

# Texture Synthesis

Presented by James Hays

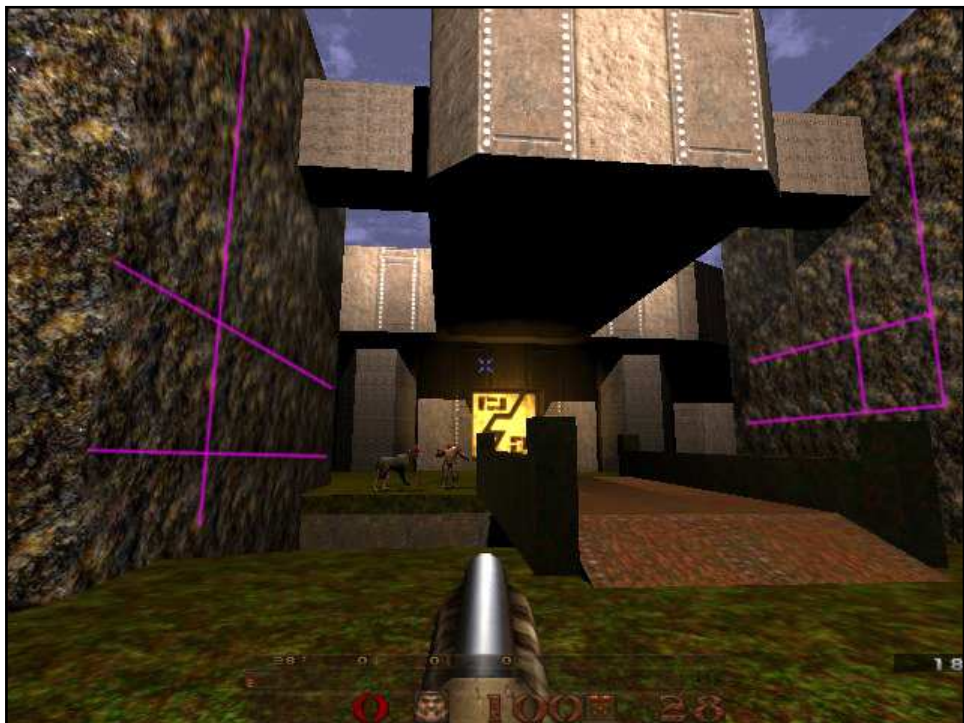
## Problem Statement







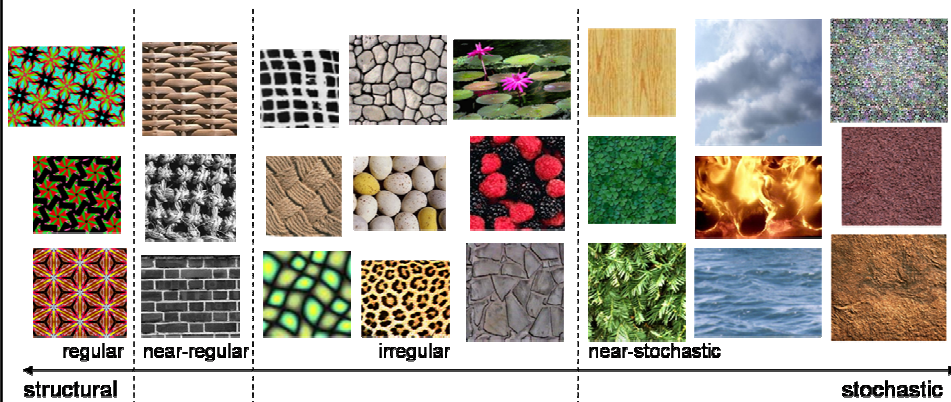




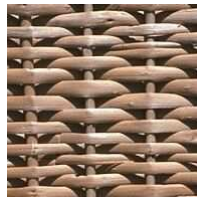
## Problem Statement

- No easy fix
- Limited by texture memory and artist man hours

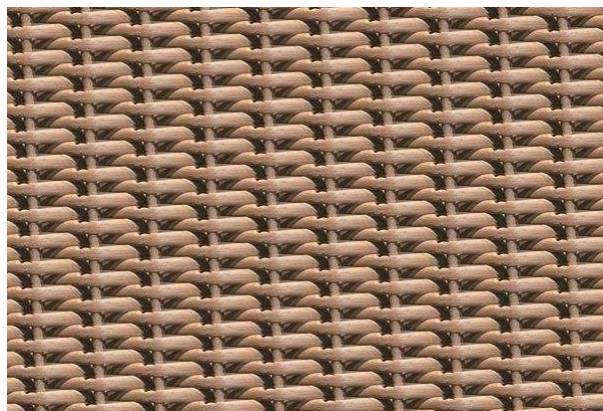
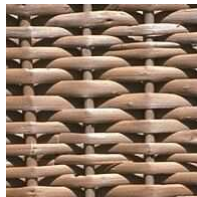
## Texture Spectrum



