Game Graphics & Real-time Rendering

CMPM 163, S2019

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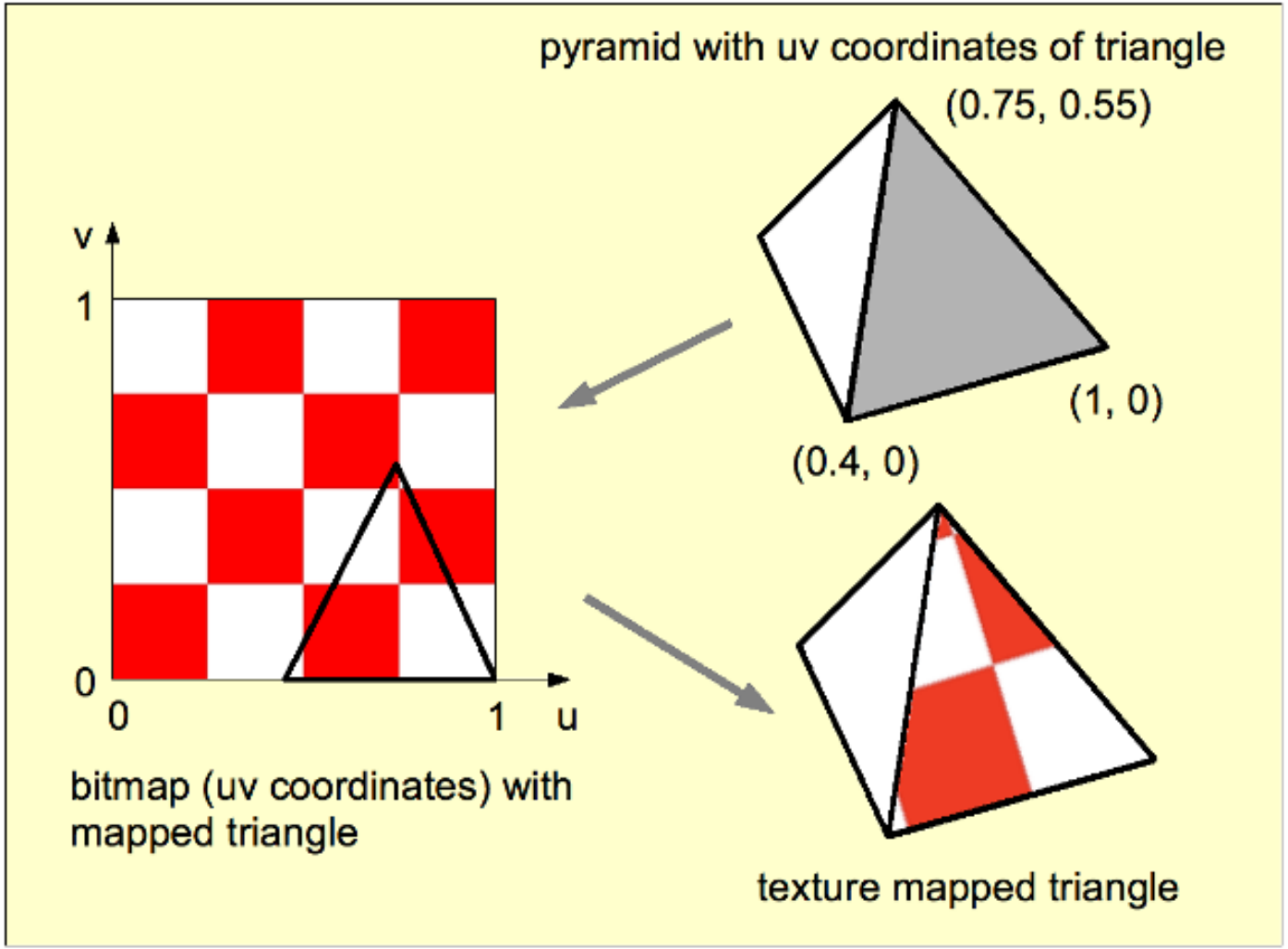
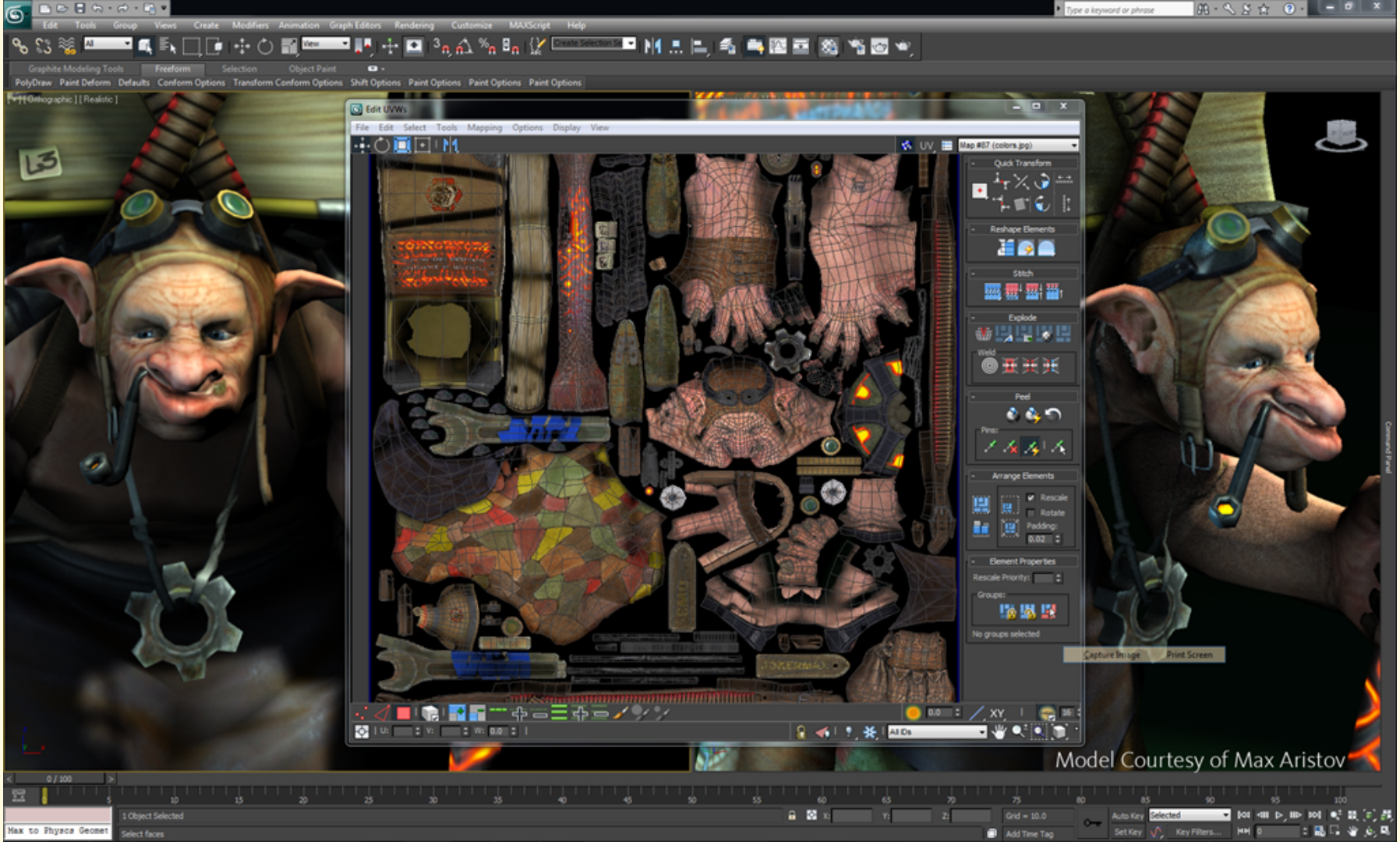
Today

