

Toolkits for Web programming

Qiufeng Zhu

Advanced User Interface Spring 2017

Outline

- Brief history of the Web
- Topics:
 - HTML 5
 - JavaScript Libraries and frameworks
 - 3D Web Application: WebGL

Brief History of Web

Brief History

Phase 1

- Pages, form-structured documents that use hyperlinks

Phase 3

- Rich Internet Application (RIAs) that combines collaboration and interaction

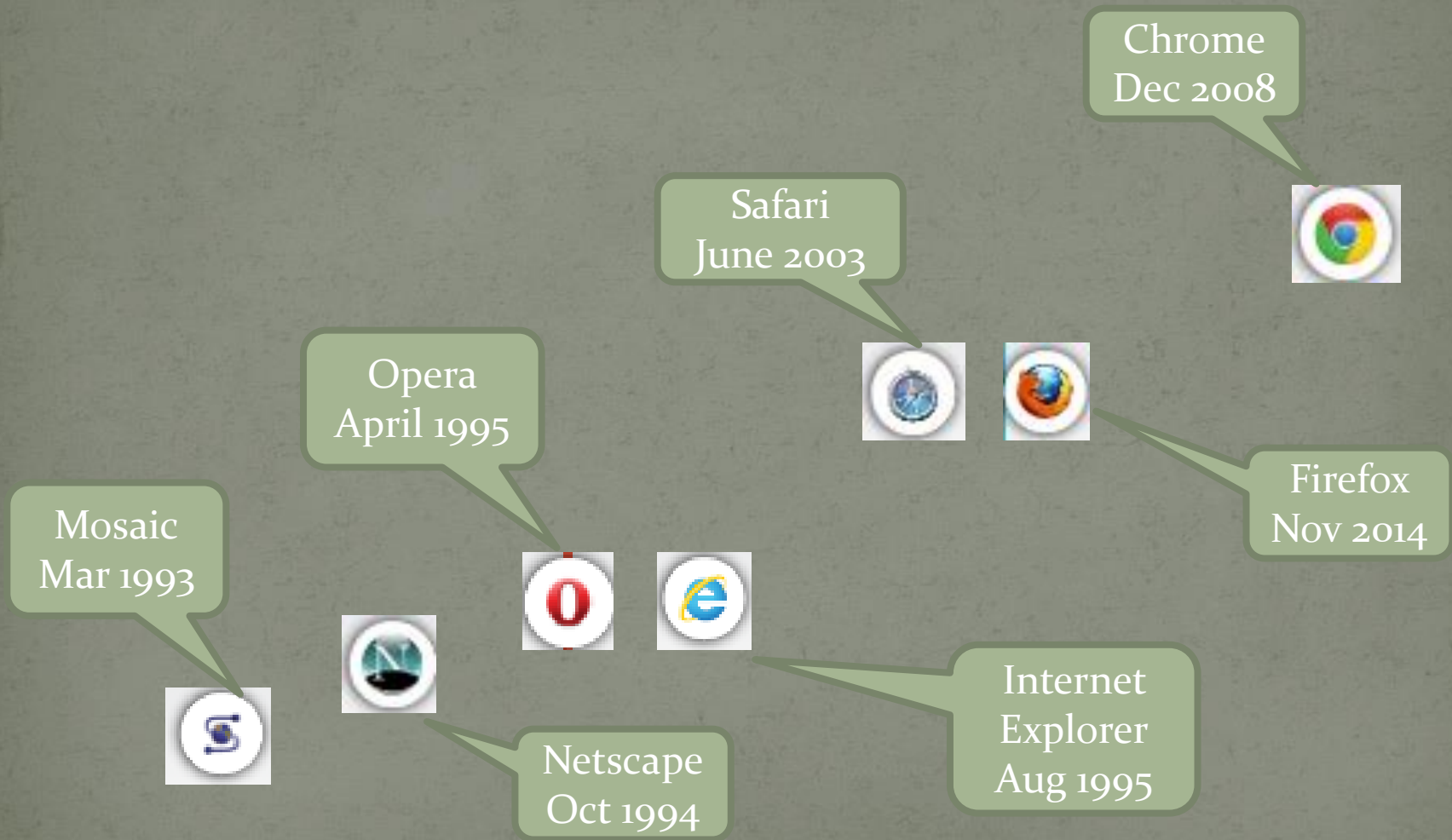
Phase 2

- Easily to build animated, interactive content; Adding plug-in component, e.g. Flash

