WebGL

Eduardo Expósito Barrera- alu0101230382@ull.edu.es
Cristo García González - alu0101204512@ull.edu.es

Index

Introduction

- Definition

  WebGL is an API implemented in JavaScript for rendering in 3D graphics within any web browser

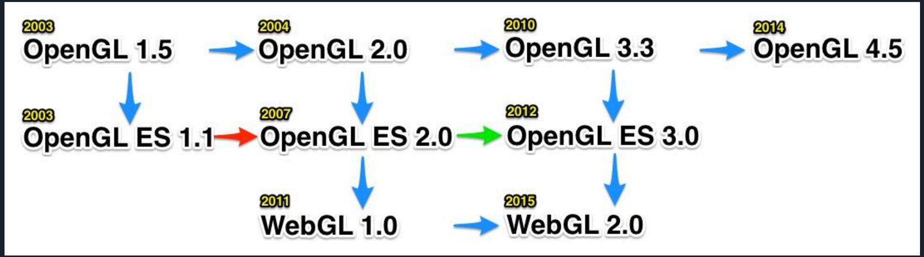
  Keynotes:

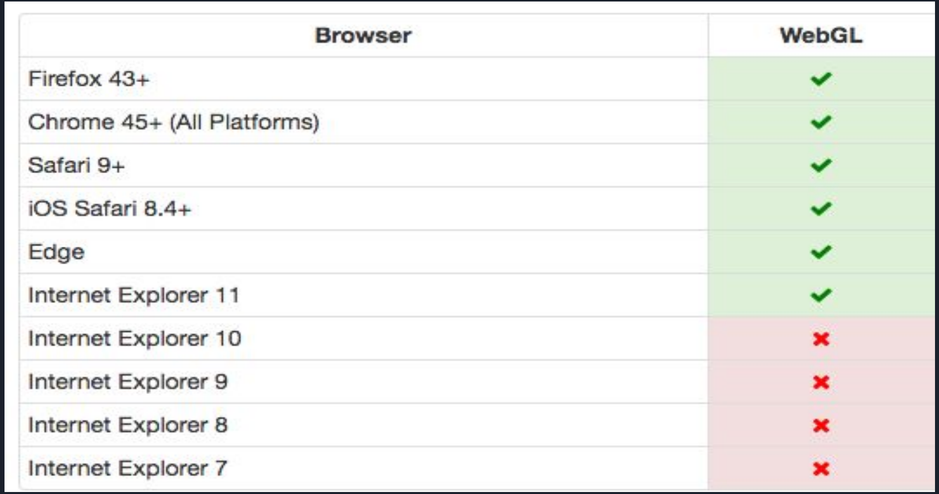
  - Zero dependencies!!!

  - Graphics acceleration

https://get.webgl.org/

Definition





Browser	WebGL
Firefox 43+	✓
Chrome 45+ (All Platforms)	✓
Safari 9+	✓
iOS Safari 8.4+	✓
Edge	✓
Internet Explorer 11	✓
Internet Explorer 10	✖
Internet Explorer 9	✖
Internet Explorer 8	✖
Internet Explorer 7	✖

