Project Report

Quilting and Texture Transfer

CS 663 : Digital Image Processing

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Algorithm :

The construction of synthesised texture can be done in three ways.
Naive Method: Randomly pick blocks from texture and put them together.

BestFit Method: Find a Block such that the error -norm of difference is minimum of the overlap region between the blocks.

Min Boundary Cut Error: To remove the noticeable edge artifacts, the best solution is to find the minimum Boundary cut path on the error surface of the overlap region by Seam Carving algorithm and treat this optimal path as the boundary of the overlap region.

Implementation :

Part 1 Quilting:
1) Iterate through the target image in raster scan form in steps of Block Size – Overlap Size

2)For every location in target image, loop over the texture in blocksize.

3)For every Block in texture image , calculate it's overlap error and choose the least error block.

4)To remove the edge artifacts, calculate the minimum Boundary cut between the two overlap blocks using the seam carving algorithm and treat this optimal path as the boundary of the overlap region.

Part 2 Texture Transfer

Correspondence images of both the target image and the texture image are calculated first, which is the luminance component of the images.

First two steps are same.
1) For every Block in texture image calculate its overlap error, as well as correspondence error and take a weighted average of them as the total error

2) To remove the edge artifacts, calculate the minimum Boundary cut between the two overlap blocks using the seam carving algorithm and treat this optimal path as the boundary of the overlap region.

Also we can do multiple iterations over the target image with reducing block size, for better results. The iterations use the results of the previous iteration to generate the next image.(The overlap is calculated with respect to the previous image)
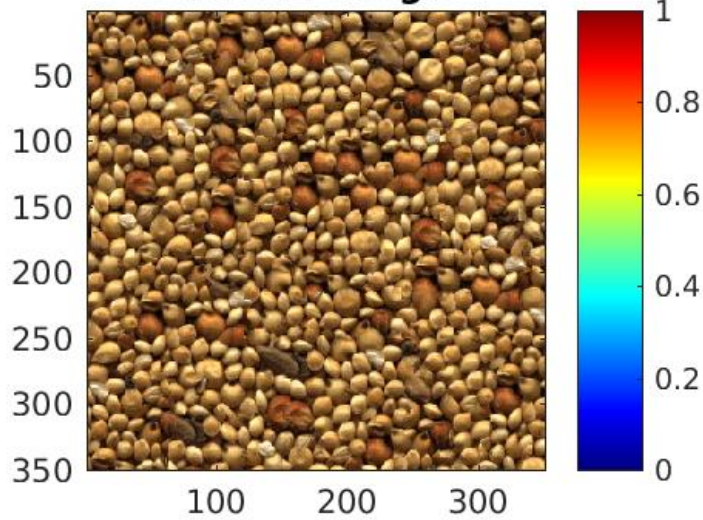
Observation :

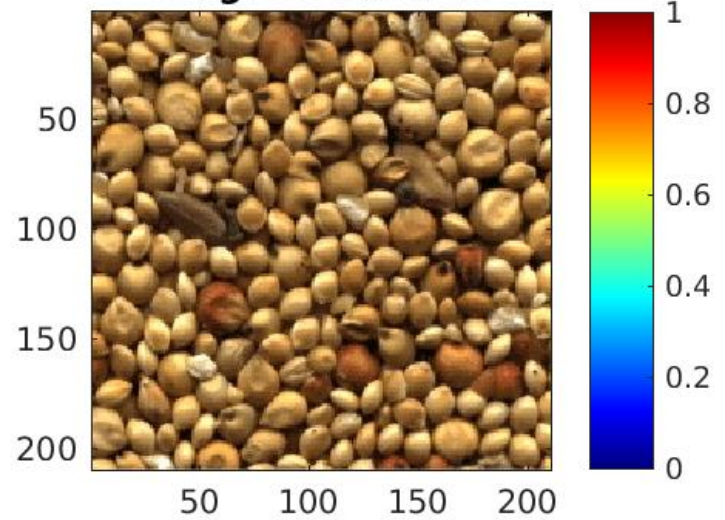## Part1 Quilting:

