground & Background for `flower.jpg`

(ii) **Contour plot of r w.r.t distance from the mask boundary**

(a) Contour Plot for `bird.jpg`
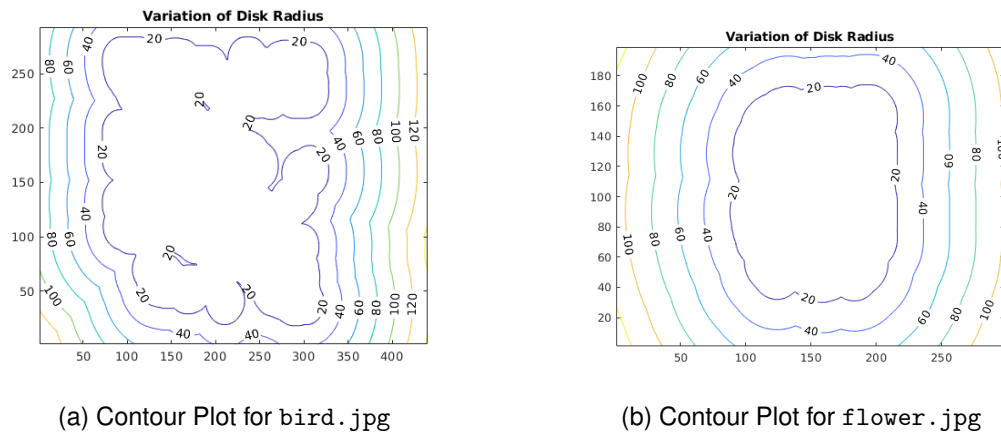

(b) Contour Plot for `flower.jpg`

Figure 3: Contour plots

The reason for the strange shape of the contour plot for bird image is owing to patches in the background that passed the thresholding.
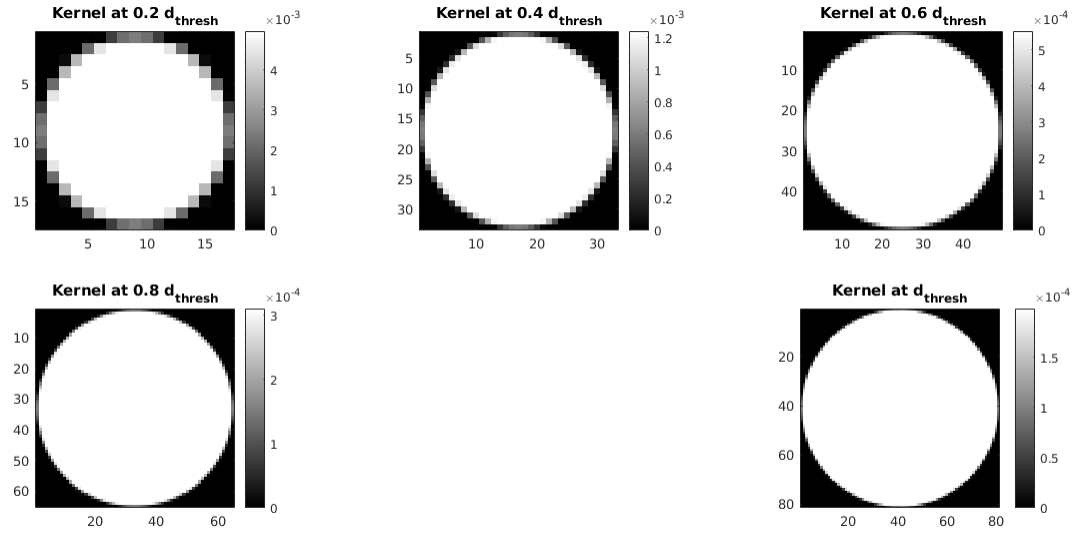
(iii) **Kernels used for Blurring**