A bit of history

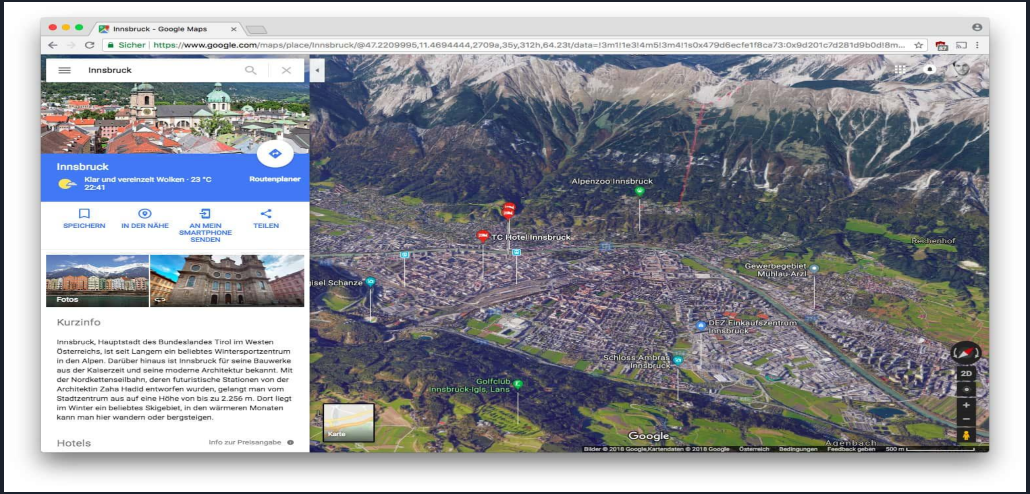
The fists steps of WebGL are in the experimental Canvas 3D, in Mozilla. The first prototype was demonstrated in 2006 and by the end of 2007, Mozilla and Opera has made their own separate implementations.

In early 2009 Khronos Group started the WebGL Working Group.

Version 1.0 was released in March 2011

Vladimir Vukićević

Some example usage


Innsbruck - Google Maps
Sicher | https://www.google.com/maps/place/Innsbruck/@47.2209995,11.4694444,2709a,35y,312h,64.23t/data=!3m1!1e3!4m5!3m4!1s0x479d6ecfe1f8ca73:0x9d201c7d281d9b0d!8m...
Innsbruck
Innsbruck
Klar und vereinzelt Wolken · 23 °C
22:41
Routenplaner
SPEICHERN
IN DER NÄHE
AN MEIN SMARTPHONE SENDEN
TEILEN
Fotos
Alpenzoo Innsbruck
TC Hotel Innsbruck
Rechenhof
Gewerbegebiet Mühlau-Arzl
DEZ Einkaufszentrum Innsbruck
Schloss Ambras Innsbruck
Golfclub Innsbruck-Igls, Lans
Karte
Google
Agenbach
2D

Kurzinfo

Innsbruck, Hauptstadt des Bundeslandes Tirol im Westen Österreichs, ist seit Langem ein beliebtes Wintersportzentrum in den Alpen. Darüber hinaus ist Innsbruck für seine Bauwerke aus der Kaiserzeit und seine moderne Architektur bekannt. Mit der Nordkettenseilbahn, deren futuristische Stationen von der Architektin Zaha Hadid entworfen wurden, gelangt man vom Stadtzentrum aus auf eine Höhe von bis zu 2.256 m. Dort liegt im Winter ein beliebtes Skigebiet, in den wärmeren Monaten kann man hier wandern oder bergsteigen.

Hotels — Info zur Preisangabe

Bilder © 2018 Google,Kartendaten © 2018 Google Österreich Bedingungen Feedback geben 500 m