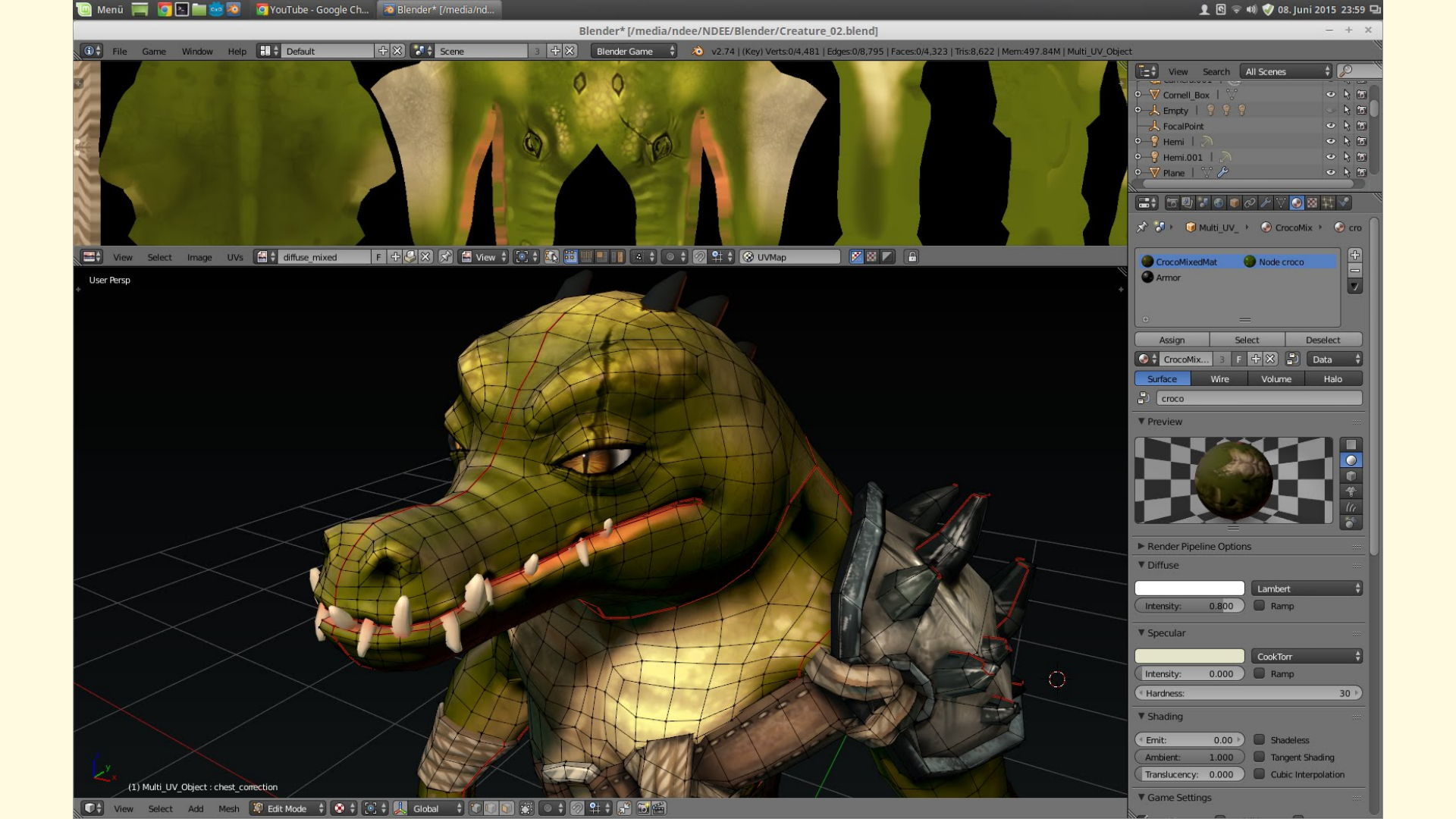
- Passing input from mouse and keyboard
- Accessing and manipulating shader variables from a C# script
- Texturing
- Querying texels
- Image processing on the fragment shader
- Interesting blogs/tutorials online


