Digital Image Processing

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OVERVIEW

Image Quilting for Texture Synthesis and Transfer

- My project is based on the paper here (title above): http://graphics.cs.cmu.edu/people/efros/research/quilting/quilting.pdf
- Image Quilting Algorithm*:
  - Go through the image to be synthesized in raster scan order in steps of one block (minus the overlap).
  - 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 block.
  - 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. Repeat

** Cited from the above paper*

Minimum Error Boundary Cut

$$E_{i,j} = e_{i,j} + \min(E_{i-1,j-1}, E_{i-1,j}, E_{i-1,j+1})$$

- After DP above, in the end, the minimum value of the last row in E will indicate the end of the minimal vertical path though the surface and I can trace back and find the path of the best cut through the overlapped region.

Texture Transfer

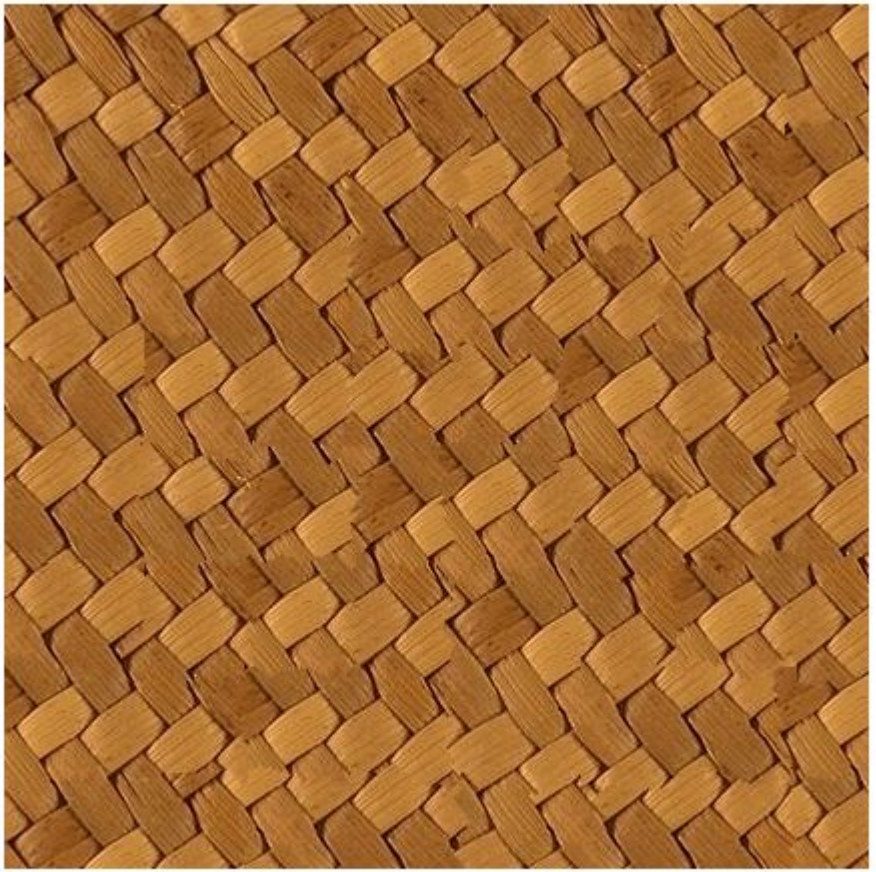
- If I modify the synthesis algorithm by requiring that each patch satisfy a desired correspondence map, C , as well as satisfy the texture synthesis requirements, I can use it for texture transfer.
- The correspondence map is a spatial map of some corresponding quantity over both the texture source image and a controlling target image.
- For texture transfer, image being synthesized must respect two independent constraints:
    - (a) the output are legitimate, synthesized examples of the source texture
    - (b) that the correspondence image mapping is respected.
- Hence, I modify the error term by the use of an ‘alpha’ parameter.