1)
Texture:
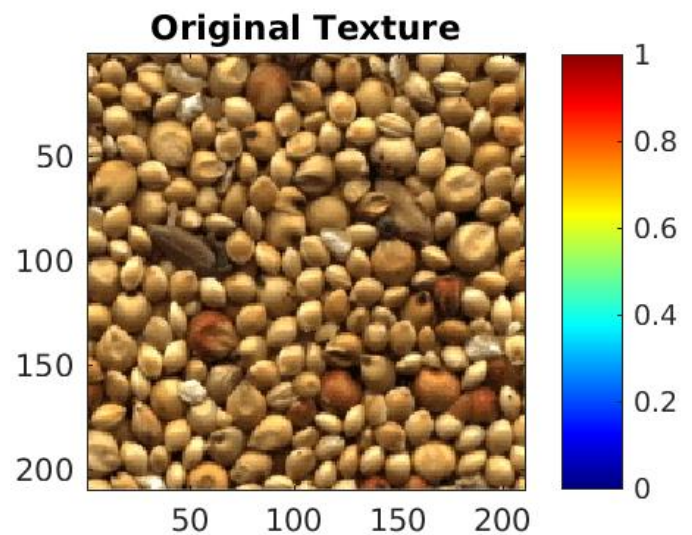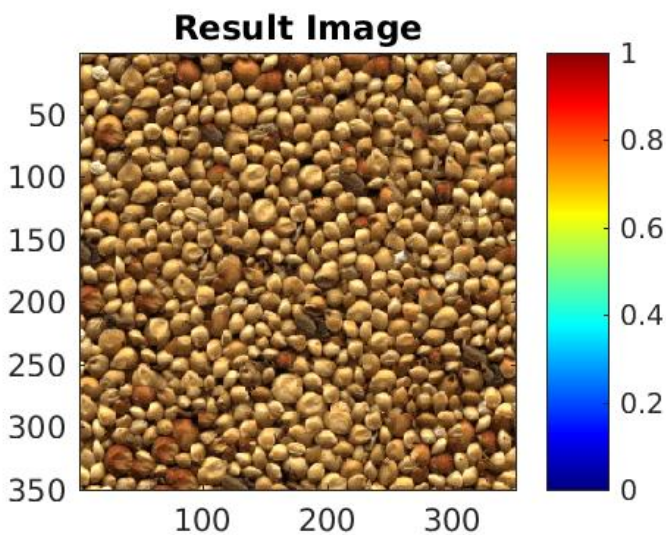
Block Size 25 Overlap Size 10
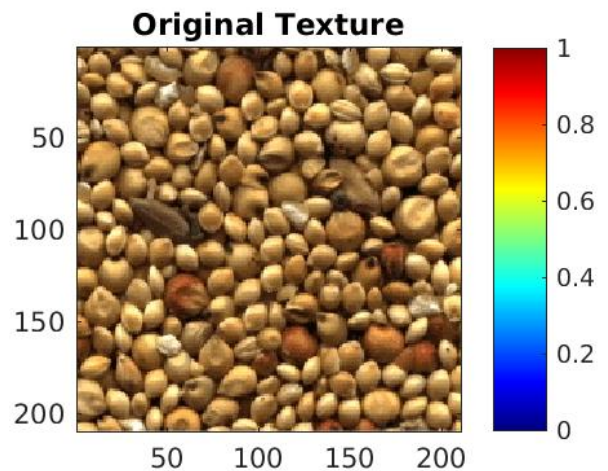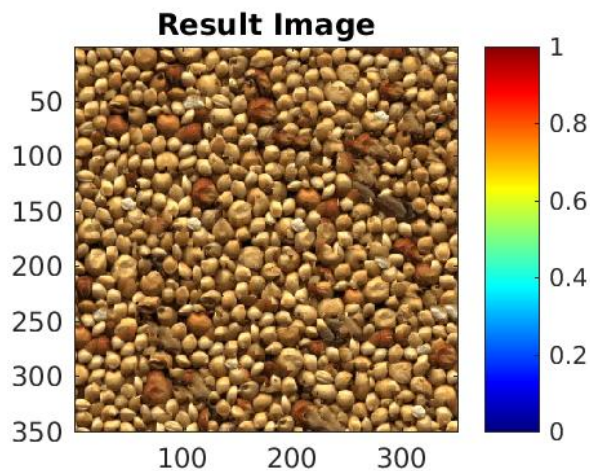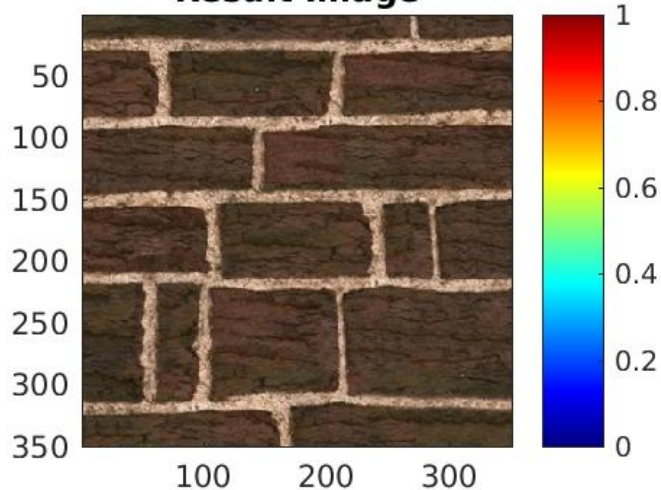
Block Size 40 Overlap Size 10

