Image Quilting

For Texture Synthesis

Team Description:-

1. Aishwarya Mishra: 21350010
   Contribution: Research, Documentation & Next Patch
2. Animesh: 21q050015
   Contribution: Next Patch implementation
3. Kiran C. Ranebennur: 21q050017
   Contribution: Minimum error boundary cut implementation

Problem Statement

To perform texture synthesis using image quilting.

1. Texture synthesis: Texture Synthesis is the process of algorithmically constructing a large digital image from a small digital sample image by taking advantage of its structural content.
2. Image Quilting: It is a simple image-based method of generating novel visual appearance in which a new image is synthesized by stitching together small patches of existing images

We are implementing research paper: "Image Quilting for Texture Synthesis and Transfer" by Alexei A. Efros1,2 William T. Freeman2

Texture Synthesis

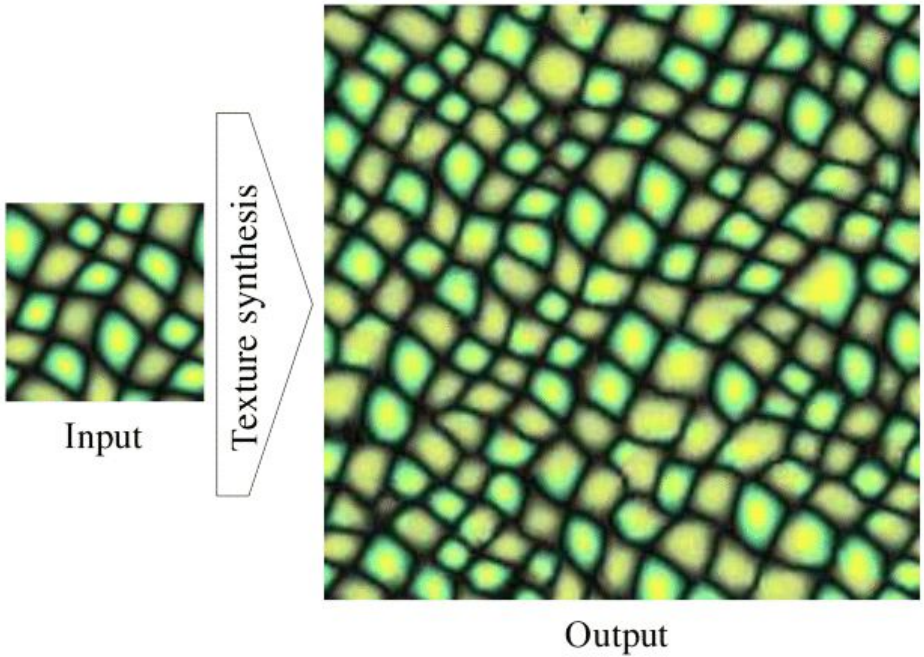

Image Quilting

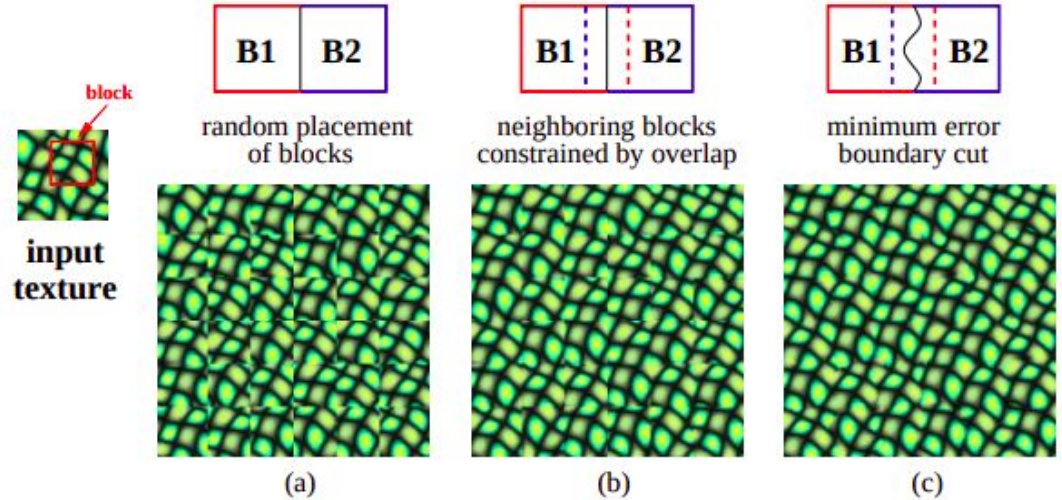

Figure 2: Quilting texture. Square blocks from the input texture are patched together to synthesize a new texture sample: (a) blocks are chosen randomly (similar to [21, 18]), (b) the blocks overlap and each new block is chosen so as to "agree" with its neighbors in the region of overlap, (c) to reduce blockiness the boundary between blocks is computed as a minimum cost path through the error surface at the overlap.

