

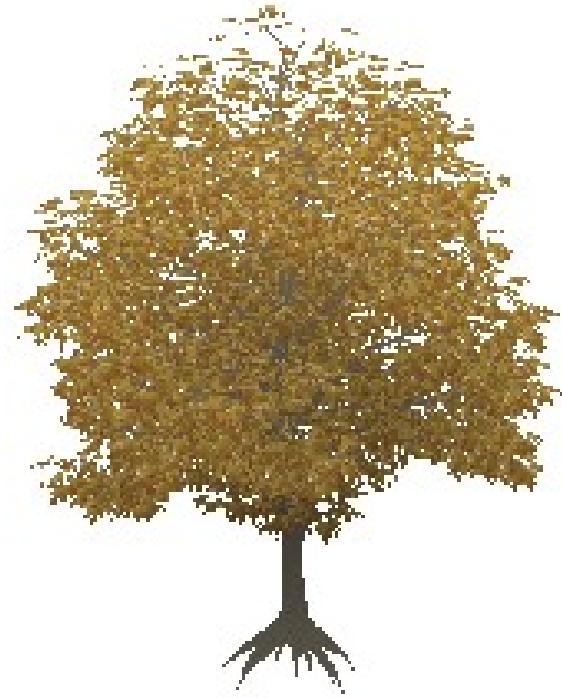


# Alpha Distribution for Alpha Testing

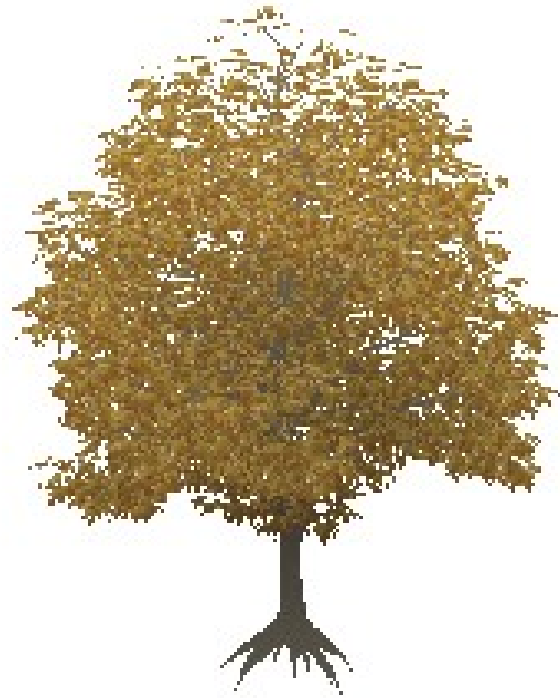
Cem Yuksel

*University of Utah*

# Alpha Testing



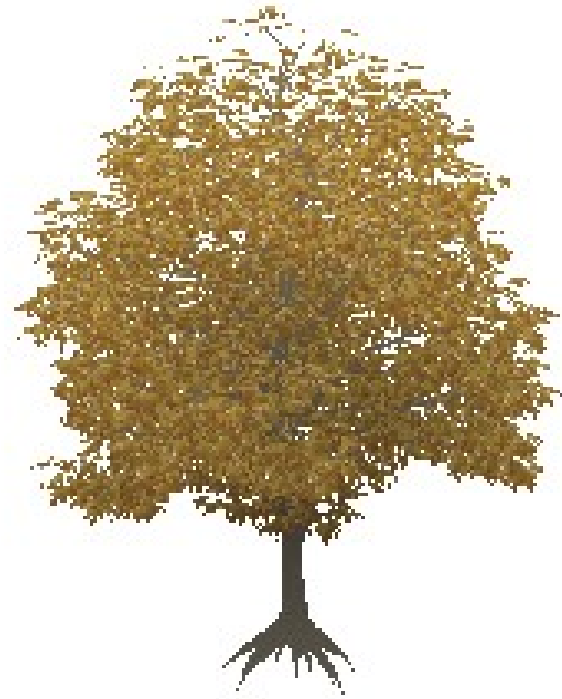
# Alpha Testing



# Alpha Testing



Texture



# Alpha Testing

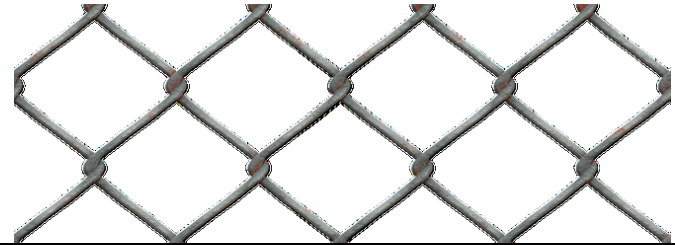


Texture



Alpha Channel