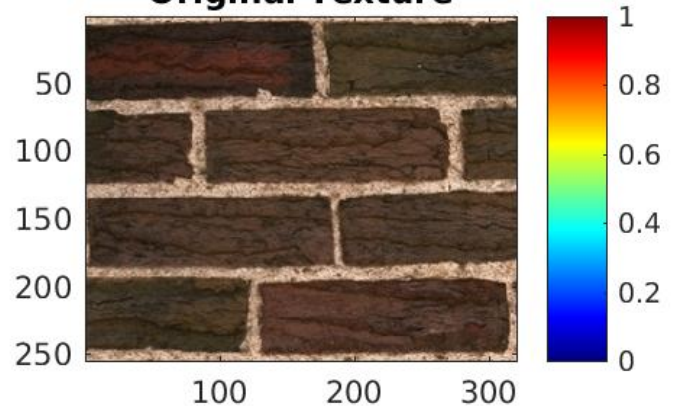These types of textures did not show much variation on edge artifacts on changing overlap and block size visually.
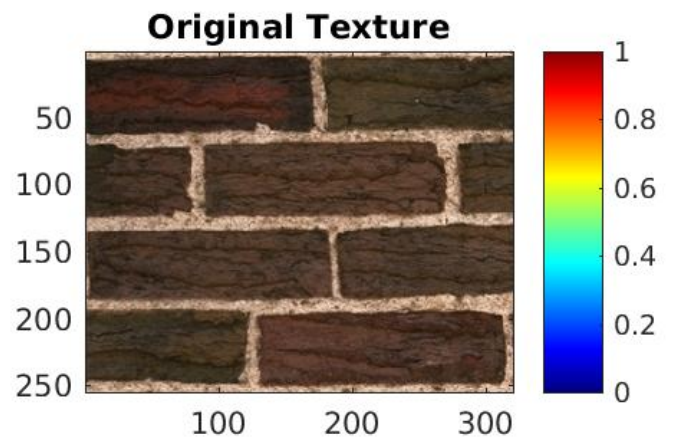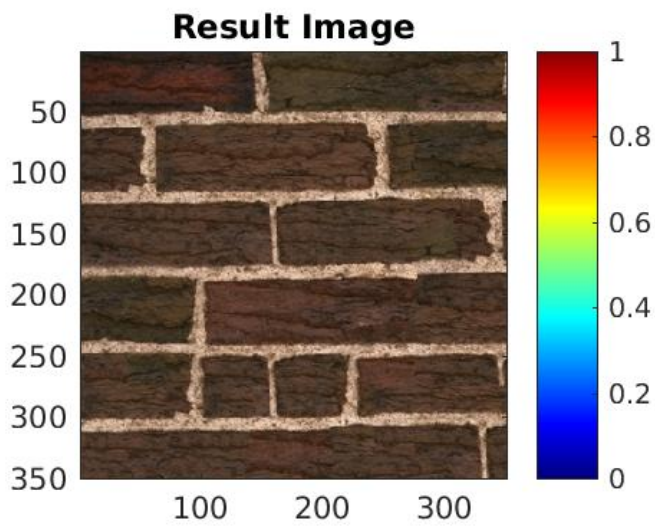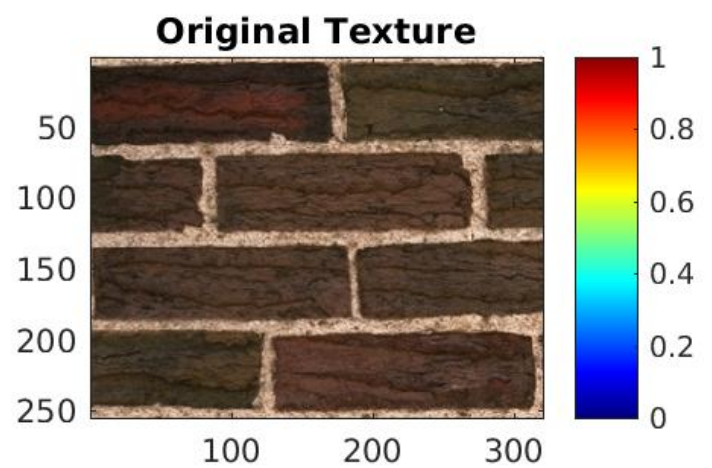
2) Texture
Block Size : 25 Overlap 6