pyramid with uv coordinates of triangle
(0.75, 0.55)
(1, 0)
(0.4, 0)
v
1
0
0
1
u
bitmap (uv coordinates) with mapped triangle
texture mapped triangle

UV mapping / Texturing

- Unity generate UV coordinates (texture coordinates) for its basic Game objects.
- All modeling software (such as Blender) will create UV coordinates for you, which can be loaded into Unity
- Additionally, modeling software will enable you to create “texture atlases” for complex meshes


Edit UVWs
Model Courtesy of Max Aristov


Menü
YouTube - Google Ch...
Blender* [/media/nd...
08. Juni 2015 23:59
Blender* [/media/ndee/NDEE/Blender/Creature_02.blend]
File Game Window Help Default Scene Blender Game
v2.74 | (Key) Verts:0/4,481 | Edges:0/8,795 | Faces:0/4,323 | Tris:8,622 | Mem:497.84M | Multi_UV_Object
View Search All Scenes
Cornell_Box
Empty
FocalPoint
Hemi
Hemi.001
Plane
View Select Image UVs diffuse_mixed View UVMap
User Persp
(1) Multi_UV_Object : chest_correction
View Select Add Mesh Edit Mode Global
Multi_UV_ CrocoMix cro
CrocoMixedMat Node croco
Armor
Assign Select Deselect
CrocoMix... Data
Surface Wire Volume Halo
croco
Preview
Render Pipeline Options
Diffuse
Lambert
Intensity: 0.800
Ramp
Specular
CookTorr
Intensity: 0.000
Ramp
Hardness: 30
Shading
Emit: 0.00
Shadeless
Ambient: 1.000
Tangent Shading
Translucency: 0.000
Cubic Interpolation
Game Settings

Querying neighbors

- Conceptually, all fragments are processed simultaneously. Thus, when the fragment shader is in the midst of processing one pixel, it can not directly get information about any of the other fragments.