# Alpha Testing



# Alpha Testing



- Binary visibility
- Order independent rendering
- Supported since OpenGL 1.1

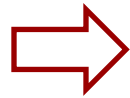
# Alpha Testing



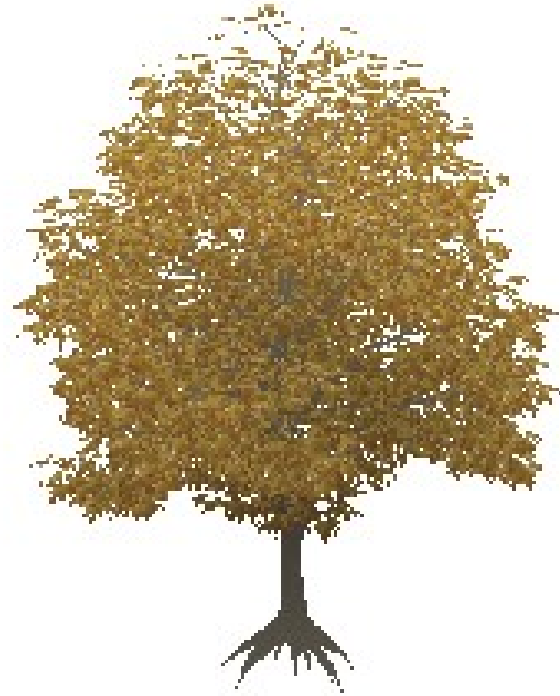
- Problems:
  - Disappearing geometry
  - No Semi-transparency



reference



alpha testing

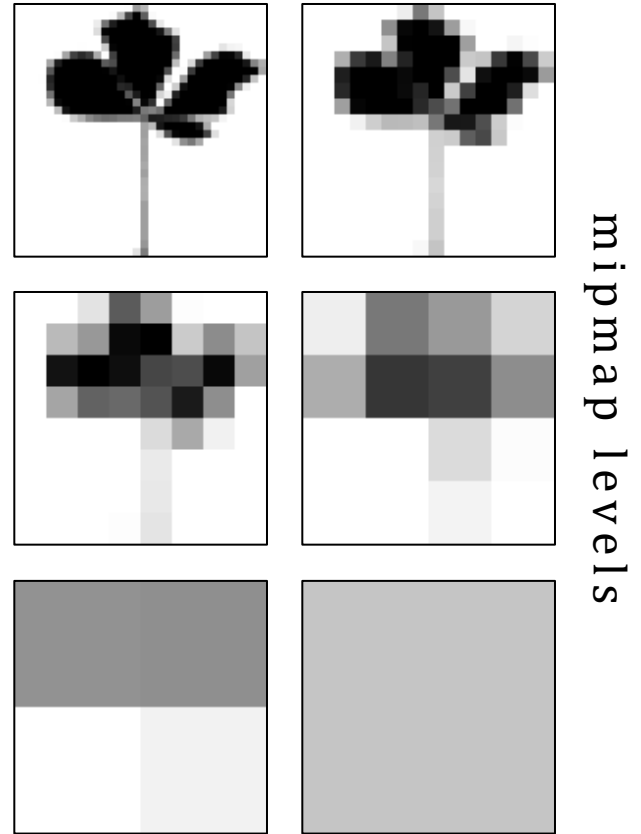
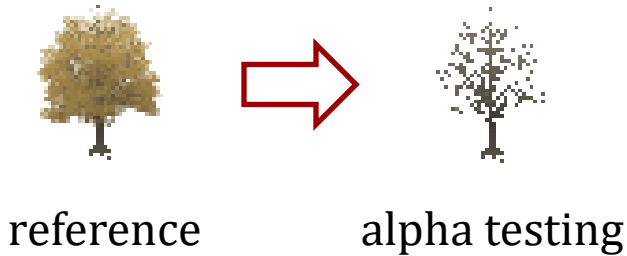