Block Size : 40 Overlap 6

Result Image

Original Texture

Block Size : 25 Overlap 10

Result Image

Original Texture
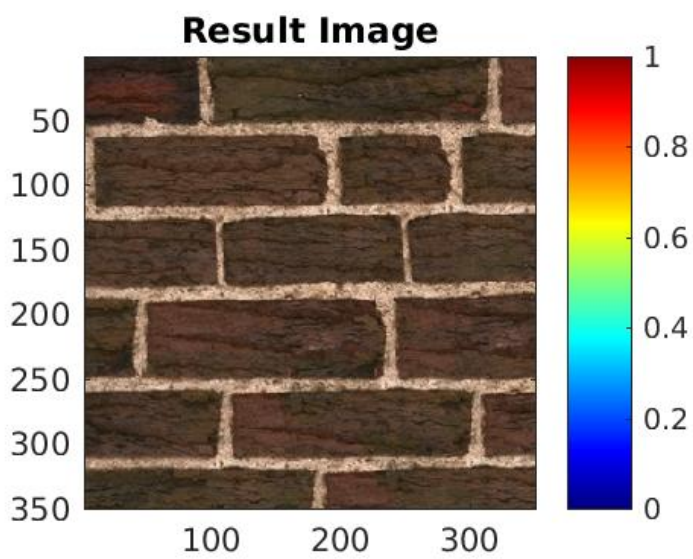
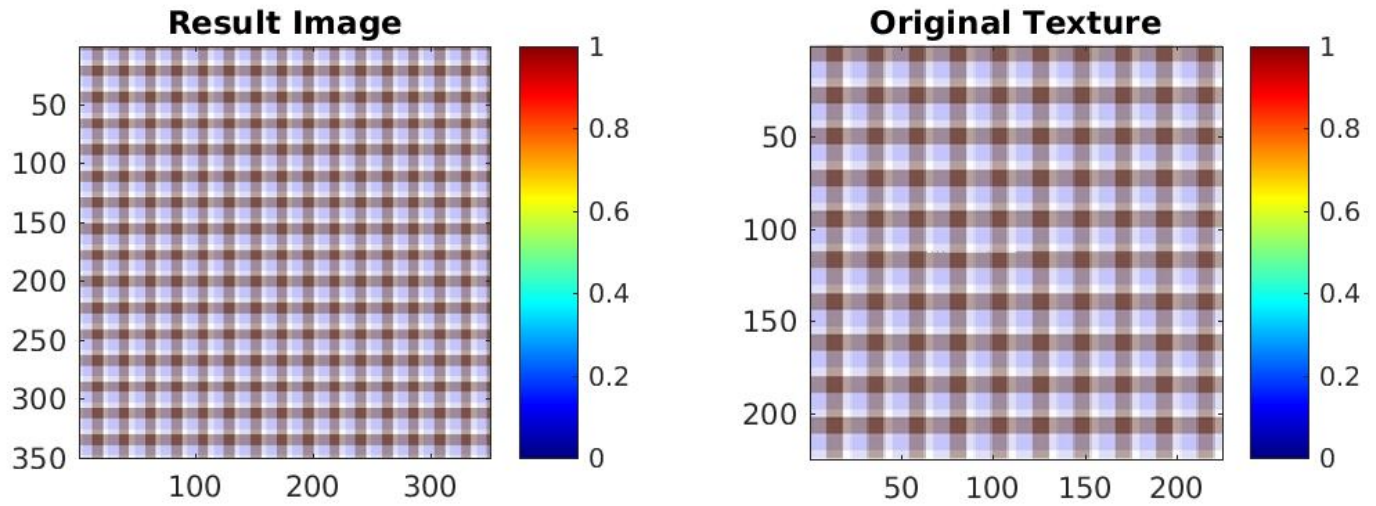## 3)