Some example usage

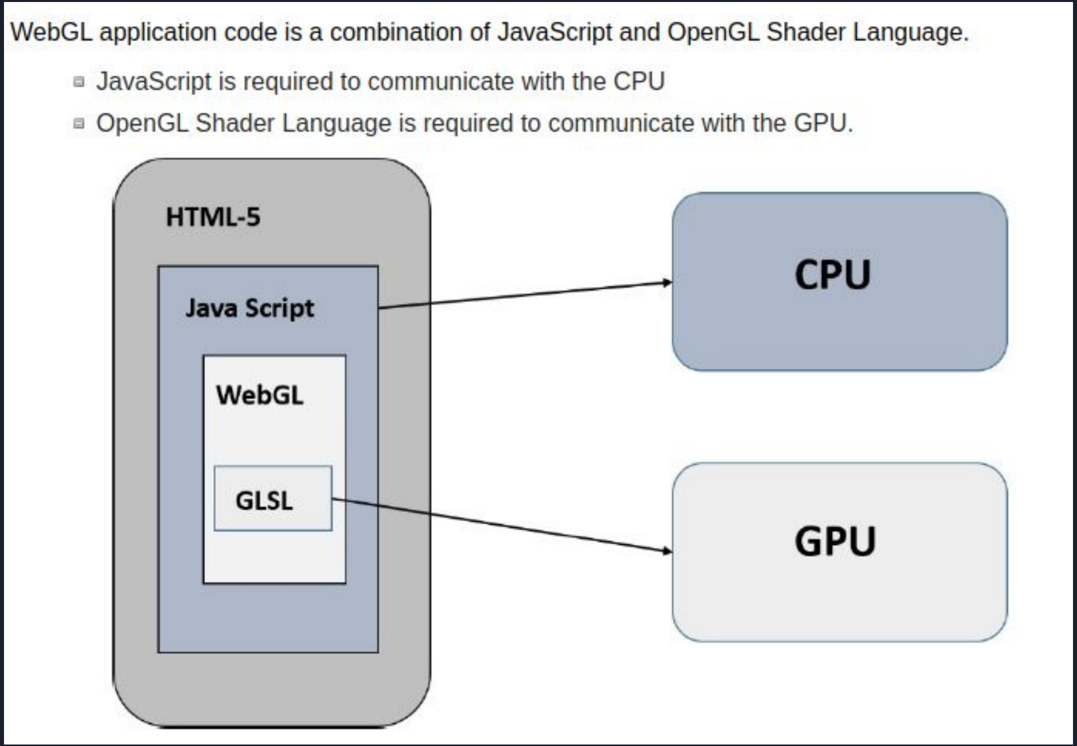
“Experience curiosity”

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

https://akirodic.com/p/jellyfish/

http://media.tojicode.com/q3bsp/

Structure of WebGL Application


WebGL application code is a combination of JavaScript and OpenGL Shader Language.

- JavaScript is required to communicate with the CPU
- OpenGL Shader Language is required to communicate with the GPU.