# Alpha Testing



- Problems:
  - Disappearing geometry
  - No Semi-transparency



# Alpha Testing



- Solutions
  - No mipmapping
  - Globally scaling alpha values [Castano 2010]
  - Hashed Alpha Testing [Wyman and McGuire 2017]
    - Use a noise function as alpha threshold.

# Alpha Testing



Traditional Alpha Testing



# Alpha Testing



## Traditional Alpha Testing



# Alpha Testing



Traditional Alpha Testing



Hashed Alpha Testing





# Alpha Distribution

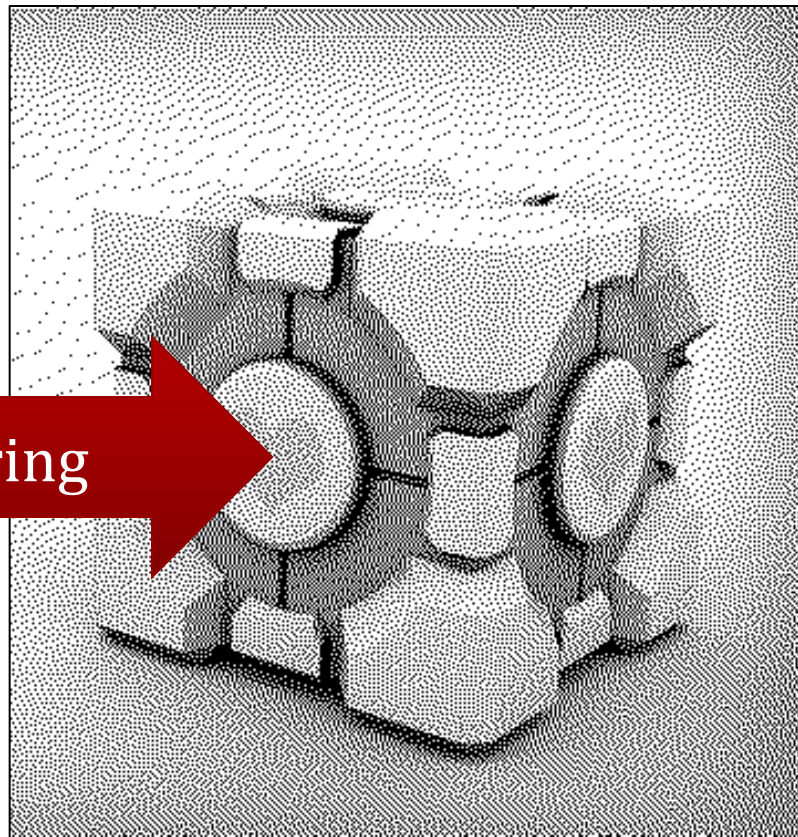
for Alpha Testing



# Alpha Distribution

for Alpha Testing

# Alpha Distribution

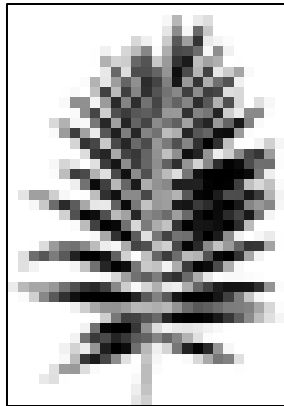




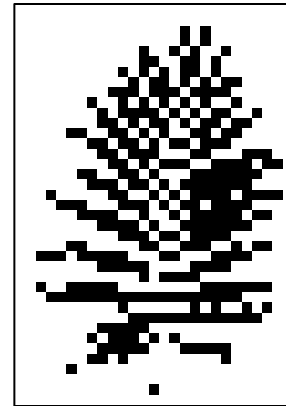
# Alpha Distribution



- Class of methods that distribute the alpha values of texels to other texels.



