

Assignment 1 Question 1 Report

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1 Image Shrinking

1.1 Approach

To downsample the image by a particular number d , we took every d^{th} element in both X and Y directions and stored it in a matrix.

1.2 Results

Shrinking Image by Factor of 2

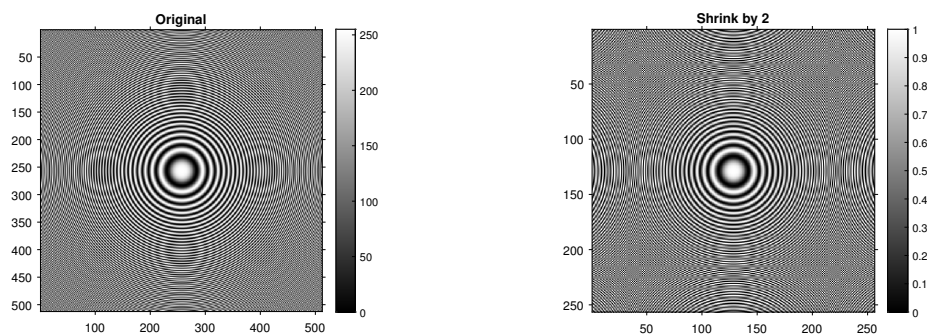


Figure 1: Shrinking by 2

Shrinking Image by Factor of 3

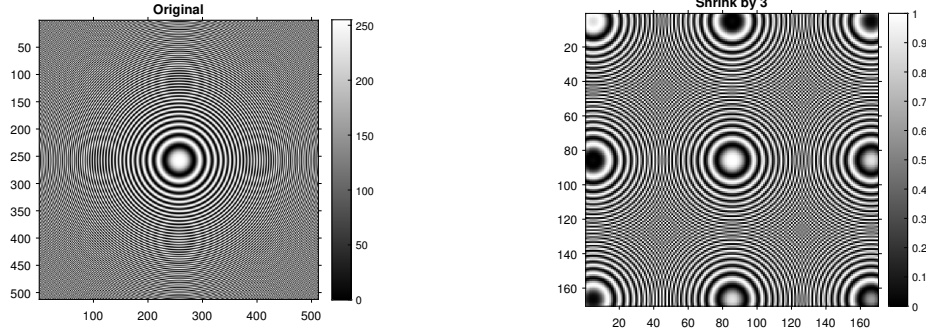


Figure 2: Shrinking by 3

1.3 Inferences

- The Moire Effect can be clearly seen in the downsampled images. The downsampled images are distorted with several perturbations
- The Moire effect is more accentuated for $d=3$ than for $d=2$, as is expected

1.4 Conclusion

Hence we have downsampled the image and successfully demonstrated Moire's effect.

2 Bilinear Interpolation

2.1 Approach

To do Bilinear Interpolation when the image was expanded by 3 in X direction and 2 in the Y direction, we created a matrix of size $(3M - 1) \times (2N - 1)$. We filled every third element in the X direction and every second element in the Y direction from the original matrix. Then we filled the empty elements in each second row using linear interpolation in X direction. To fill the rows completely empty, we used linear interpolation in Y direction

2.2 Results

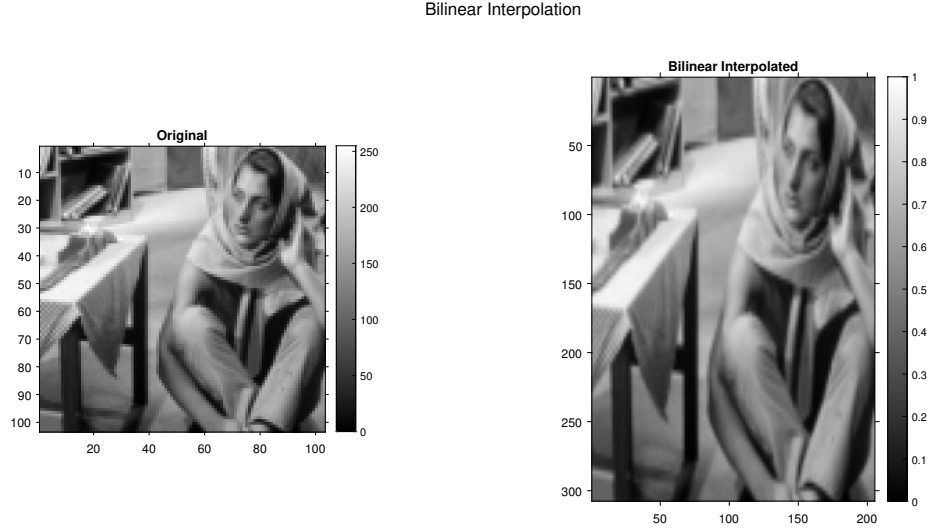


Figure 3: Bilinear Interpolation

2.3 Inferences

- The bilinear interpolated image is considerably smoother and softer than our original image.
- The texture and the color gradient of the image has remained intact

2.4 Conclusions

Hence we have successfully used bilinear interpolation to upsample our image.

3 Nearest Neighbour interpolation

3.1 Approach

To do nearest neighbour interpolation of an image, we formed a $(3M - 1) \times (2N - 1)$ like in the bilinear interpolation case. We fill in the missing gaps in the rows depending on which pixel is closer. But for the empty rows, where there are two pixels above and below which are equally close, we select the pixel above by convention.

3.2 Results

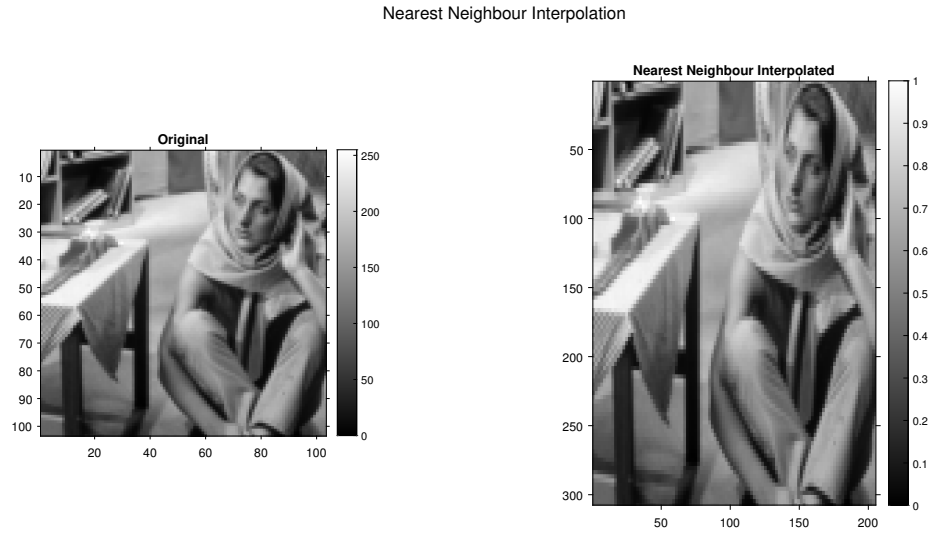


Figure 4: Nearest Neighbour Interpolation

3.3 Inferences

- The nearest neighbour interpolation is not as smooth and soft as the bi-linear interpolation
- The squares of each individual pixels can be seen in some parts of the image like the tablecloth as the pixel size has been effectively increased four times due to this approach.

3.4 Conclusions

Hence we have performed nearest neighbour interpolation on the image