Algorithm

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1. Go through the image to be synthesized in raster scan order in steps of one block (minus the overlap).

2. For every location, search the input texture for a set of blocks that satisfy the overlap constraints (above and left) within some error tolerance. Randomly pick one such.

3. Compute the error surface between the newly chosen block and the old blocks at the overlap region. Find the minimum cost path along this surface and make that the boundary of the new block. Paste the block onto the texture.

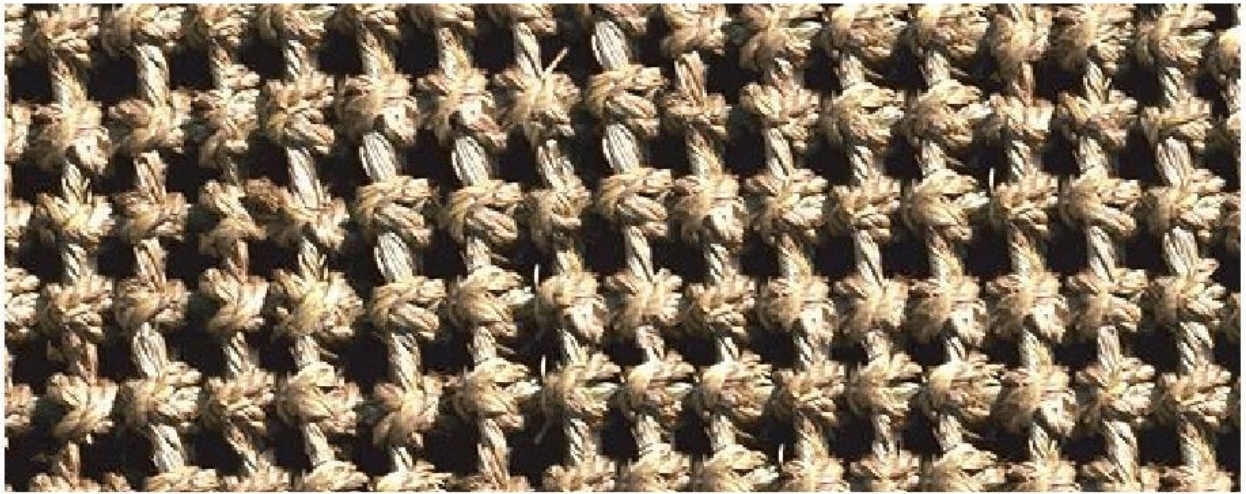
Minimum error boundary cut

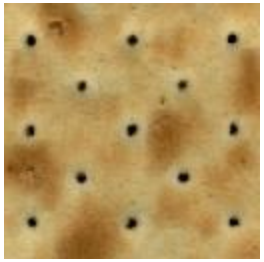
We calculate the minimum error boundary cut using dynamic programming

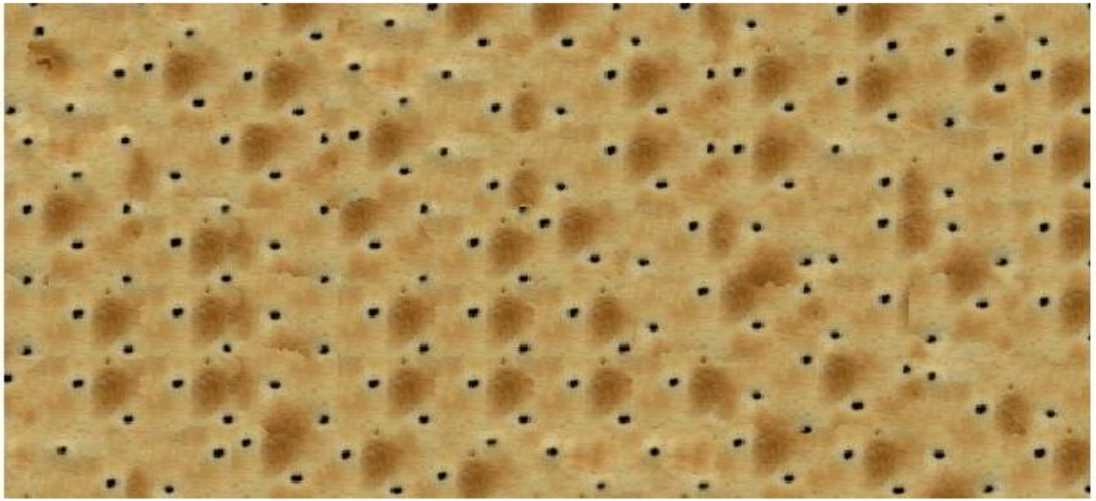
recursively in the following manner :

