WebGL

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CIS 565 - Spring 2012

Announcements

- Homework 5 due Monday, 04/16
  - In-class quiz Wednesday, 04/18
- Final on Tuesday, 05/01
  - 6-8pm
  - David Rittenhouse Lab A7
  - Networking event immediately following
- Final project presentation/demo

WebGL for Web Developers

- The web has
  - Text
  - Images
  - Video
- What is the next media-type?

WebGL for Graphics Developers

- We want to support
  - Windows, Linux, Mac
  - Desktop and mobile
- How?

Bring 3D to the Masses

- Put it in on a webpage
  - Does not require a plugin or install
  - Does not require administrator rights
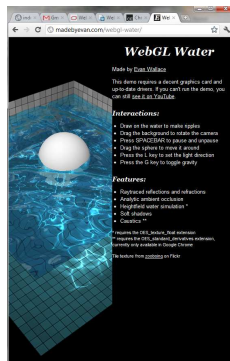- Make it run on most GPUs

WebGL
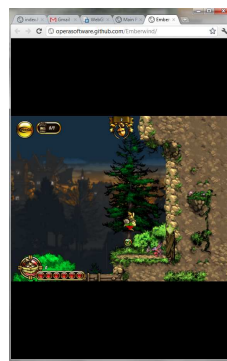
- OpenGL ES 2.0 for JavaScript
  - Seriously, JavaScript

Demos

WebGL Water
http://madebyevan.com/webgl-water/

EmberWind
http://operasoftware.github.com/Emberwind/

WebGL

- Includes
  - Vertex shaders
  - Fragment shaders
  - Vertex buffers
  - Textures
  - Framebuffers
  - Render states
  - …

- Does not include
  - Geometry shaders
  - Tessellation shaders
  - Vertex Array Objects
  - Multiple render targets
  - Floating-point textures
  - Compressed textures
  - FS depth writes
  - …

See http://www.khronos.org/registry/webgl/specs/latest/

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WebGL

- If you know *OpenGL*, you already know *WebGL*
- If you know *C++*, the real learning curve is *JavaScript*

WebGL Alternatives?

- Flash
- Silverlight
- Java Applets
- Unity

WebGL

- Creating a context is easy:

```
// HTML:
<canvas id="glCanvas" width="1024"
  height="768"></canvas>

// JavaScript:
var gl =
  document.getElementById("glCanvas")
  .getContext("experimental-webgl");
```

WebGL

- The rest is similar to desktop OpenGL:

```
// ...
gl.bindBuffer(/* ... */);
gl.vertexAttribPointer(/* ... */);
gl.useProgram(/* ... */);
gl.drawArrays(/* ... */);
```

Checkout http://learningwebgl.com/

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WebGL

- Create an animation loop:

```
(function tick(){
  // ... GL calls to draw scene
  window.requestAnimationFrame(tick);
})();
```

WebGL Performance

- Performance can be very good. Why?

WebGL Performance

- Performance can be very good. Why?
  - The GPU is still doing the rendering
  - Batch!
    - Draw multiple objects with one draw call
    - Sort by texture
    - Push work into shaders
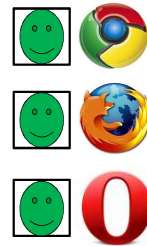
WebGL and other APIs

- Take advantage of other web APIs:
  - HTML5 <video>
  - 2D <canvas>
  - CSS transforms
  - Composite UI elements
  - Web workers
  - Typed Arrays

WebGL support is good, and it is getting better…
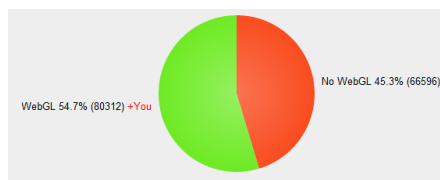
Desktop WebGL Support

- In April, 2012

- 3rd Party Plugins available

WebGL Stats

- In April, 2012

No WebGL 45.3% (66596)

WebGL 54.7% (80312) +You

WebGL Support on your System

- http://analyticalgraphicsinc.github.com/webglreport/

WebGL Report

This browser supports WebGL!

Platform:	Win32
Browser User Agent:	Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/ Chrome/18.0.1025.151 Safari/535.19
Context Name:	experimental-webgl
GL Version:	WebGL 1.0 (OpenGL ES 2.0 Chromium)
Shading Language Version:	WebGL GLSL ES 1.0 (OpenGL ES GLSL ES 1.0 Chro
Vendor:	WebKit
Renderer:	WebKit WebGL

Vertex Shader

Max Vertex Attributes:	16
Max Vertex Uniform Vectors:	254
Max Vertex Texture Image Units:	4
Max Varying Vectors:	10

Rasterizer

Aliased Line Width Range:	[1, 1]
Aliased Point Size Range:	[1, 64]

Texture

Max Texture Size:
Max Cube Map Texture Si
Max Combined Texture Im

Disclosure: My awesome intern wrote this

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Desktop WebGL Support

- Windows
  - No OpenGL driver installed? Old driver?
    - Only 35% of Windows XP machines have GL 2 drivers
  - Buggy driver?
  - No problem:
- *ANGLE* – *A*lmost *N*ative *G*raphics *L*ayer *E*ngine

| OpenGL ES 2.0 |
| Direct3D 9 |

See http://code.google.com/p/angleproject/

Mobile WebGL Support

- In April, 2012

 Firefox Mobile – "Fennec"
- Performance improvements possibly this this year

 Opera Mobile

 Stock Browser
- Demo at SIGGRAPH 2011. NVIDIA is working on it.