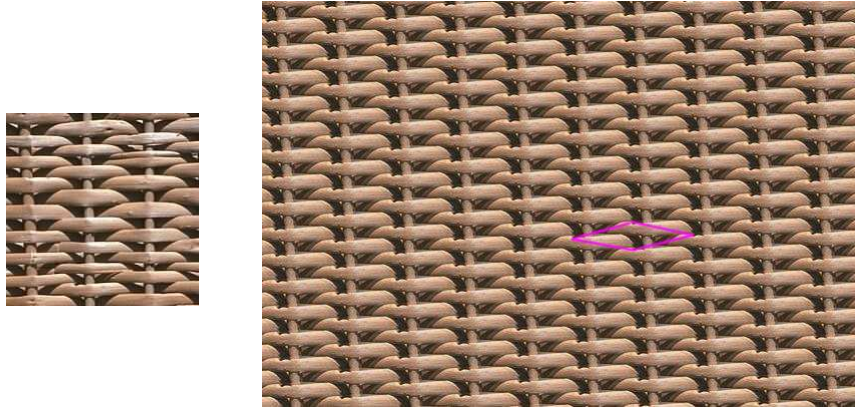
## Real world texture



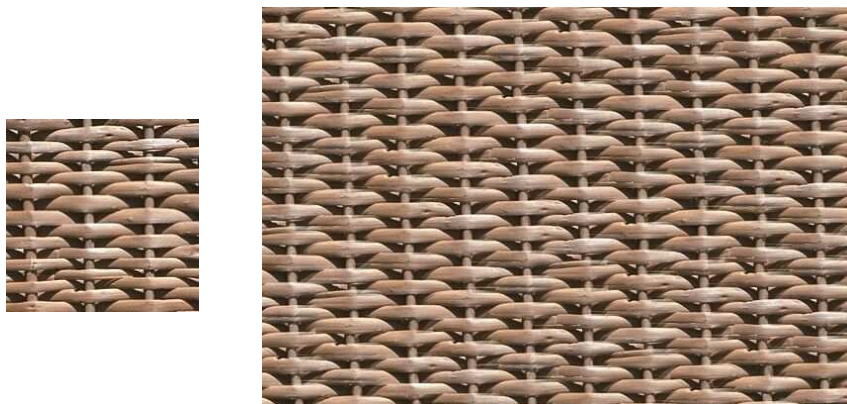
## Tiling



## Tiling

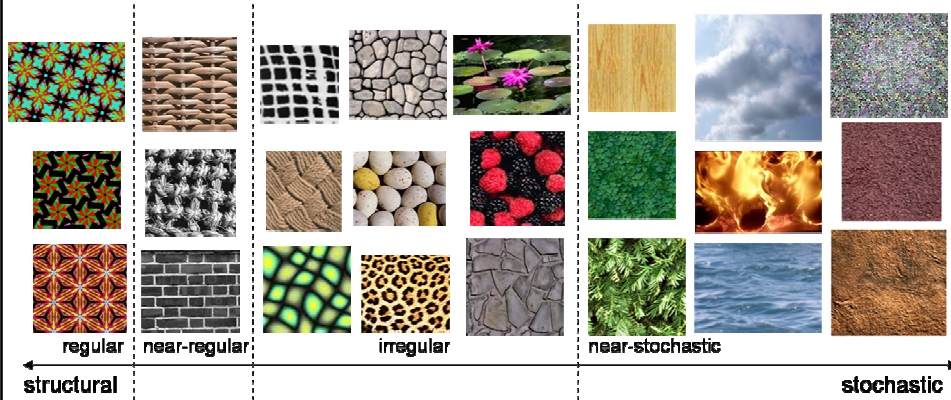


## Texture Synthesis Result

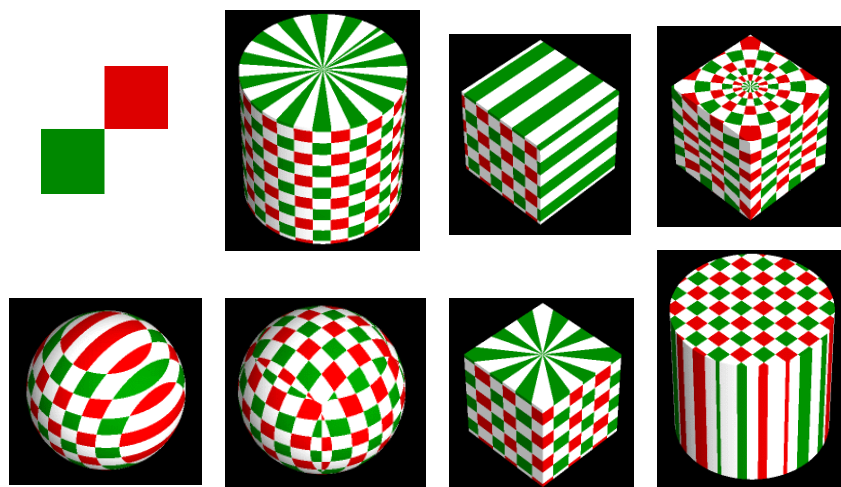


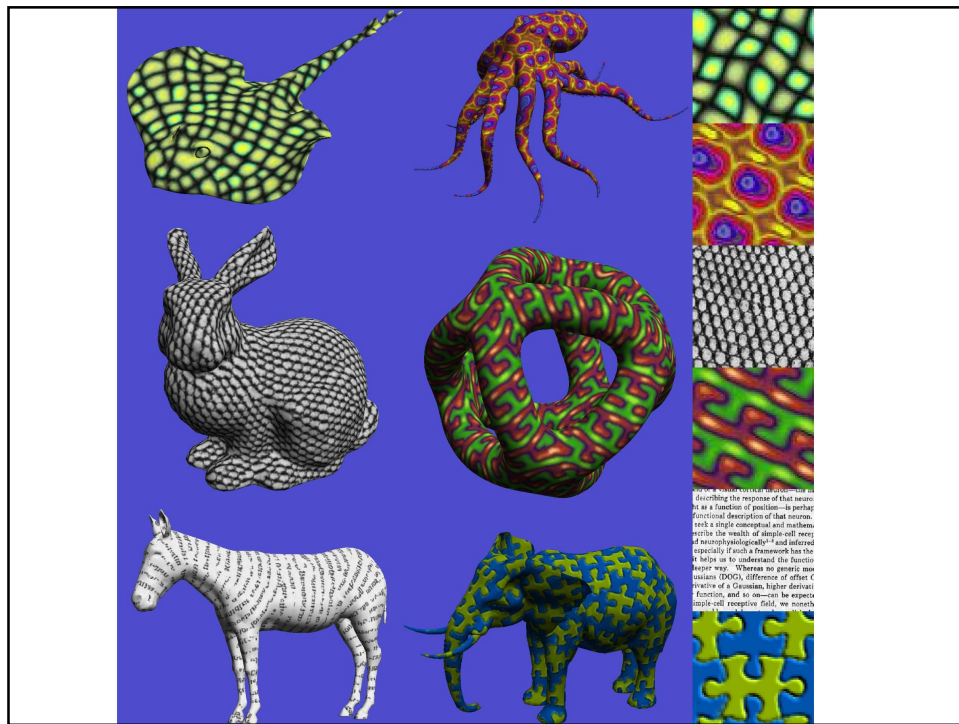


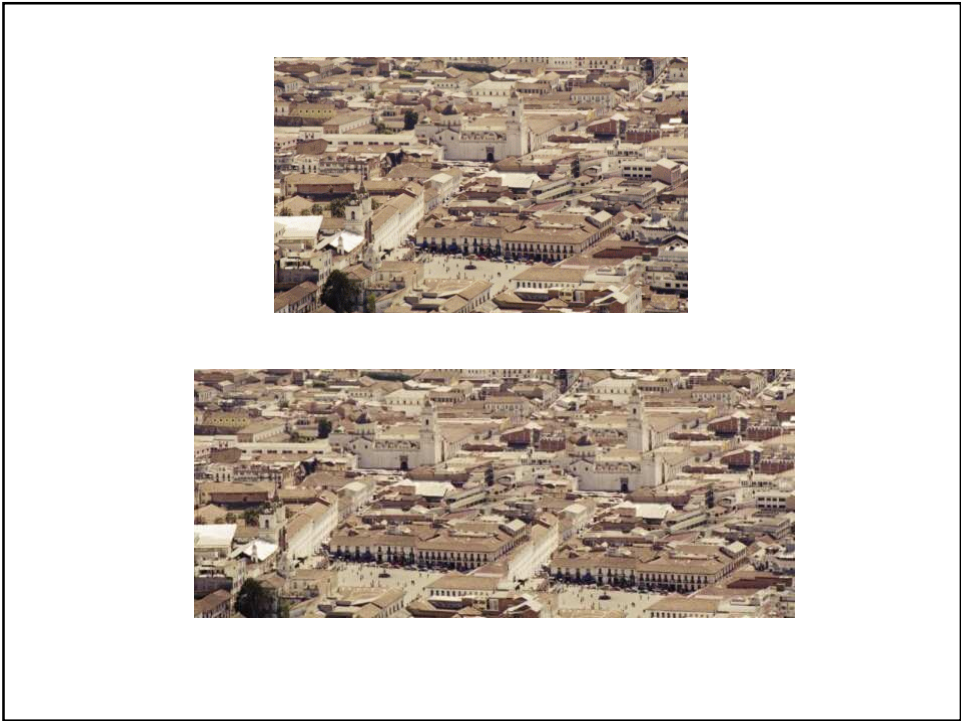