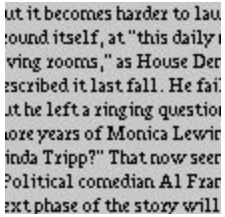
1. For the first row we store the minimum error cut boundary to cover the row, i.e. for each col we store the e ij value .
2. We recursively calculate the minimum error value for i = [2, N] and $\forall$ j as E i, j = e i, j + min(E i-1, j-1 , E i-1, j , E i-1, j+1).
3. The minimum value in the last row in E will indicate the end of the minimal vertical path through the error surface and we backtrack and trace the path of the best cut.
4. A similar approach is followed for finding the minimal horizontal path through the error surface

Our Results









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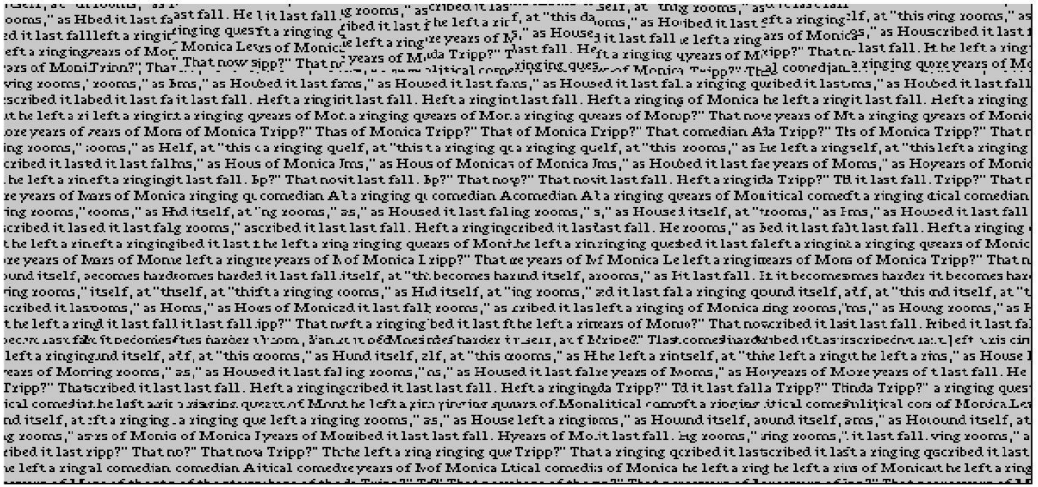

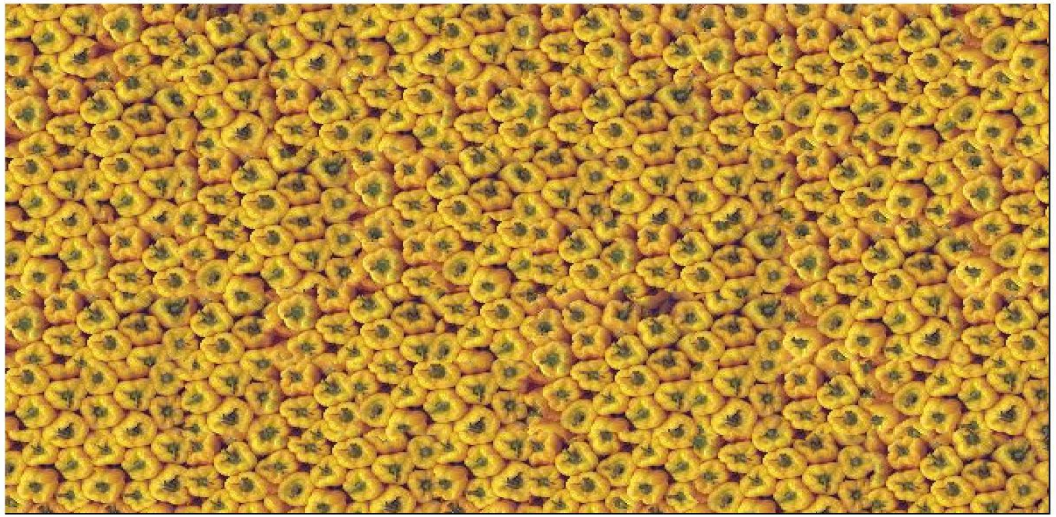

Thank You