Mobile WebGL Support

- In April, 2012

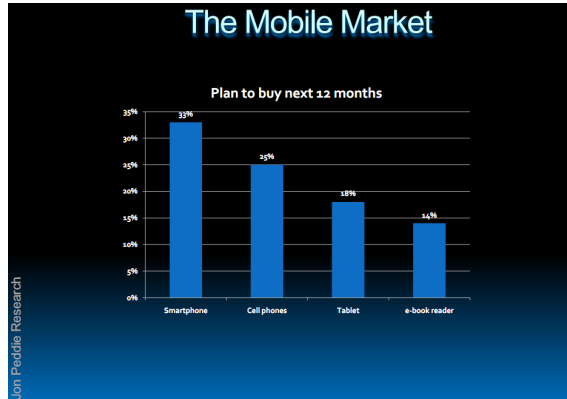In iOS 5 for iAd developers

Windows Mobile

See http://news.cnet.com/8301-30685_3-20071902-264/apple-signs-up-for-webgl-graphics-in-iads/

HTML5 on Mobile

- Touch events
  - Test with http://www.snappymaria.com/misc/TouchEventTest_v2.html
- Geolocation
- Device orientation and motion

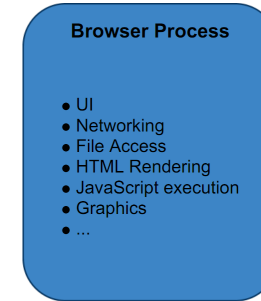- The future of HTML5 and WebGL on mobile is *very promising*

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By the way, mobile is really important:

The Mobile Market

Plan to buy next 12 months

Jon Peddie Research

Browser Architecture

- Single Process

Browser Process

- UI
- Networking
- File Access
- HTML Rendering
- JavaScript execution
- Graphics
- ...

Browser Architecture

- Chrome's Multi-process

Browser Process

UI, Networking, File Access

IPC

Render Process

JavaScript execution (V8),
HTML rendering (WebKit),
WebGL, etc

Browser Architecture

- Chrome's Multi-process

Browser Process

UI, Networking, File Access

Render Process 1 ... **Render Process N**

Browser Architecture

- Chrome's Multi-process
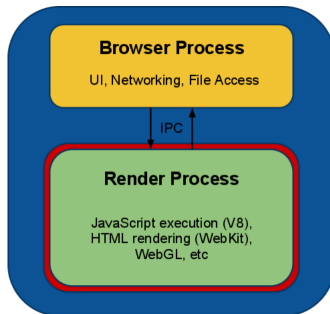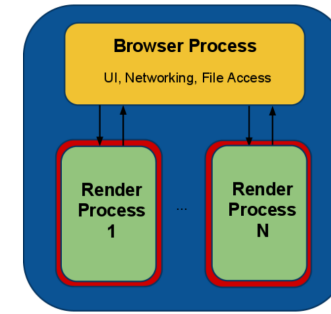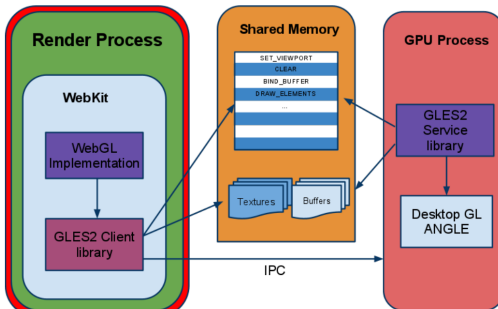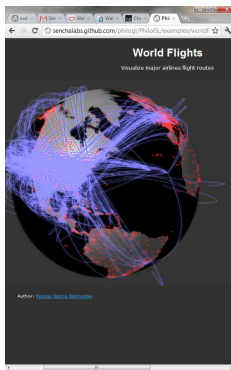

See http://www.khronos.org/assets/uploads/developers/library/2010_siggraph_bof_webgl/WebGL-BOF-2-WebGL-in-Chrome_SIGGRAPH-Jul29.pdf

Questions

- In a multi-process is `gl.Get*` slow? Why?

- What about security?

Demos

World Flights
http://senchalabs.github.com/philogl/PhiloGL/examples/worldFlights/

WebGL Jellyfish
http://chrysaora.com/

WebGL Libraries

- Three.js: https://github.com/mrdoob/three.js/
- SceneJS: http://scenejs.org/
- PhiloGL: http://senchalabs.github.com/philogl/
- SpiderGL: http://spidergl.org/
- Many more:
  http://www.khronos.org/webgl/wiki/User_Contributions

WebGL Resources

- WebGL Camps: http://www.webglcamp.com
- Learning WebGL: http://learningwebgl.com

JavaScript Resources

By the way, *WebCL* is coming

http://www.khronos.org/webcl/
Prototypes for Firefox and WebKit are available

Interactive WebCL kernel editor:
http://webcl.nokiaresearch.com/kerneltoy/