Uniform Texture: Texture synthesized has almost zero edge artifacts(visually). Changing overlap size and block size did not affect the results
Block Size: 25 Overlap 6

Results:

Algorithm:

Result generated by Min Boundary Cut error was the best among the three algorithm.

Quilting

1)When the Block size is same, the larger overlap size corresponds to better results to a certain extent.

2)When Overlap Size is same, the larger block size corresponds to better image.Block size should not be too large as this would increase the overlap region error between the two blocks considerably and edge artifacts will become more prominent.

3)When Texture is highly uniform , the result generated has least edge artifacts and results did not vary much on changing overlap and block size.
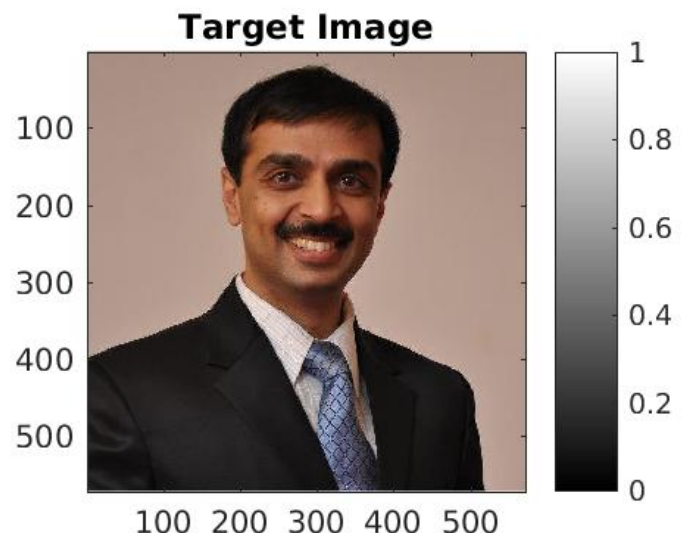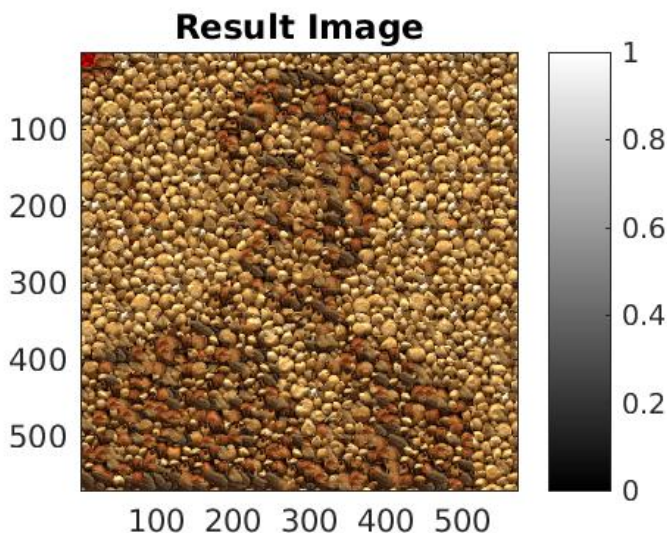
4)When Texture is very fine , results did not vary much on changing block or overlap size.

TIME: Small Block Size and large overlap size will take more time to generate.