Project Results

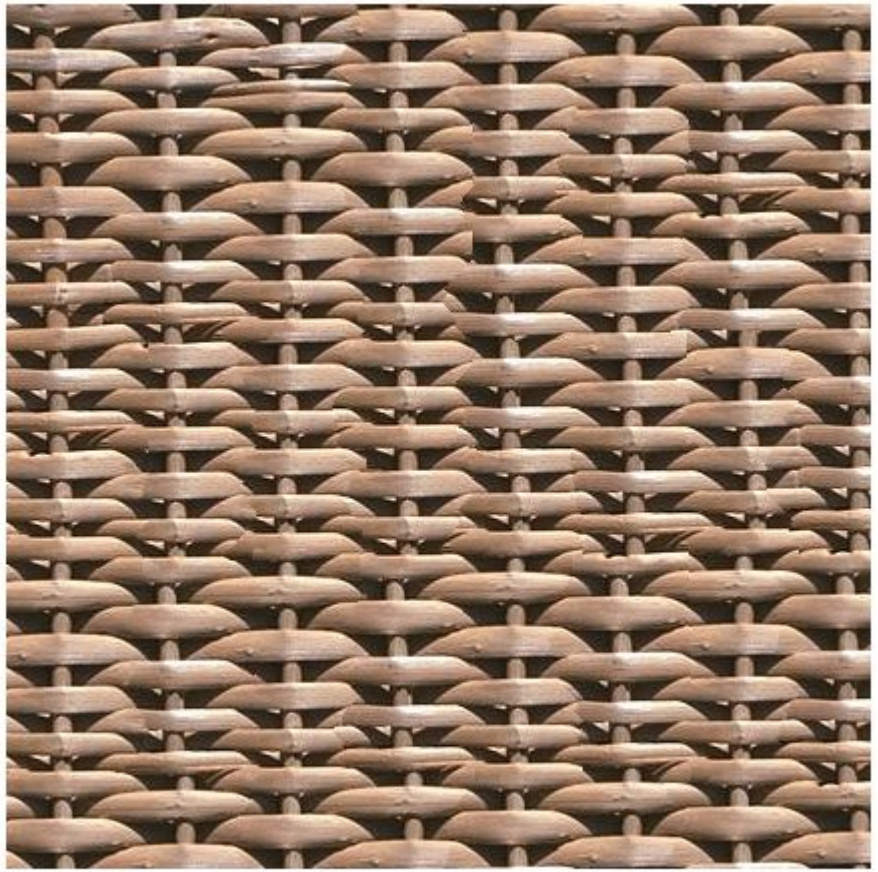
Texture Synthesis

Texture Synthesis

Texture Synthesis



Texture Synthesis



Texture Synthesis

Texture Synthesis

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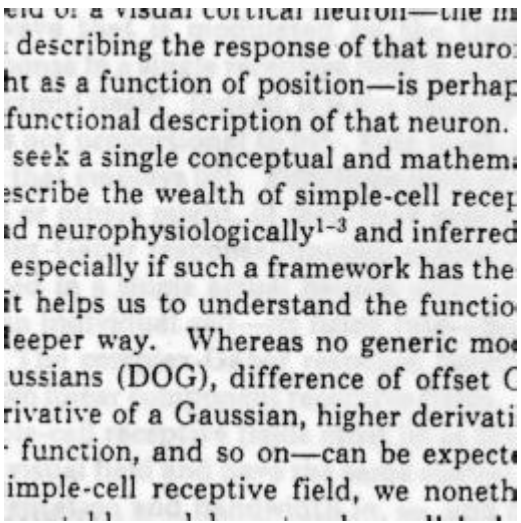
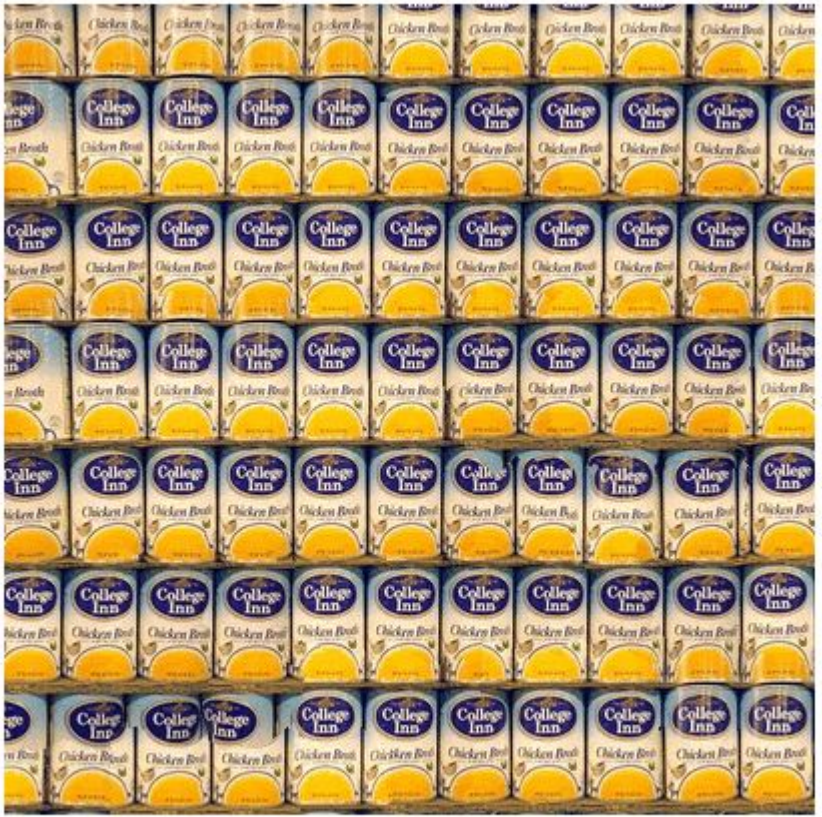
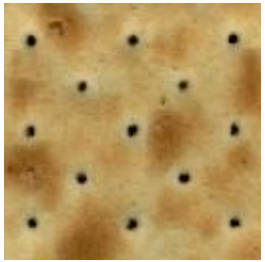