original alpha values



new alpha values

# Alpha Distribution

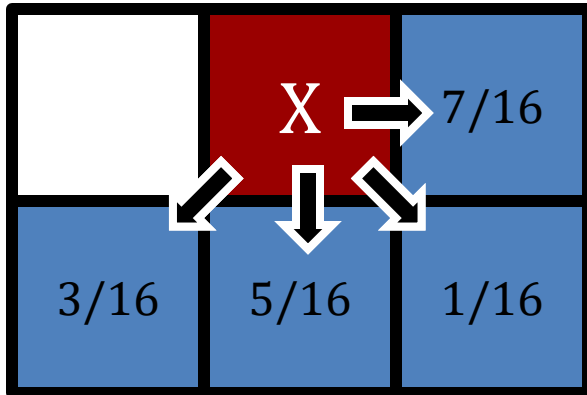


- Two Alpha Distribution methods:
  1. Error diffusion [Floyd and Steinberg 1976]
  2. Alpha Pyramid

# Alpha Distribution



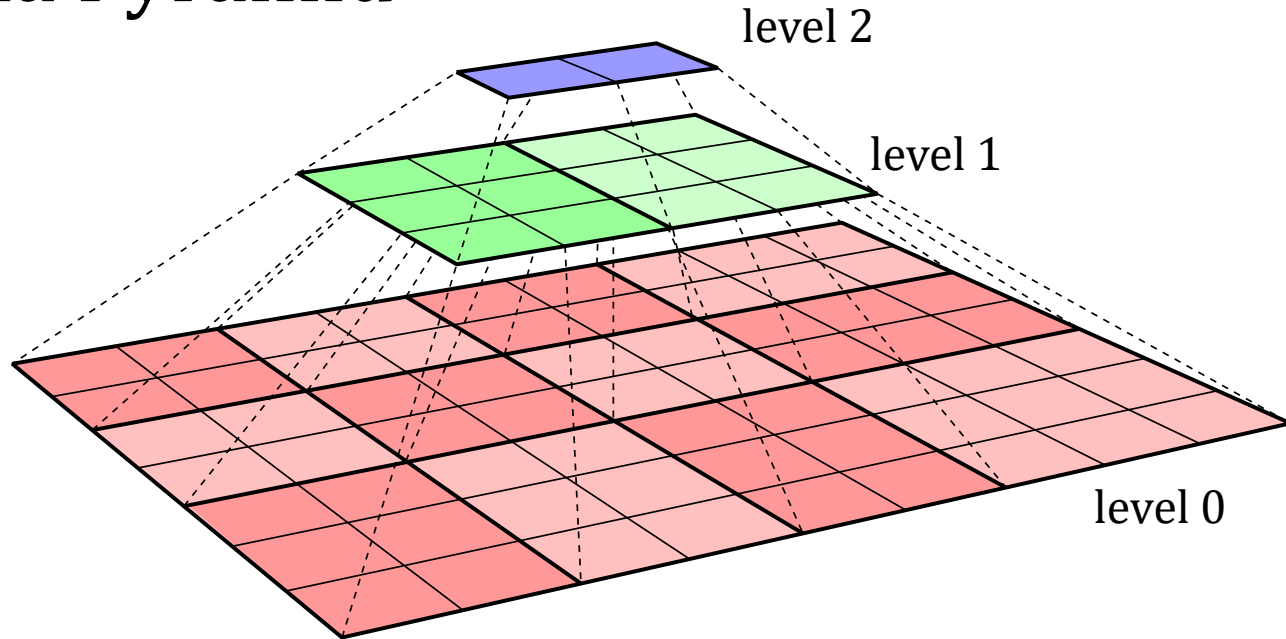
- Error diffusion [Floyd and Steinberg 1976]
  - Perform quantization to each texel in scanline order
  - Distribute the quantization error to neighbors