# Texture Spectrum



## Another Justification







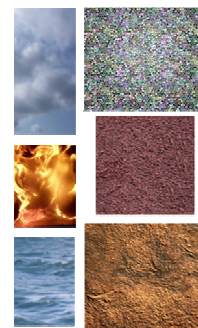


## Approaches

- First approach – toy with some noise image until it matches the statistics of the input image.



## Texture Spectrum

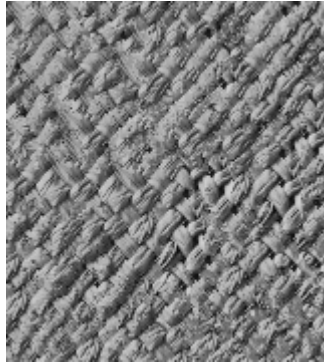


→ stochastic

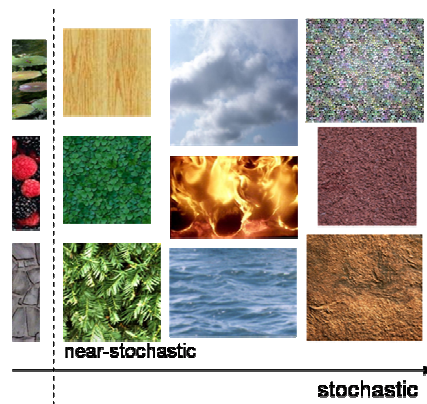