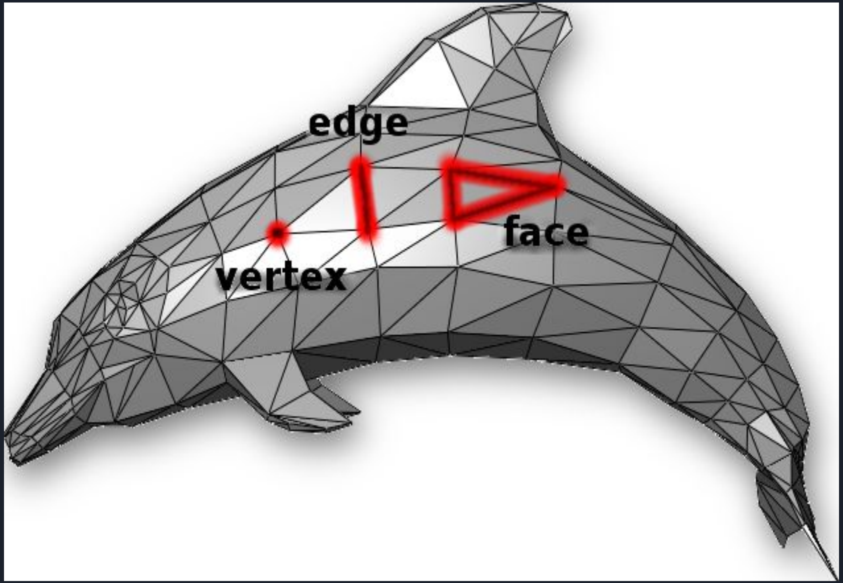
GLSL-Hello World

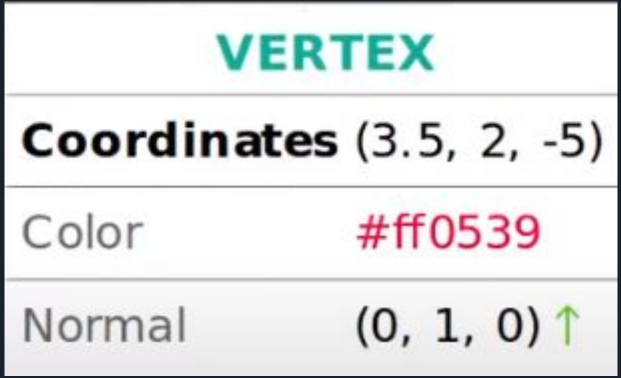
We'll come back to this code...

```
#version 300 es

// an attribute is an input (in) to a vertex shader.
// It will receive data from a buffer
in vec4 a_position;

// all shaders have a main function
void main() {

  // gl_Position is a special variable a vertex shader
  // is responsible for setting
  gl_Position = a_position;
}
```

How should I approach WebGL? (Considerations)