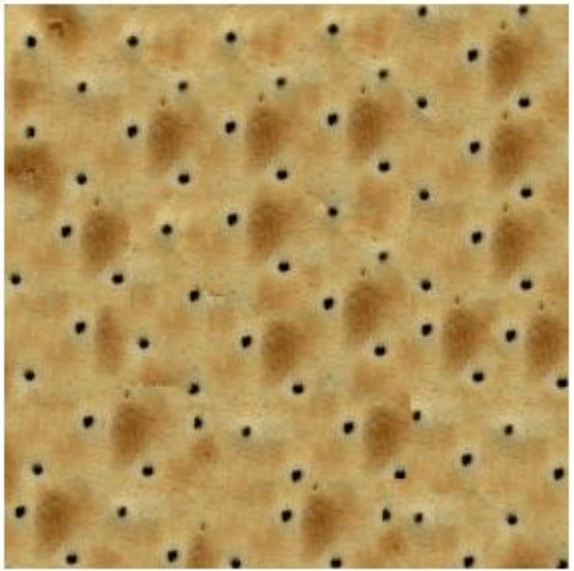
Texture Synthesis

Texture Synthesis



Texture Synthesis



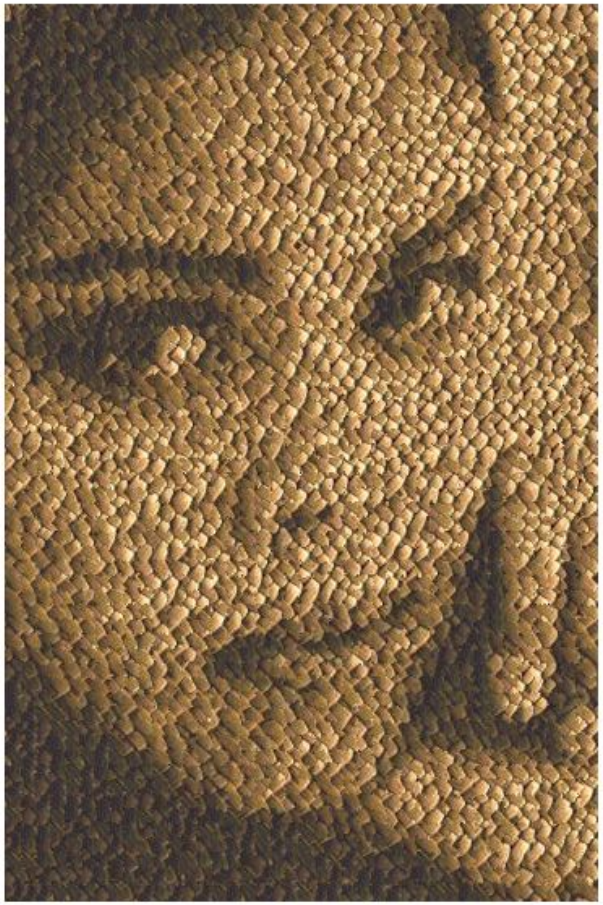


Texture Synthesis

Texture Synthesis

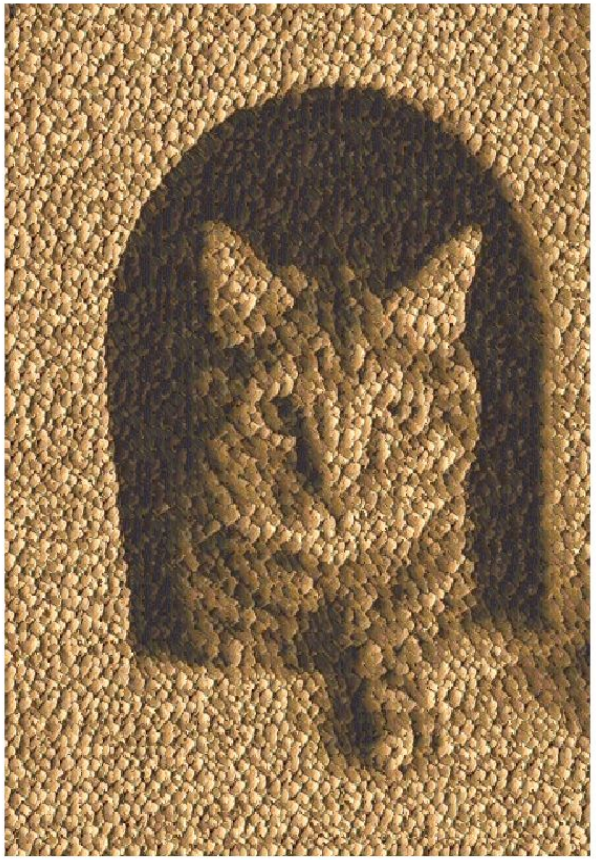
Texture Transfer

Texture Transfer



Texture Transfer

Texture Transfer



THANK YOU!
谢谢