## Approaches

- Newer approach – Copy pixels directly from the input. Search instead of model.

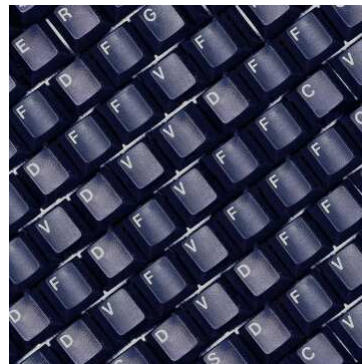


## Texture Spectrum

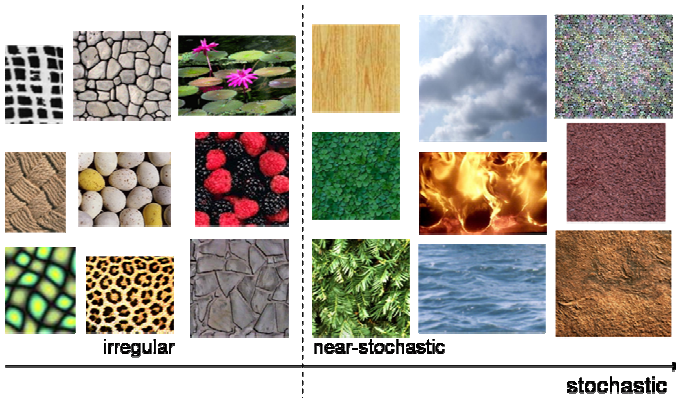


## Approaches

- Newest approach – Copy patches directly from the input and worry about stitching them together