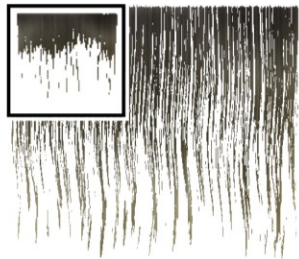
# Alpha Distribution



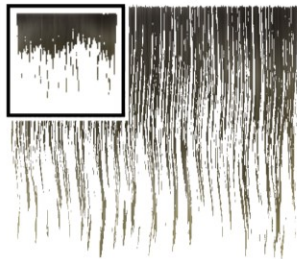
- Alpha Pyramid



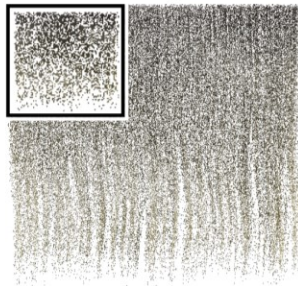
Traditional



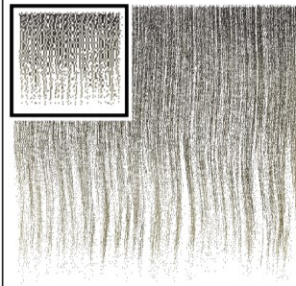
Scaled Alpha



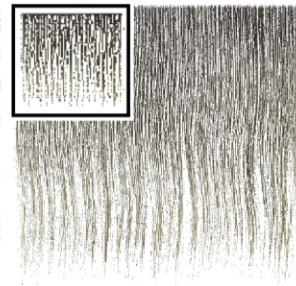
Hashed Alpha Test



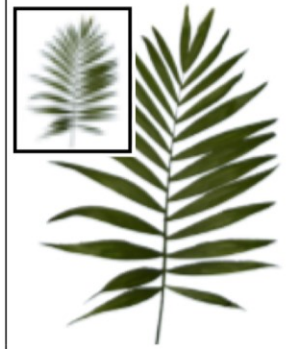
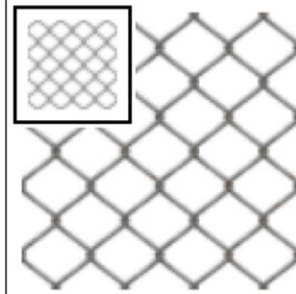
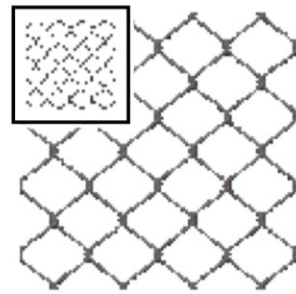
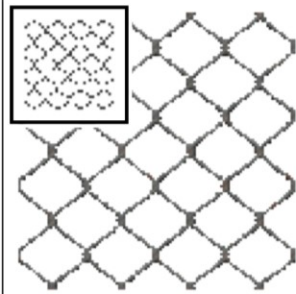
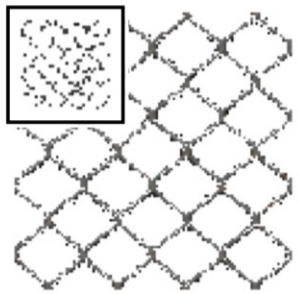
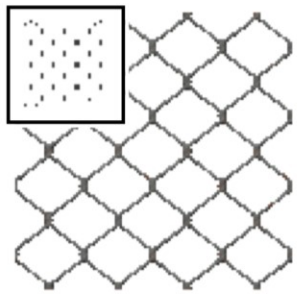
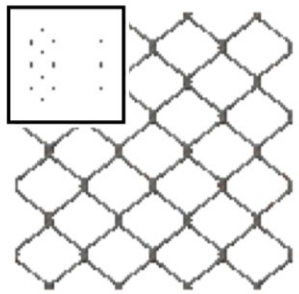
Alpha Distribution with Error Diffusion



Alpha Pyramid



Reference



Traditional



Scaled Alpha



Hashed Alpha Test



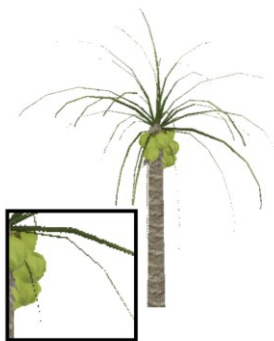
**Alpha Distribution with Error Diffusion**