Texture Transfer

1)
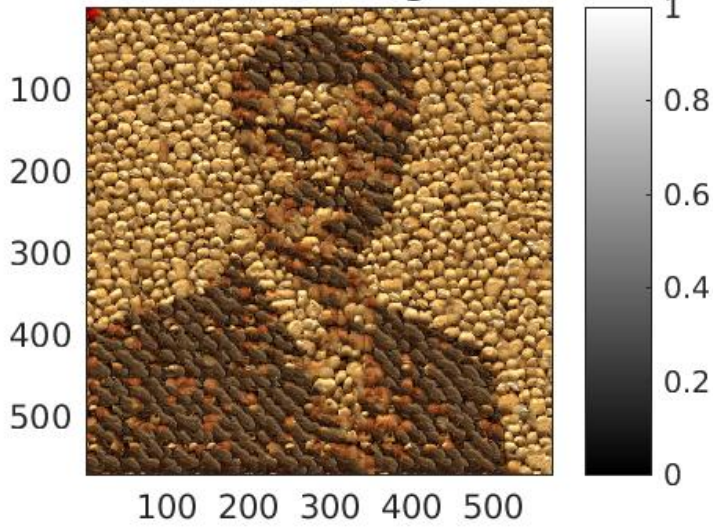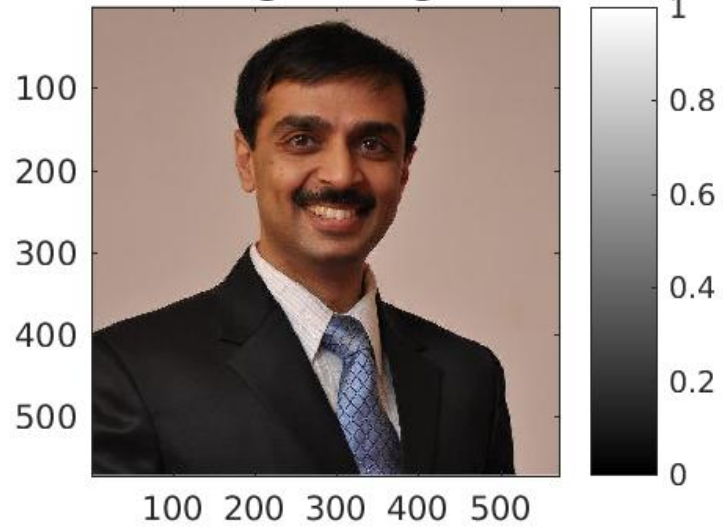Block size = 45   Overlap size = 9   Number of Iterations = 3

Block Size = 25   Overlap Size = 6   Number of Iterations = 3

The decrease in block size leads to better contrast and variation in intensities.