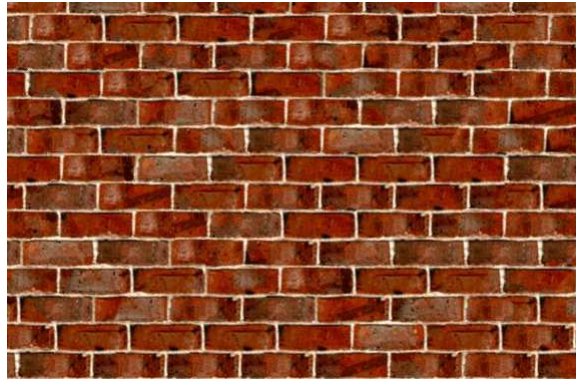


## Texture Spectrum

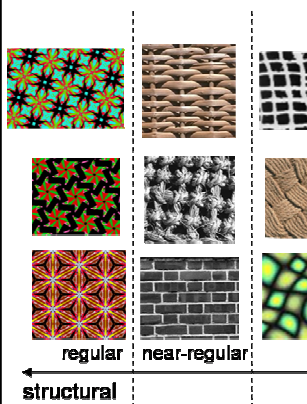


## Approaches

- Newest approach – Copy patches directly from the input and worry about stitching them together while enforcing periodicity.



## Texture Spectrum



## Limitations



## Neighborhood Based Methods

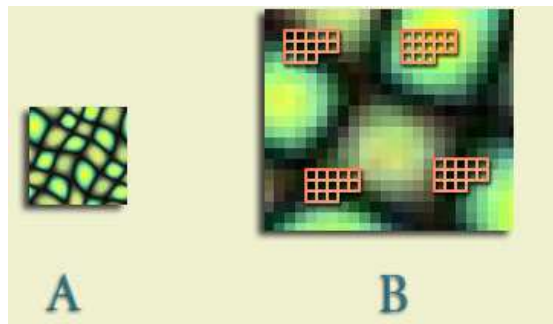
- This is what you will be implementing for homework 4.





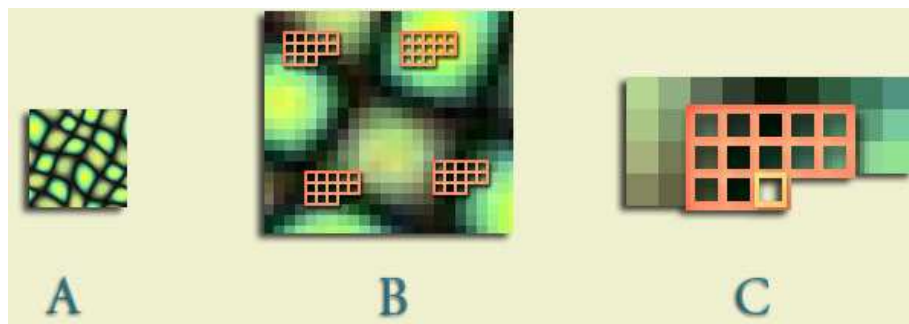
## Neighborhood Based Methods

- This is what you will be implementing for homework 4.



## Neighborhood Based Methods

- This is what you will be implementing for homework 4.



## Neighborhood Based Methods

- There is one significant parameter

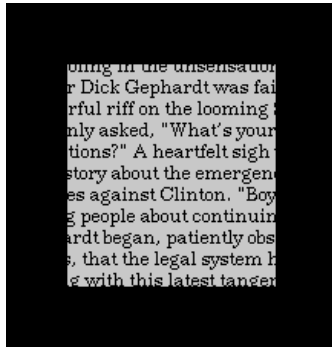


## Neighborhood Based Methods

- Several meaningful extensions
  - Hole filling
  - Coherence Parameter
  - Targeted Synthesis
  - Multiresolution Synthesis
  - Analogy Based Synthesis
  - Acceleration
  - Your Brilliant Idea

## Neighborhood Based Methods

- Hole filling

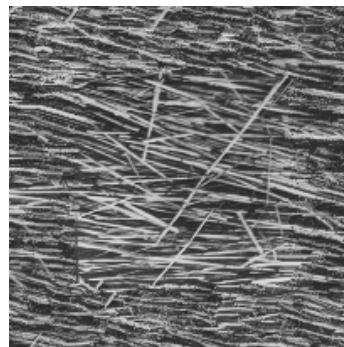
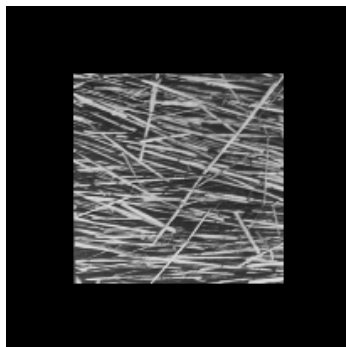


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## Neighborhood Based Methods

- Hole filling



## Neighborhood Based Methods

- Coherence Parameter



With C.P.