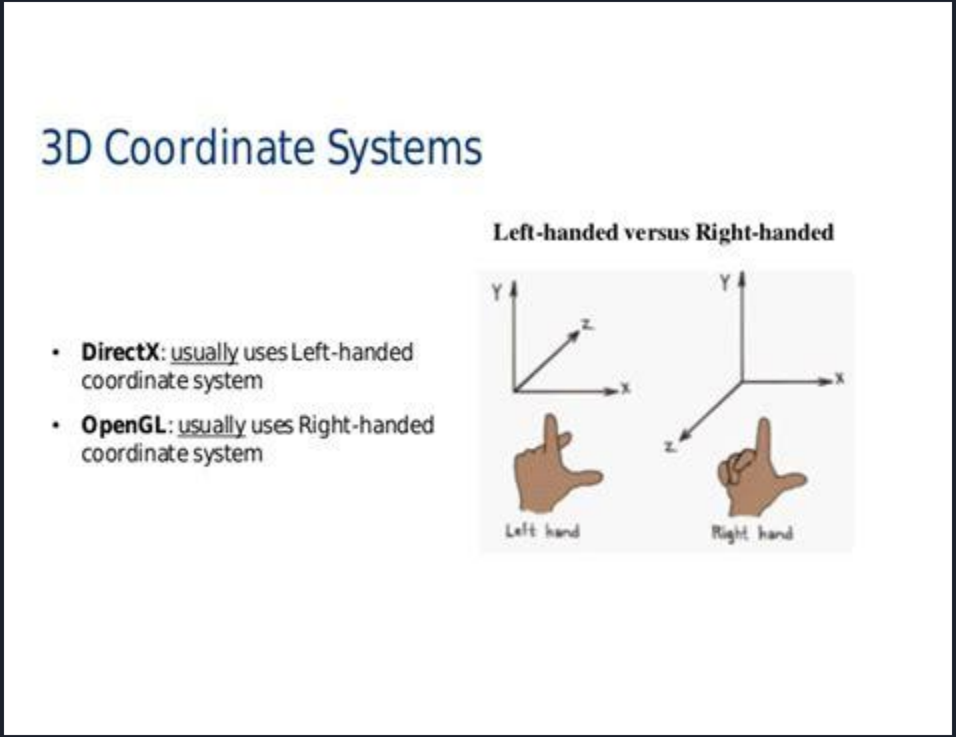
- Vertex is the main structure





VERTEX	
Coordinates	(3.5, 2, -5)
Color	#ff0539
Normal	(0, 1, 0) ↑

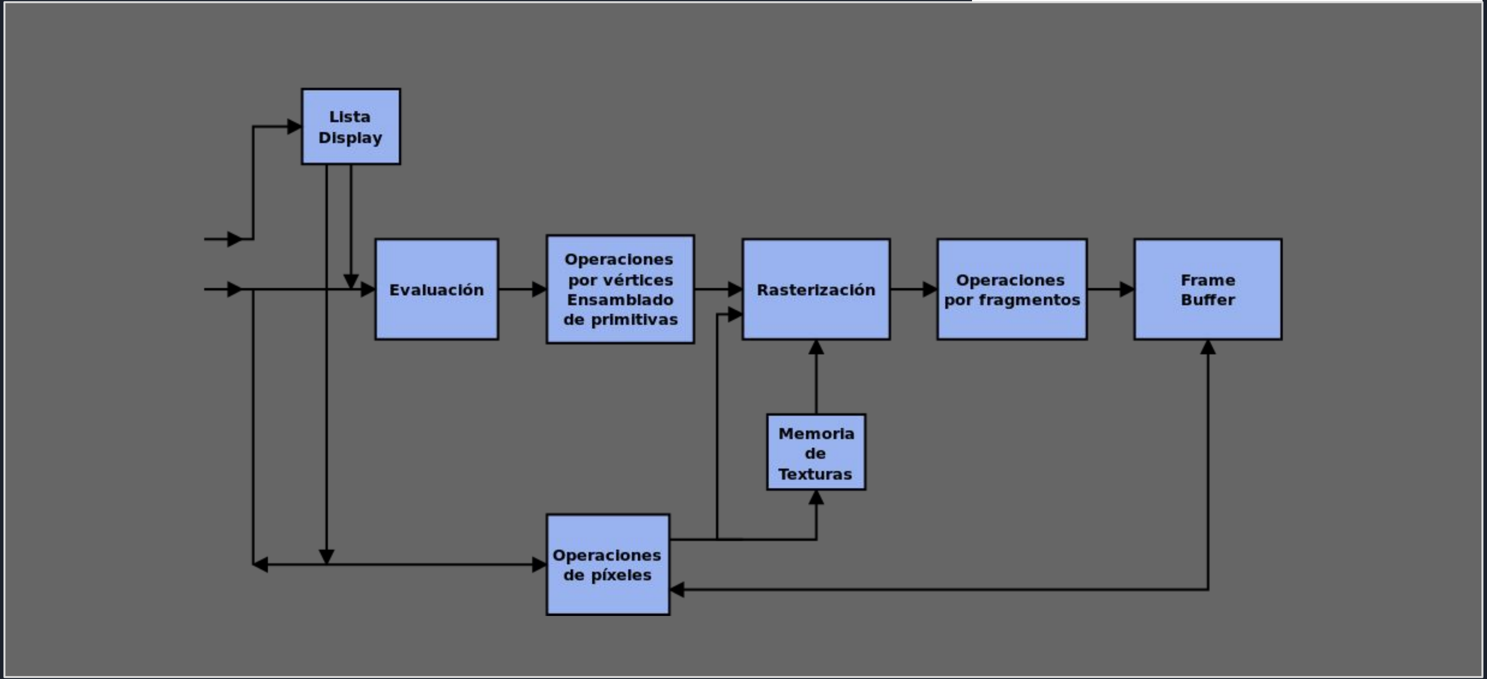
How should I approach WebGL? (Considerations)


3D Coordinate Systems

- **DirectX**: usually uses Left-handed coordinate system
- **OpenGL**: usually uses Right-handed coordinate system

Left-handed versus Right-handed
Y
Z
X
Left hand
Y
X
Z
Right hand

OpenGL design and Process in the graphics pipeline



Differences between WebGL and OpenGL

The basis of Comparison	WebGL	OpenGL
Definition	It is designed for rendering 2D and 3D graphics	It is a cross-language and platform API to render 2D and 3D vector graphics
Application	It is mainly used to run in the browser for web applications	It is mainly used in desktop applications
Programmed	It is programmed in JavaScript	It is written in C
Features	It has fewer features comparatively	It has many features to make the application or graphics more interactive
Pipeline	In WebGL, there is no fixed-function pipeline	In OpenGL, theres is fixed function pipeline