**Alpha Pyramid**



Reference



# Alpha Distribution

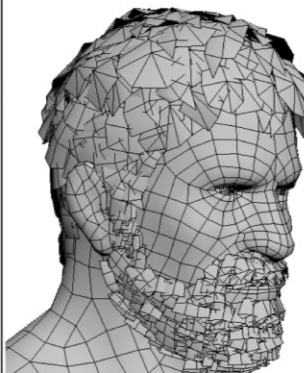


- Alpha-to-coverage
  - More than two quantization levels
  - 2 methods for picking “covered” samples
    - Sample Mask Texture
      - Precomputed sample masks, instead of alpha values.
    - Hashed Sample Mask
      - Randomly pick samples in fragment shader

Alpha Test



Alpha-to-Coverage



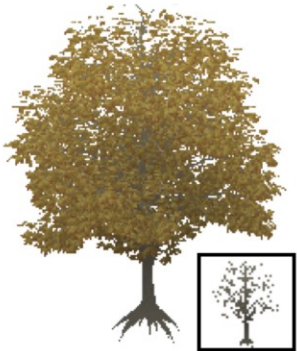
**Alpha Distribution with Error Diffusion**

**Alpha Pyramid**

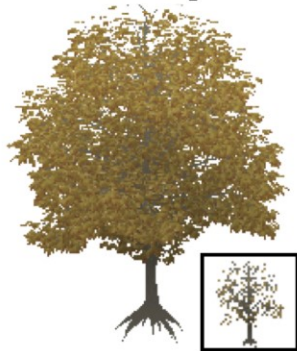


Alpha Test

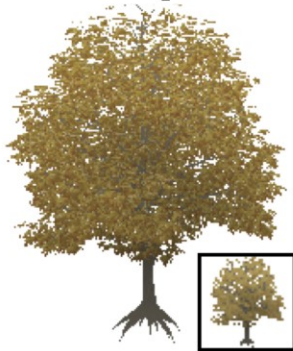
Traditional



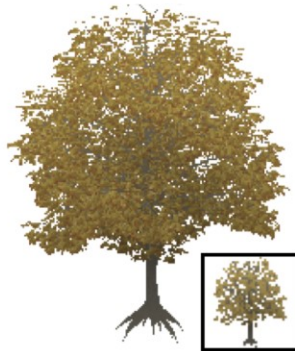
Scaled Alpha



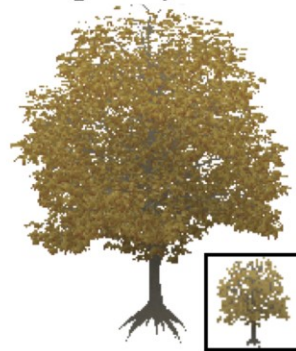
Hashed Alpha Test



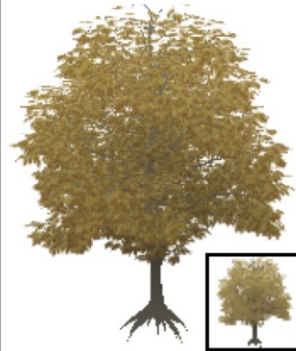
Alpha Distribution with Error Diffusion



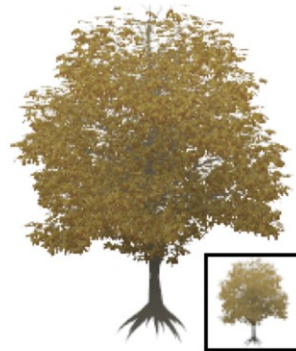