- However, in the fragment shader, if we are passing in a texture, then we can easily query the neighboring pixels in the texture (also called “texels”), as long as we know the width and height of the texture.

- This info is provided automatically by Unity as a special uniform float4 called **_MainTex_TexelSize**, where **.x** = 1.0/width, **.y** = 1.0/height, **.z** = width, and **.w** = height

Image processing – edge detection

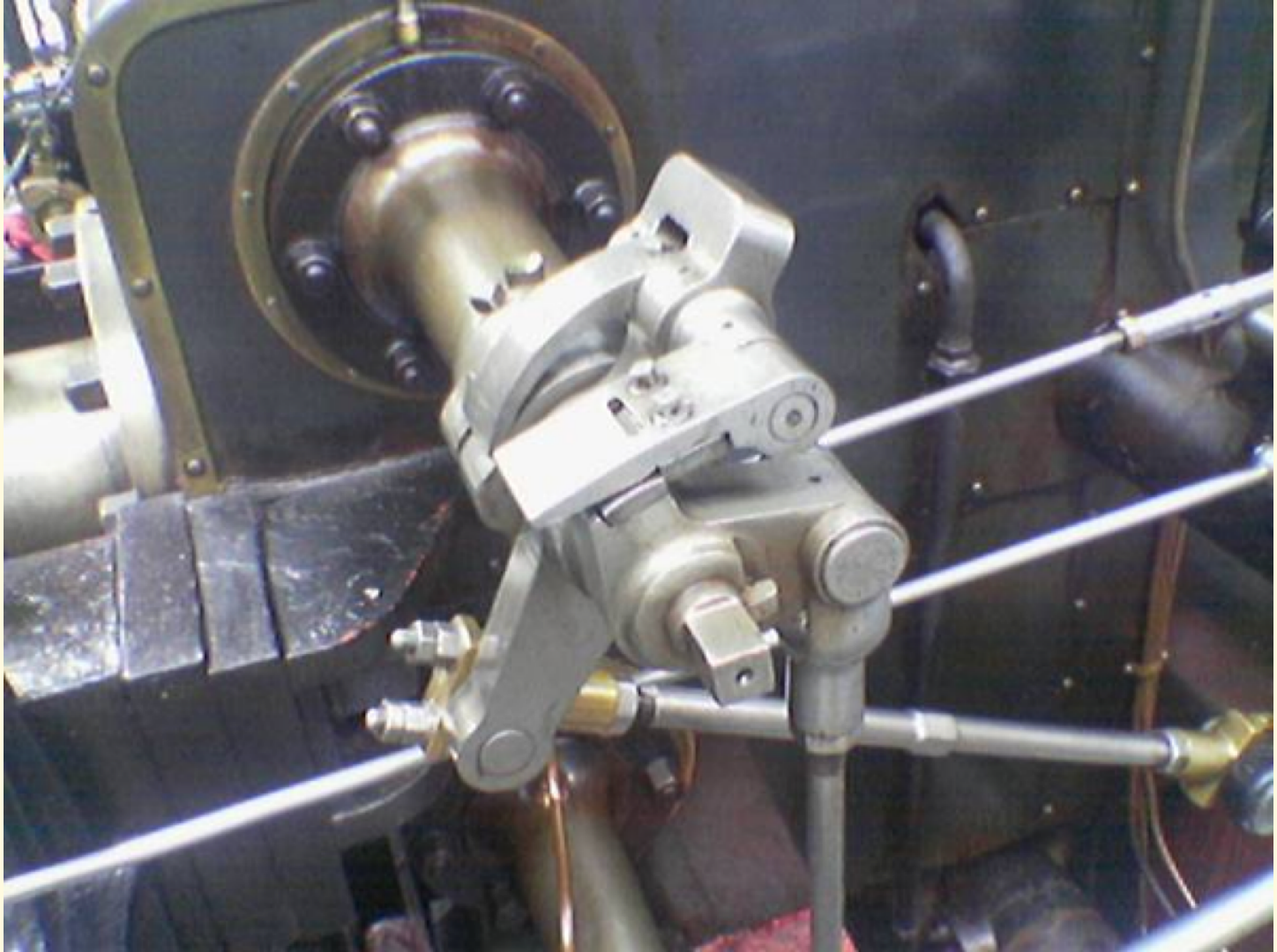
- You can start doing sophisticated querying and processing of texture data within the fragment shader. For example, we can define an image processing kernel that looks at each pixel's neighbors to determine if the current pixel is an edge.