Differences between WebGL and Canvas

WebGL is low level:

- WebGL is faster than Canvas (also due to GPU rendering).
- WebGL gives you more control in your code.
- Boilerplate

WebGL is newer:

- Not so much used and robust

3D Graphics

Very hard to learn (Unless you have experience with OpenGL)

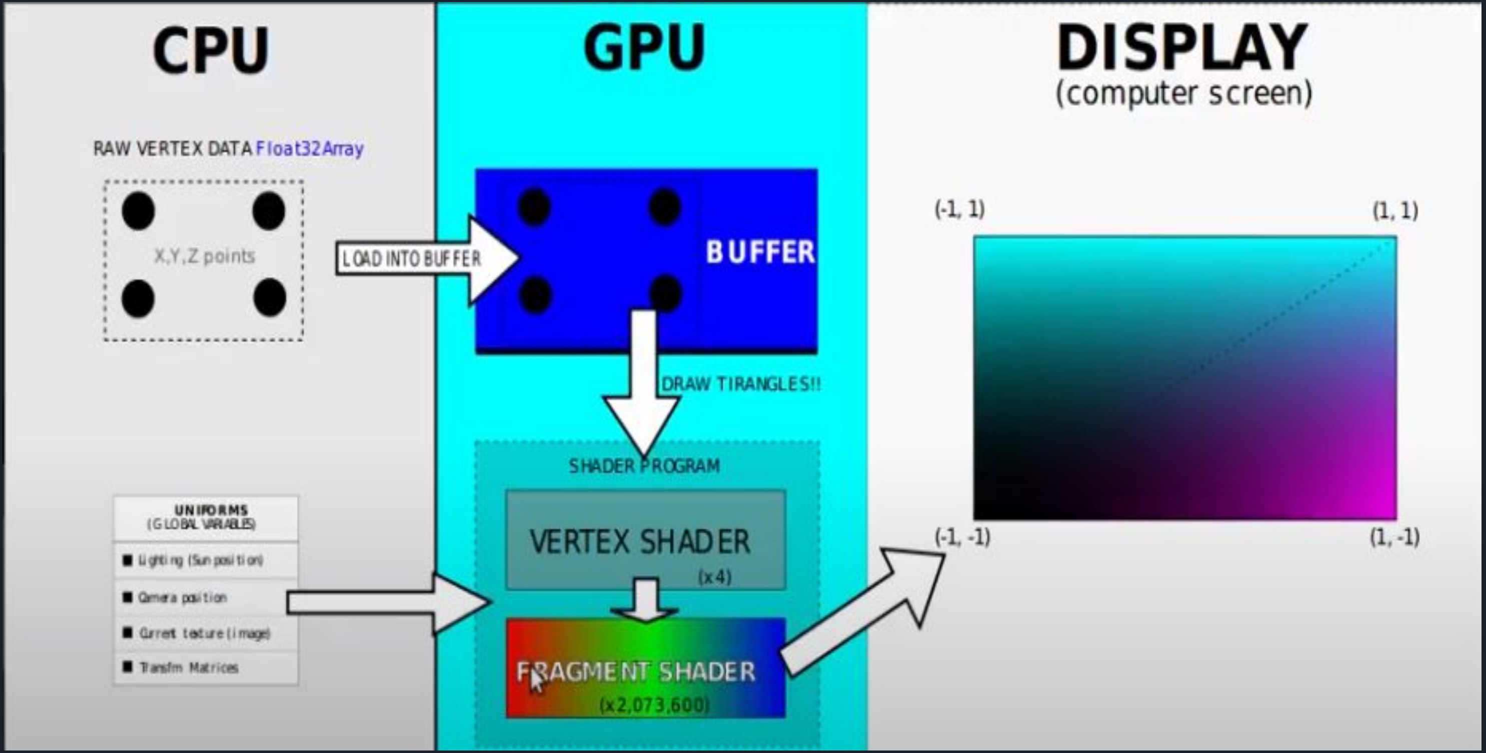
GLSL also has a standard

- Include appropriate comments in your code.
  - Write // VERTEX SHADER at the top of you vertex shader
  - Write // FRAGMENT SHADER at the top of your fragment shader
- Put the WebGL version number at the top of each shader #version 103
- Avoid “all-in-one-shaders”. Write separate shaders as needed.