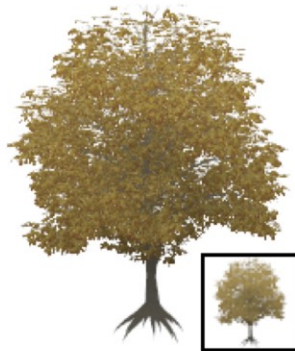
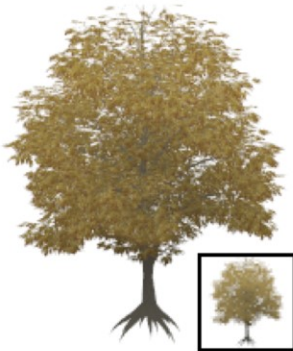
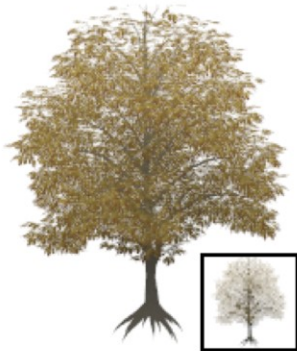
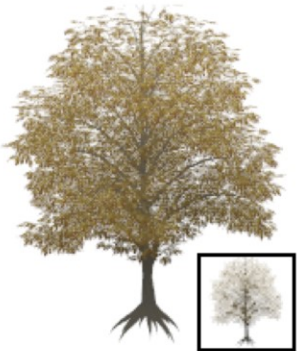
Alpha Pyramid



Reference/Model



Alpha-to-Coverage





# Limitations

of Alpha Distribution



# Limitations

of Alpha Distribution

# Limitations



- Pixelated edges with magnification

0.1. 1.

Traditional



Scaled Alpha



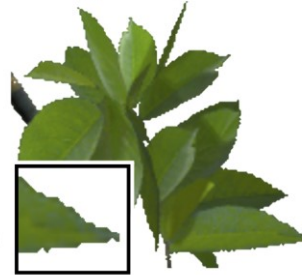
Hashed Alpha Test



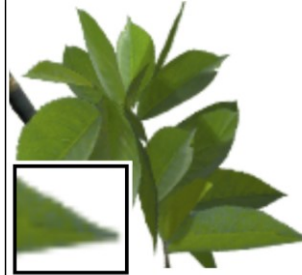
Alpha Distribution with  
Error Diffusion Alpha Pyramid



Alpha Pyramid



Reference

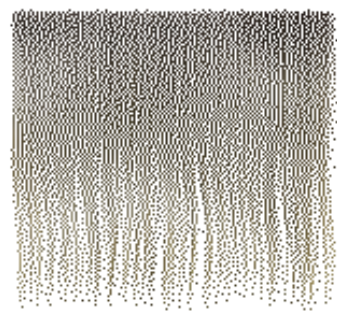
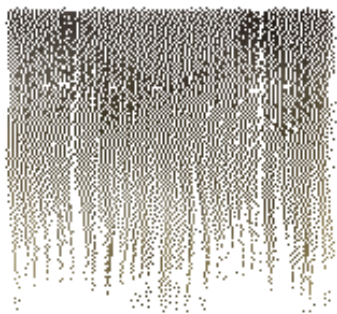
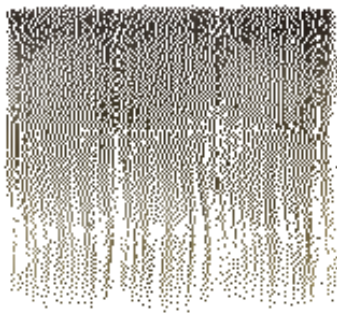
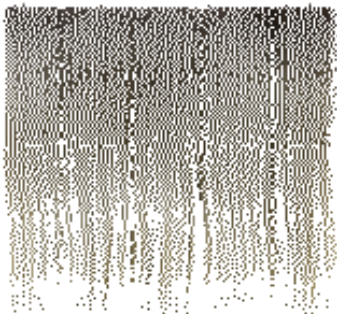


# Limitations

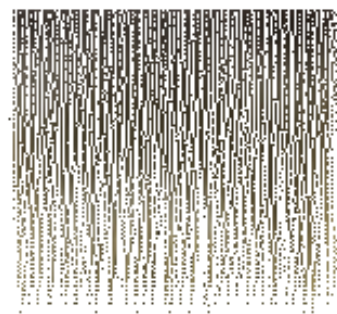
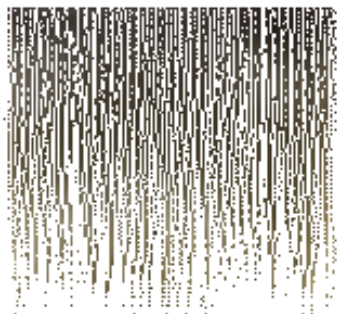
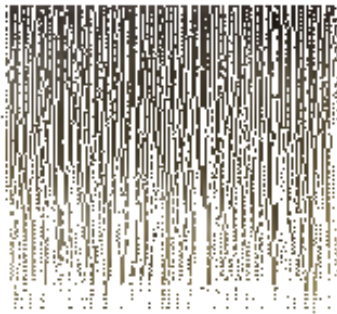