Figure 4: Kernels used to blur `bird.jpg` ($d_{thresh} = 40$)
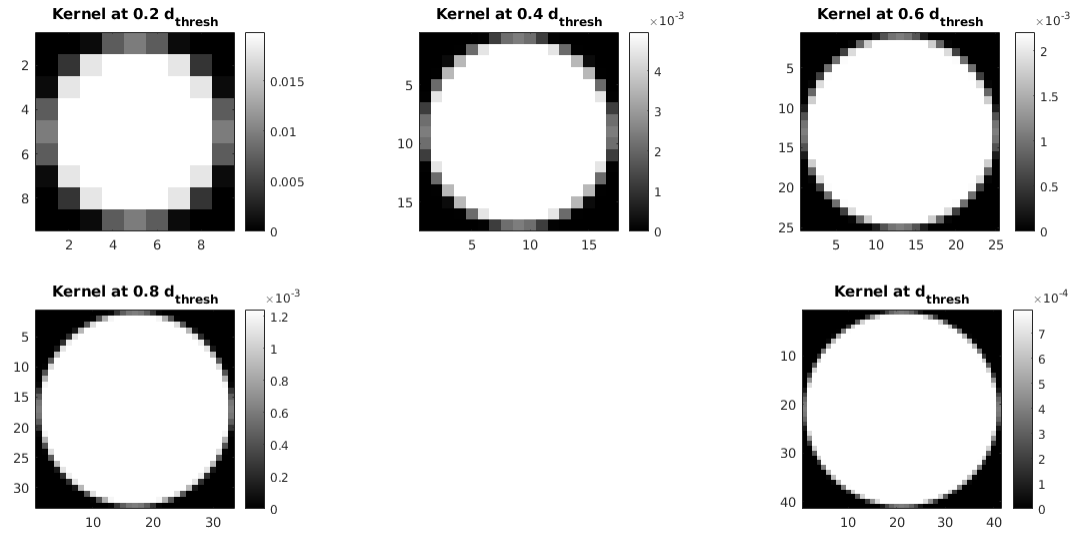

Figure 5: Kernels used to blur `flower.jpg` ($d_{thresh} = 20$)

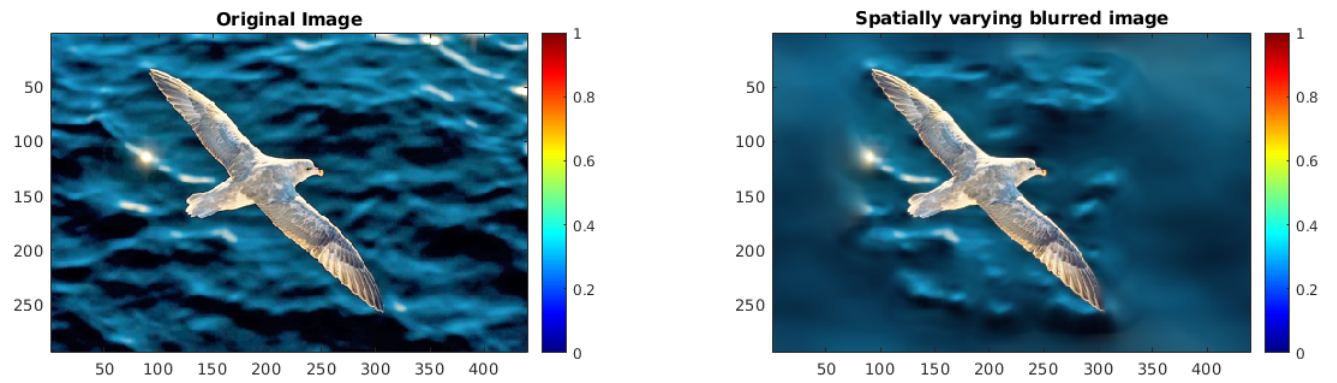(iv) **Spatially varying blurring**
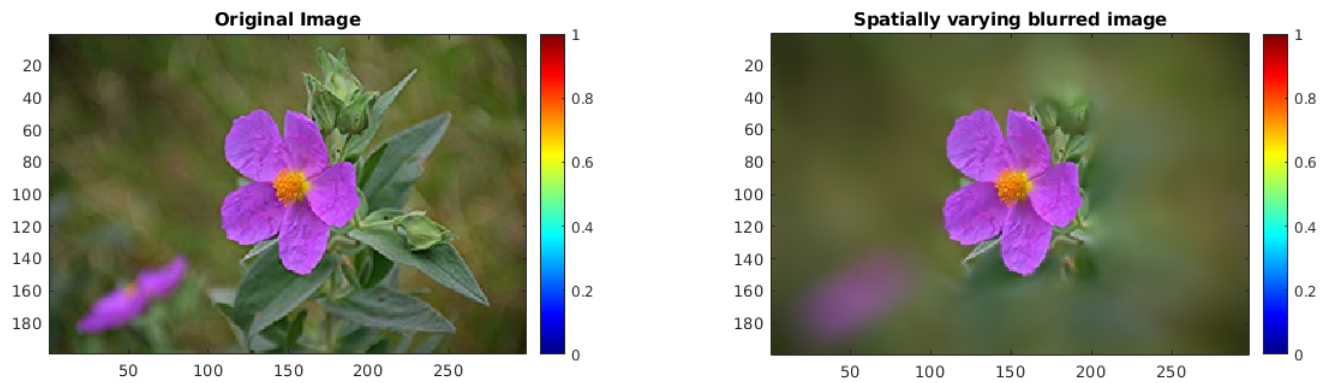

Figure 6: Original & Blurred `flower.jpg`

Figure 7: Original & Blurred `flower.jpg`