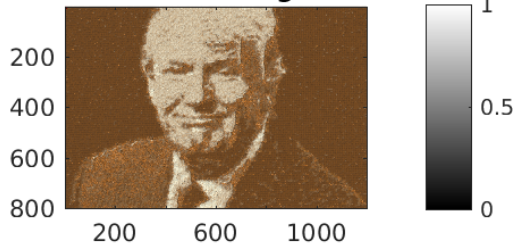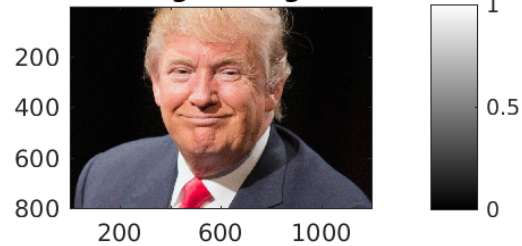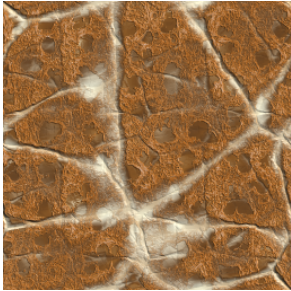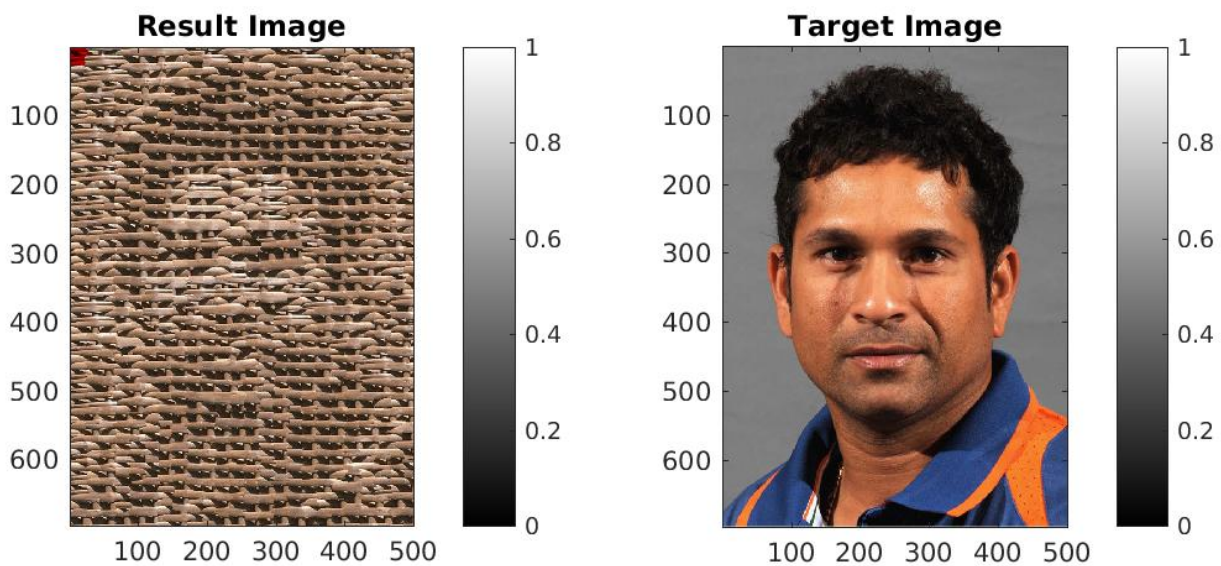2)   **Block size = 25   overlap size = 6   Number of iterations =3**
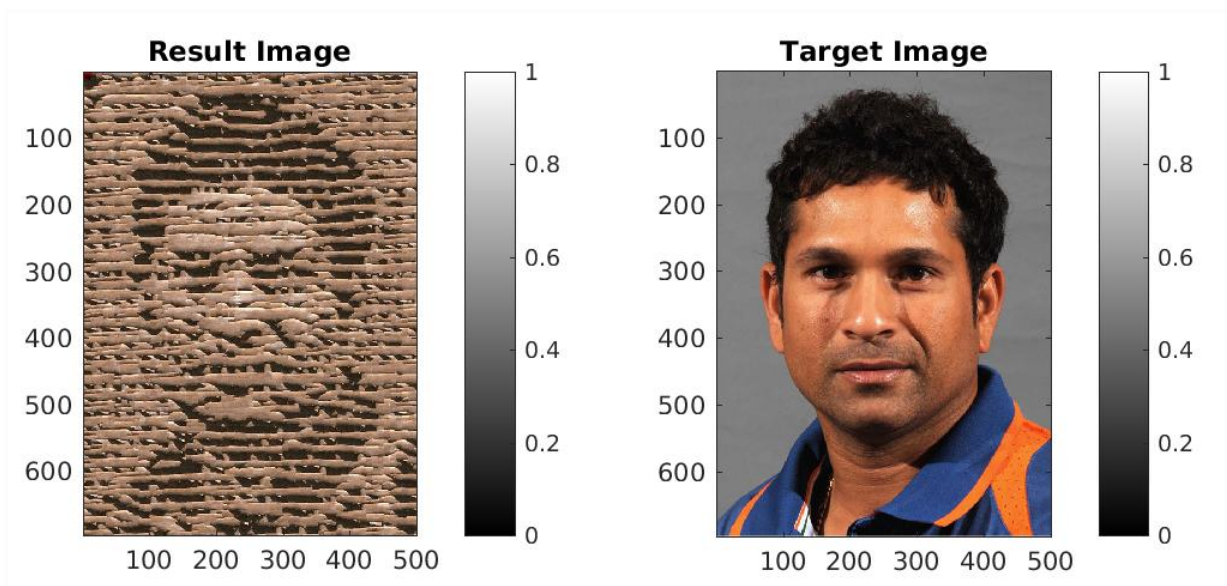
The texture transferred image is very fine as the image size is very big, so the block size is relatively small, moreover the image is zoomed out.