Without



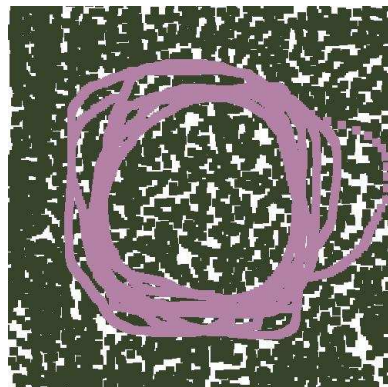
With C.P.



Without

## Neighborhood Based Methods

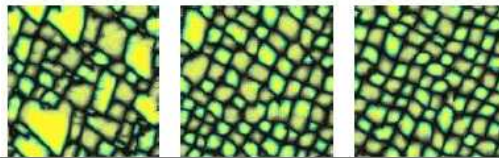
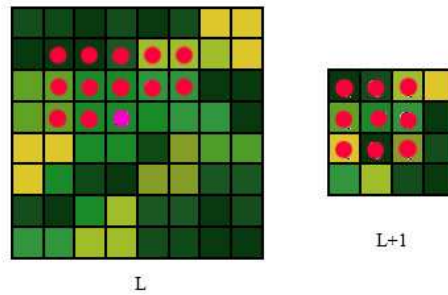
- Coherence Parameter
  - Targeted Synthesis





## Neighborhood Based Methods

- Multiresolution Synthesis



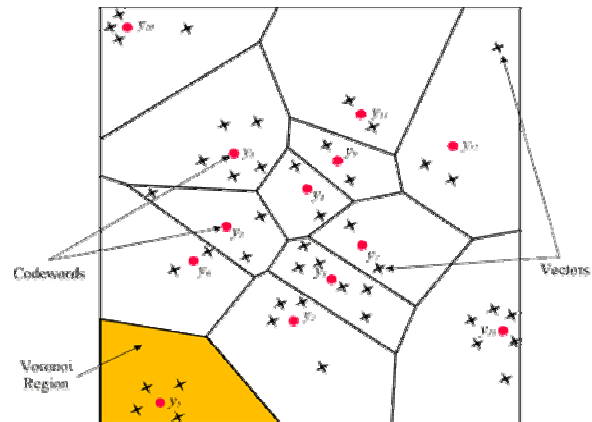
## Neighborhood Based Methods

- Analogy Based Synthesis



# Neighborhood Based Methods

- Acceleration



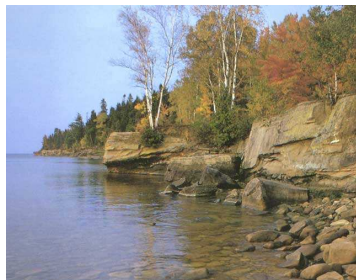
## Non-photorealistic rendering



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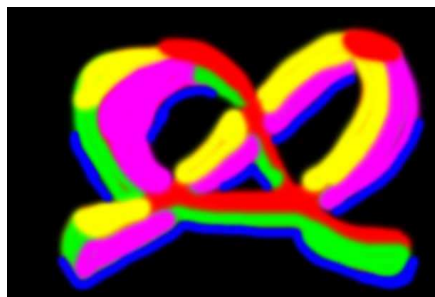
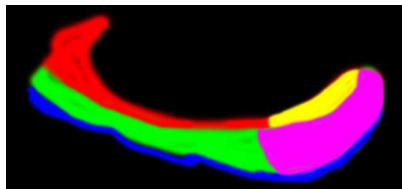
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## Non-photorealistic Rendering



## Paint by numbers



## Colorization



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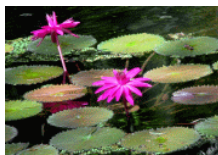
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## Perspective synthesis





## Perspective synthesis



## Rotation invariant synthesis





## Movies



## More neat stuff

[Near Regular Manipulation](#)