

CS 663: Digital Image Processing

Assignment 1

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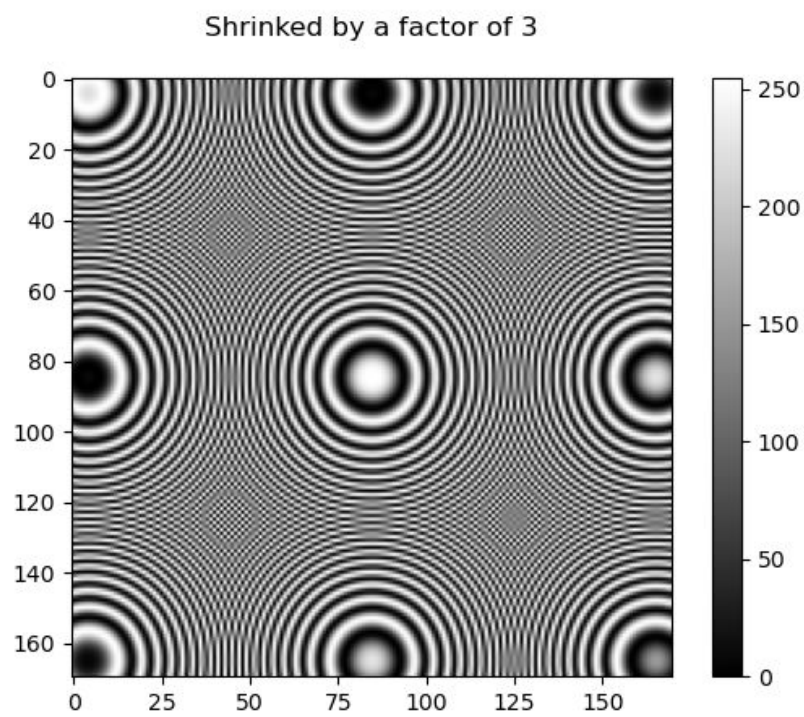
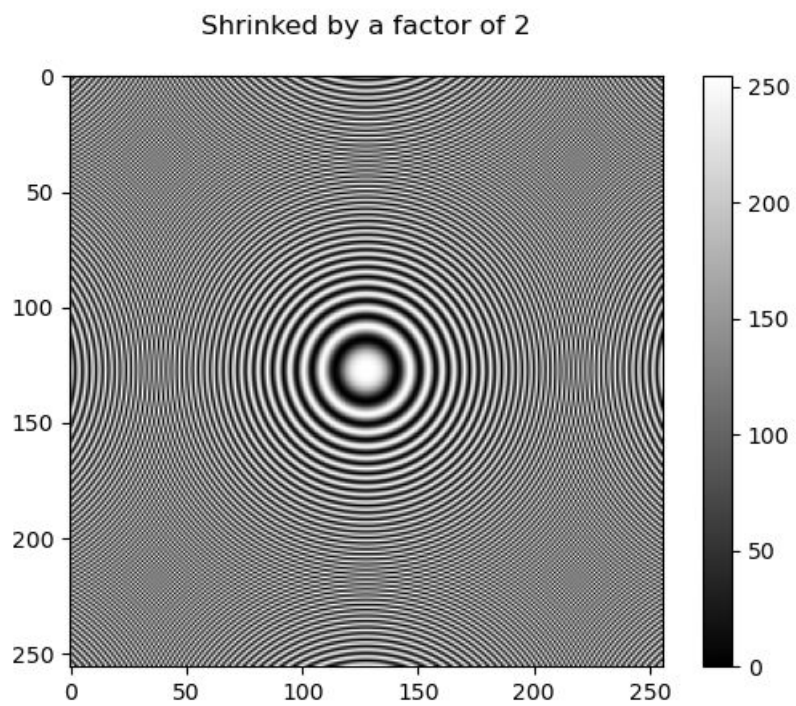
Question 1

a) **Task:** to shrink the given image by a given factor

Strategy: if the given factor of reduction is d , then select every d th pixel starting from the 1st pixel to get the resultant image

Observations: we get to see the Moire effects in both of the contracted images.

The Moire effect is seen if the photograph has details smaller than the resolution of the camera. Here, we have contracted an image with circles very close to each other. The Moire effect is seen more in the image which is contracted by a factor of three than the image which is contracted by a factor of 2.