3)   Block size = 27   Overlap Size = 6   Number of Iterations = 1

Block size = 27   Overlap Size = 6   Number of Iterations = 3

Texture

On one hand, the patch size is decreased at each iteration, thus the details of the target image can be rendered because of the smaller patch samples, but the quality of texture tends to be degraded. On the other hand, as alpha is increased at each iteration, the correspondence match between the sampled patch and target image becomes less important while the correspondence match with the neighbouring patches becomes more significant, this tends to attach more importance to the texture quality, which makes the synthesized image look more natural.

4)
Block Size : 25 Overlap Size : 6 Number of iterations: 6
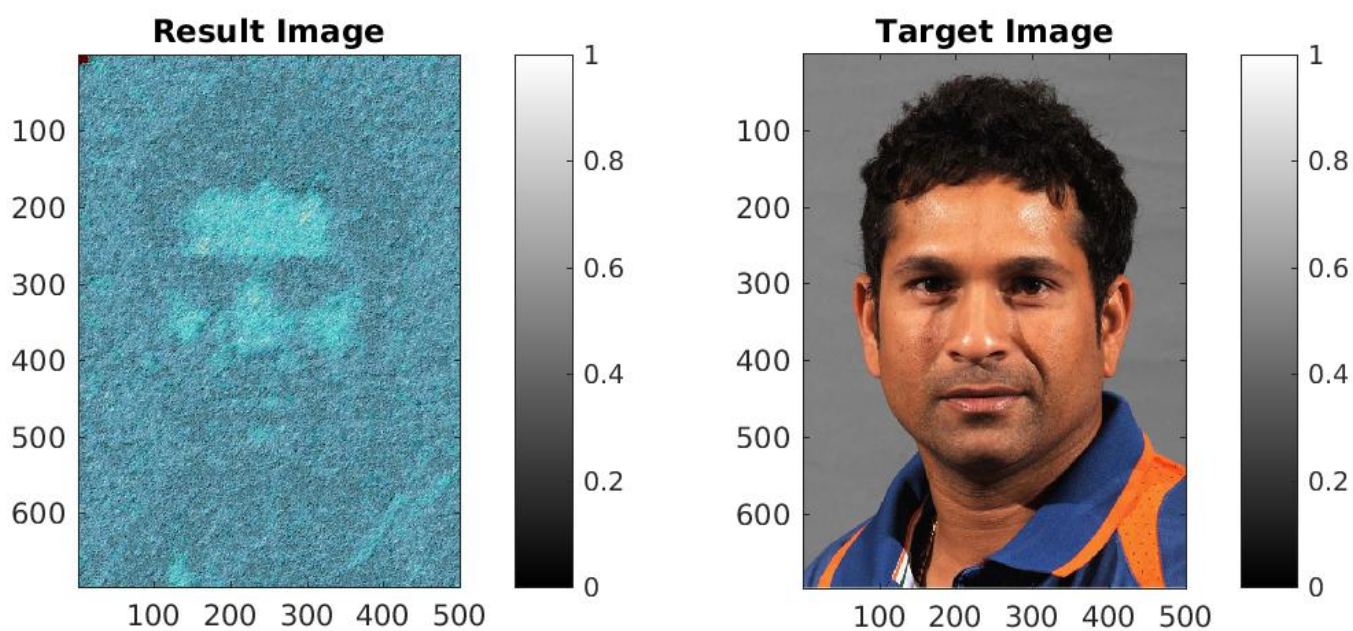
The Image obtained is not so natural/fine due to very small variations in intensity in texture image.

Results:

1) On increasing number of iterations , the synthesised image has more contrast.
2) On decreasing block size , the synthesised image looks more similar to the target image.(better contrast)
3) Result image clarity also depends upon the extent of variation of intensity present in Texture Image.

MORE TEXTURE TRANSFER AND QUILTING RESULTS IN IMAGE DIRECTORY.