- Regular sampling artifacts

error diffusion



alpha pyramid

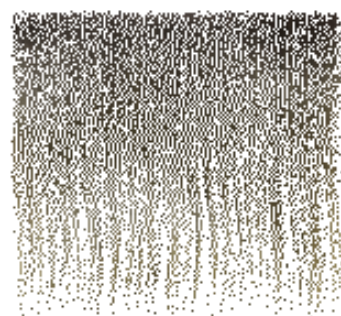
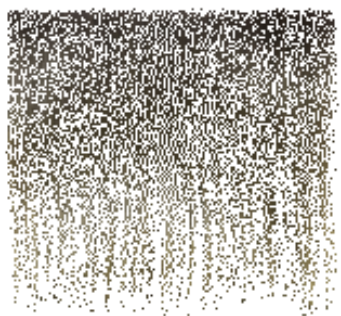
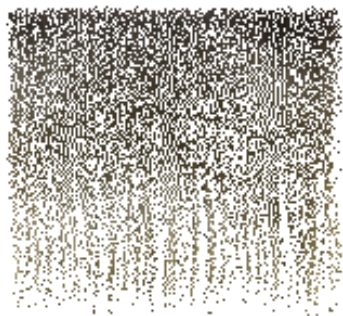
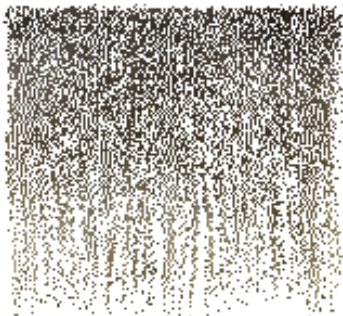


# Limitations

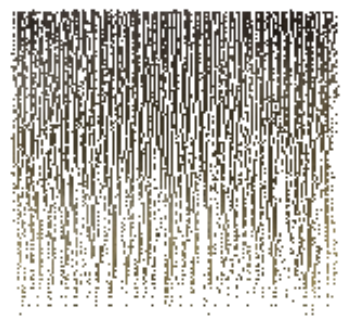
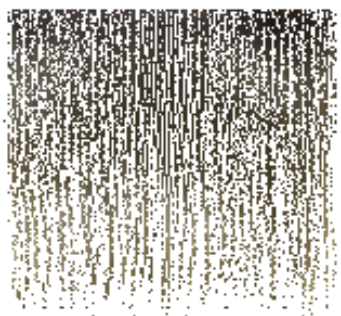
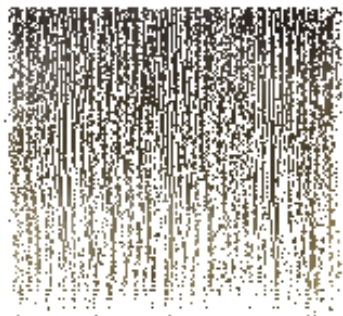
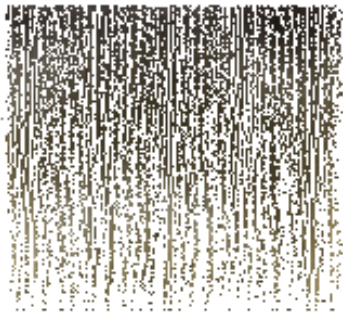


- Regular sampling artifacts (removed with jittering)

error diffusion



alpha pyramid





# Conclusion

Alpha Distribution



# Conclusion

Alpha Distribution



# Alpha Distribution



- Pre-process
- No shader code for alpha testing
- Low noise