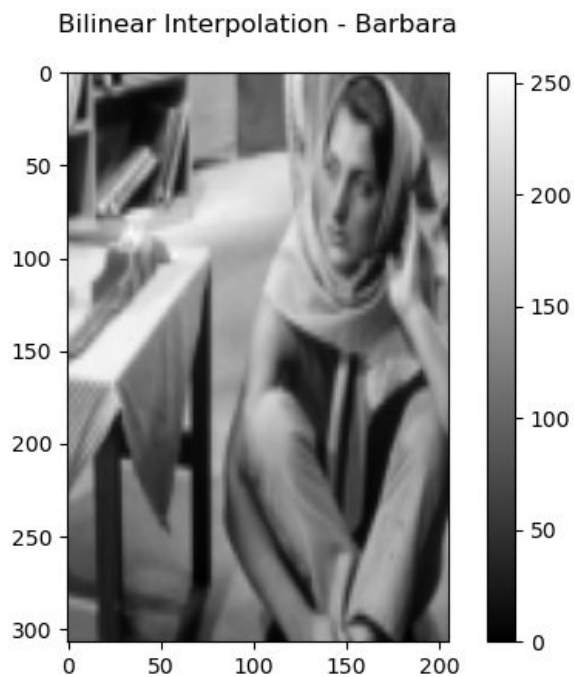


b) Task: To enlarge the image using bi-linear interpolation to fill the empty spaces

Strategy: as per given dimensions create a resultant image which is initialized to zeros. Update the pixel intensities such that the pixels occupy every 3rd position along a column and every second position along every row

For each rectangle created by the pixels we apply bilinear interpolation for the region enclosed

Observations : The image created by bilinear interpolation shows color transitions smoother than nearest neighbour method



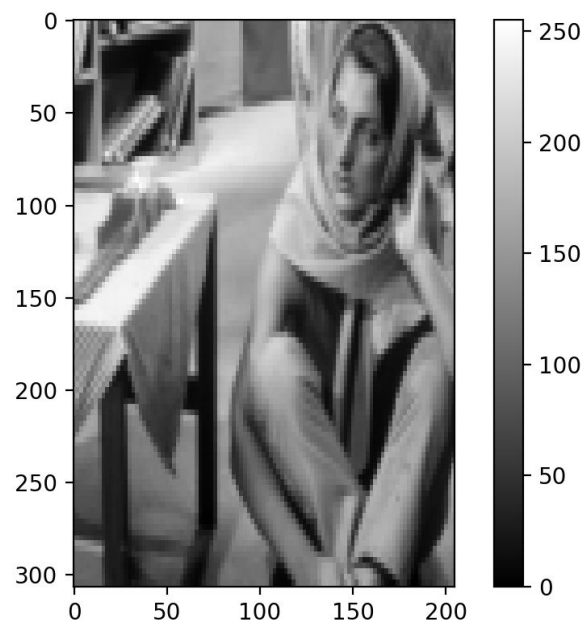
c) Image Enlargement using nearest neighbor Interpolation:

Observations:

1. Image is not smooth and has jaggedness due to taking the value of the nearest neighbor at the corresponding location on the original image

Results

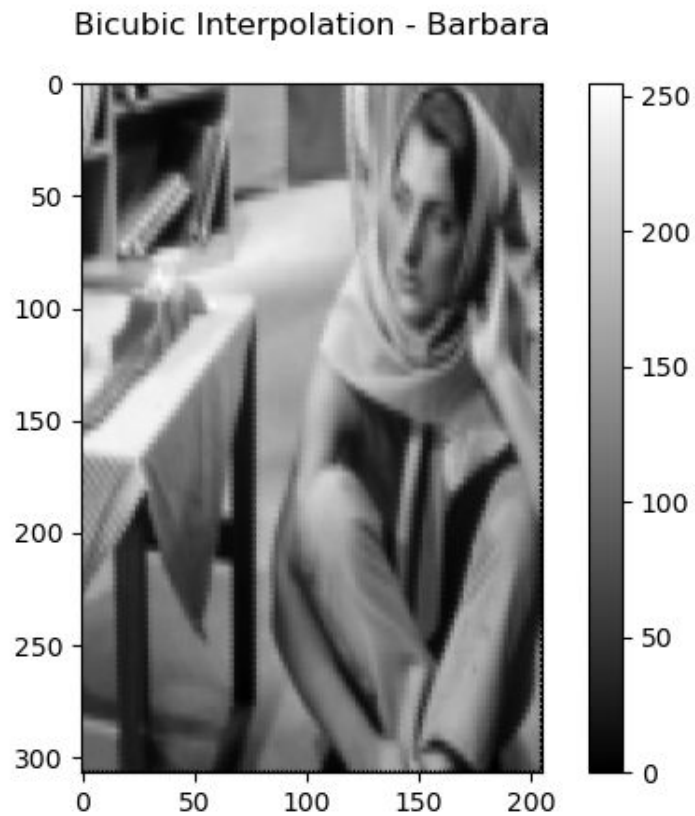
Nearest Neighbour Interpolation - Barbara