https://www.khronos.org/opengl/wiki/GLSL_:_recommendations

https://www.khronos.org/opengl/wiki/Core_Language_(GLSL)

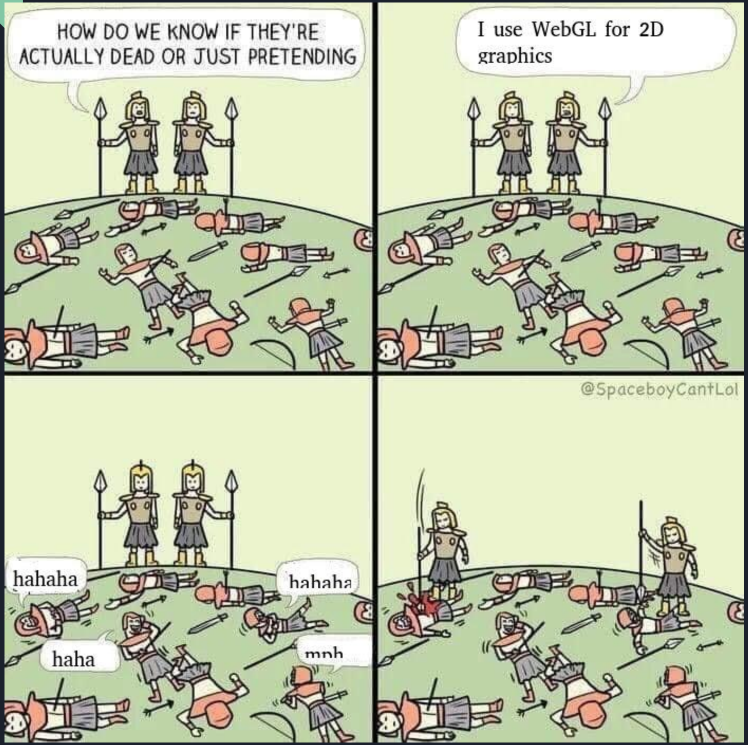
What are Shaders? How do they work?



Code examples

TO THE CODE!!!!

Why would someone use WebGL for 2D?


HOW DO WE KNOW IF THEY'RE ACTUALLY DEAD OR JUST PRETENDING
I use WebGL for 2D graphics
@SpaceboyCantLol
hahaha
hahaha
haha
mph

http://glslsandbox.com/e#207.3

- Shaders
- Performance

Summary

- Has no dependency and run in almost all the browsers (including mobile devices)
- Accelerated by Hardware
- It’s low level (hard to use, boilerplate, fine grained control)
- It uses 2 languages Javascript for the CPU and GLSL for the GPU
- It’s a subset, port, binding, etc... of OpenGL ES which in turn is a subset, port, binding, etc... of OpenGL
- It evolves from canvas, but that’s it.
- Take a look at WebGPU (https://en.wikipedia.org/wiki/WebGPU)

References

[WebGLRenderingContext.draw.Arrays()]

https://developer.mozilla.org/en-US/docs/Web/API/WebGLRenderingContext/drawArrays

[WebGL-Shaders]

https://www.tutorialspoint.com/webgl/webgl_shaders.htm

[Structure of WebGL]

https://www.tutorialspoint.com/webgl/webgl_sample_application.htm

[Learn WebGL]

https://www.youtube.com/watch?v=kju9OgYrUmU

Thanks for your attention

Eduardo Expósito Barrera

e-mail

Cristo García González

e-mail