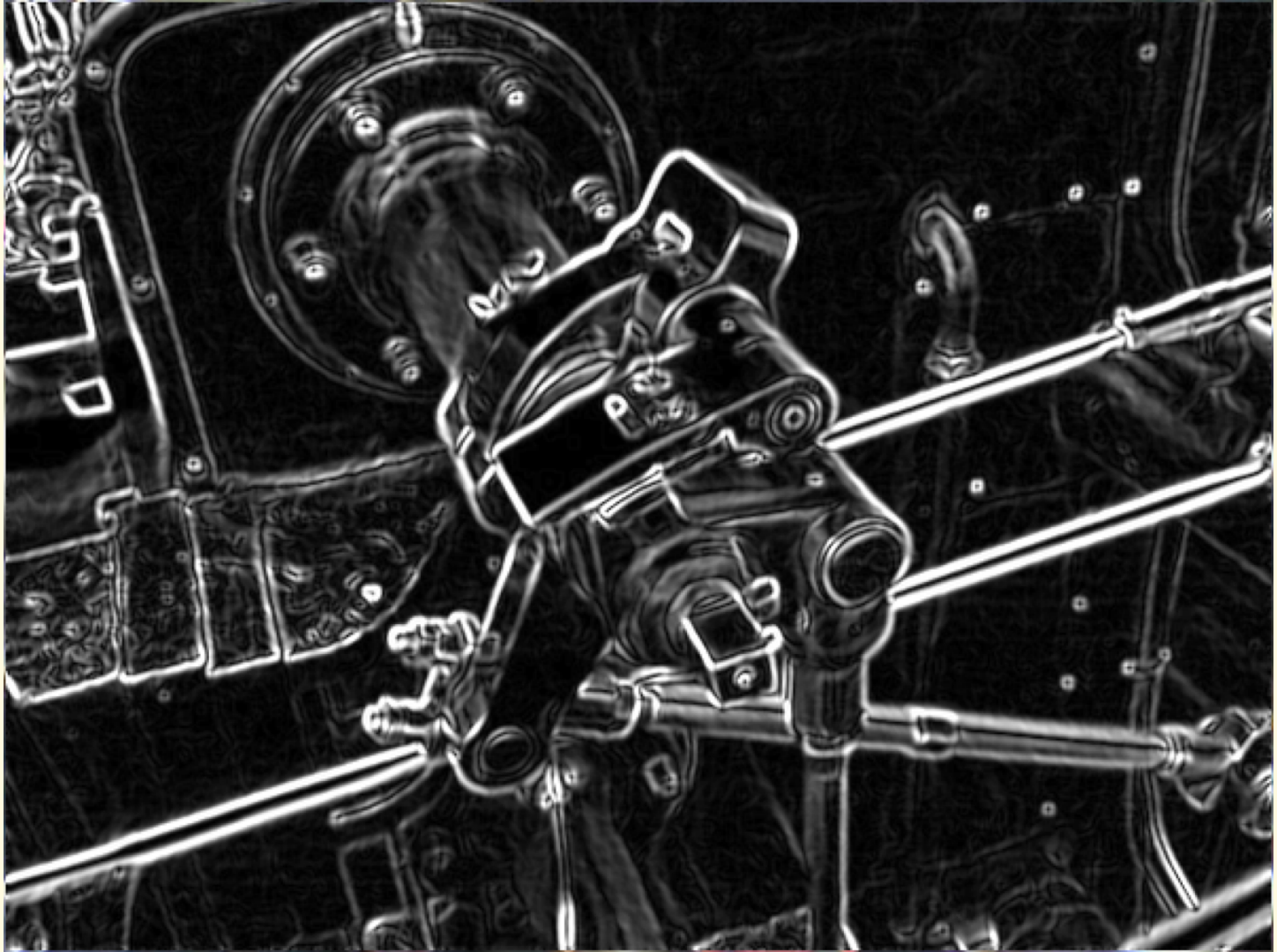
- That is, we can check if there is a discontinuity between the color of the current pixel and its neighbors in the x or y direction, and have the fragment shader output that information to the screen.