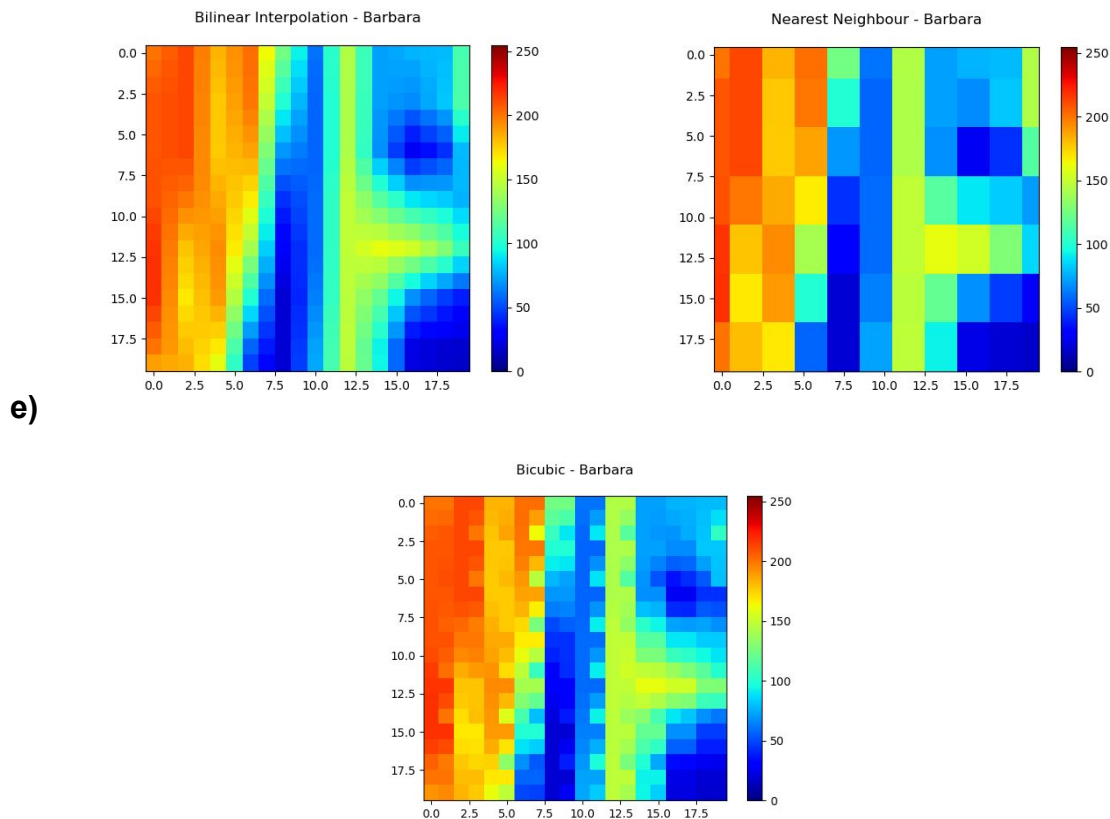


d) **Task:** to enlarge the image to given dimensions using bi-cubic interpolation

Strategy: as per given dimensions create a resultant image which is initialized to zeros. Update the pixel intensities such that the pixels occupy every 3rd position along a column and every second position along every row. Assume a cubic function which will satisfy given 16 conditions of image intensity and derivatives of functions

Observations: bi-cubic interpolation gives smoother results than bi-linear interpolation and nearest neighbour interpolation





Task - To compare the jet colormaps of a small region in the three enlarged images using bilinear, bicubic and nearest neighbour interpolation

Strategy - We have taken a small region of 20x20 in all the three images for making the observations

Observations - As expected , the nearest neighbour interpolation has the most discrete colormap. That is the nearby pixels can easily be differentiated. This happens because nearest neighbour interpolation takes the same value of intensity over the entire pixel.

While bilinear and bicubic have smoother colormaps since the intensity values in these methods are calculated for each point and thus form smoother curves. This is because

in bilinear first derivatives at the edges of pixels are constrained to be equal and in bicubic even the second derivatives are constrained to be equal