- (See shader example "edge.shader" where we blend an input image and its edges to create a sketch-like output of a photo.)

https://en.wikipedia.org/wiki/Sobel_operator

https://en.wikipedia.org/wiki/Edge_detection





Manifold Garden, W. Chyr

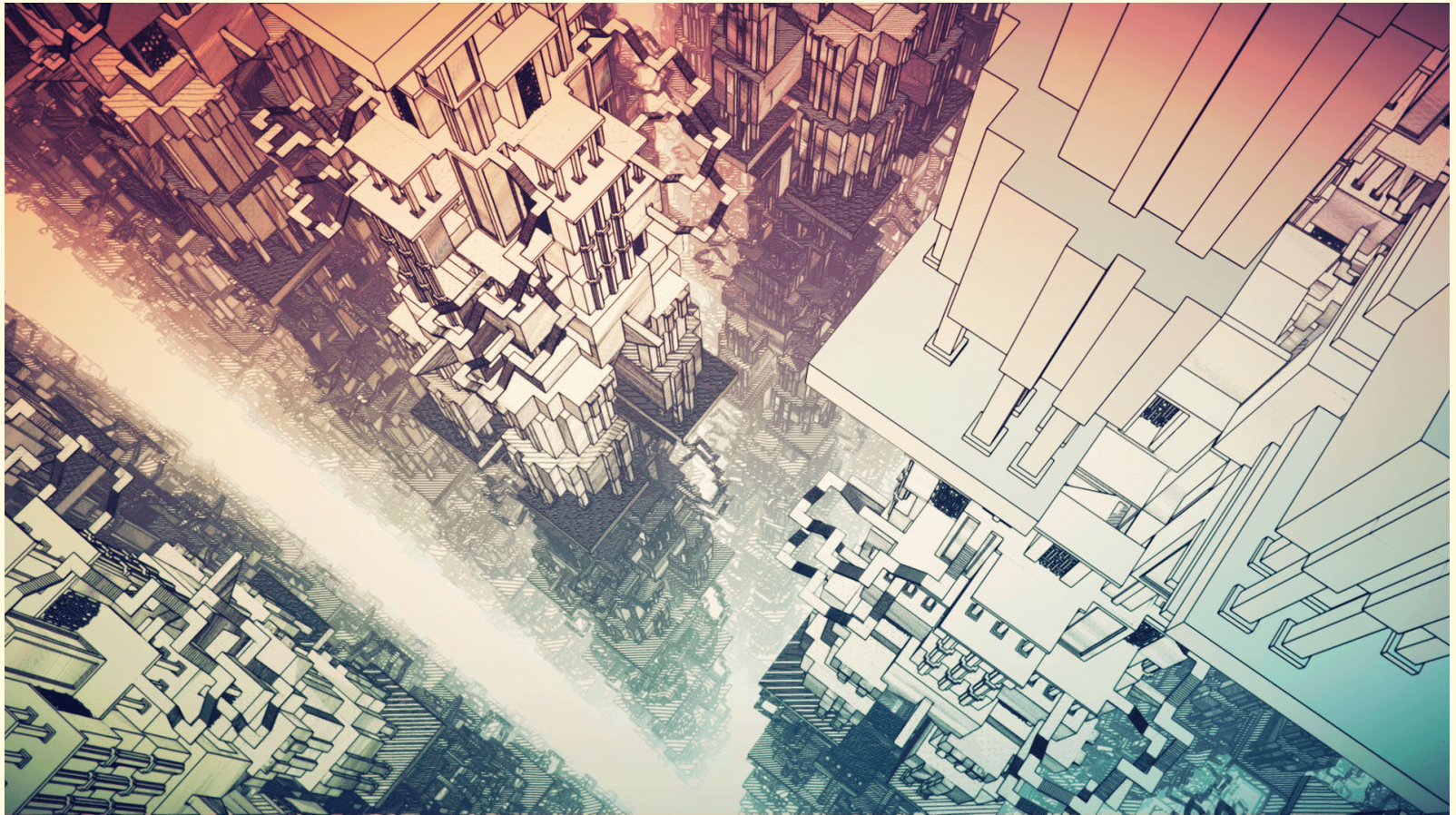


Image processing – edge detection

Demo code (blur + edge)