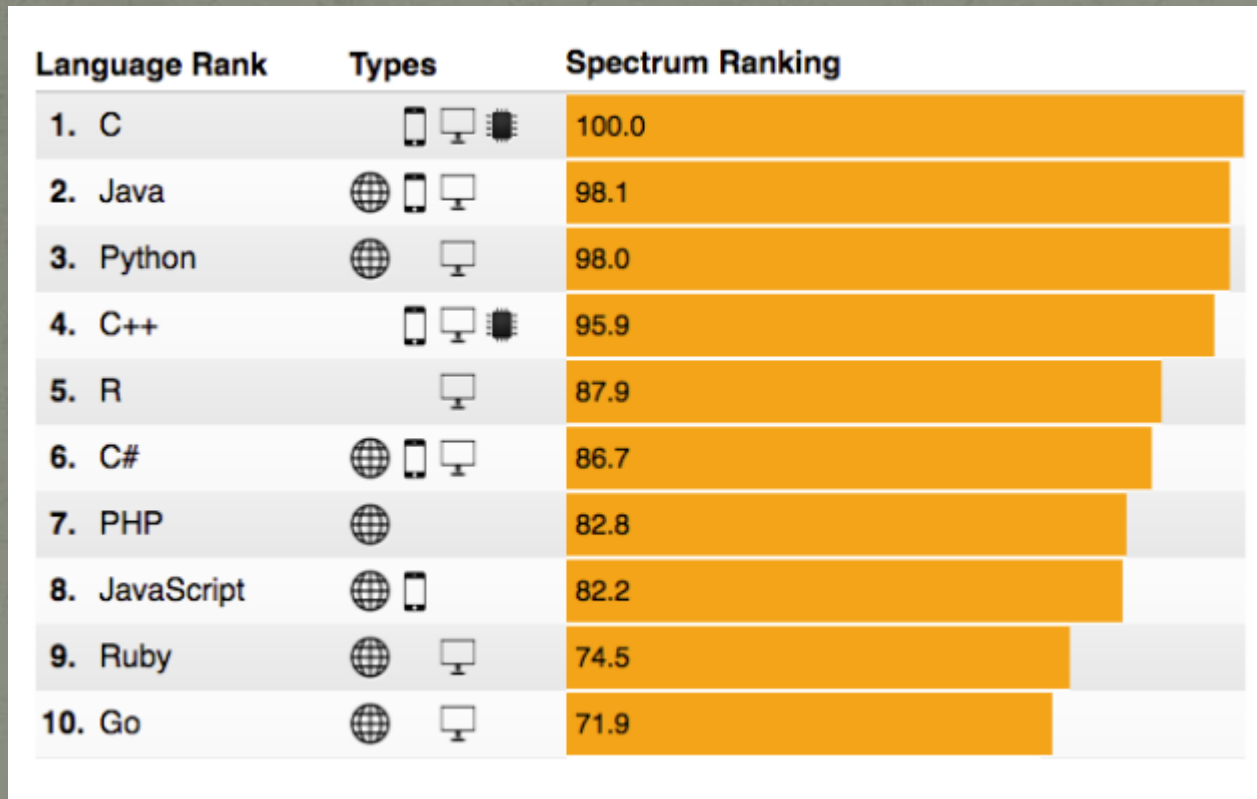
Netscape
Navigator



Browsers



Web Programming is so popular



Source: <http://spectrum.ieee.org/computing/software/the-2016-top-programming-languages>

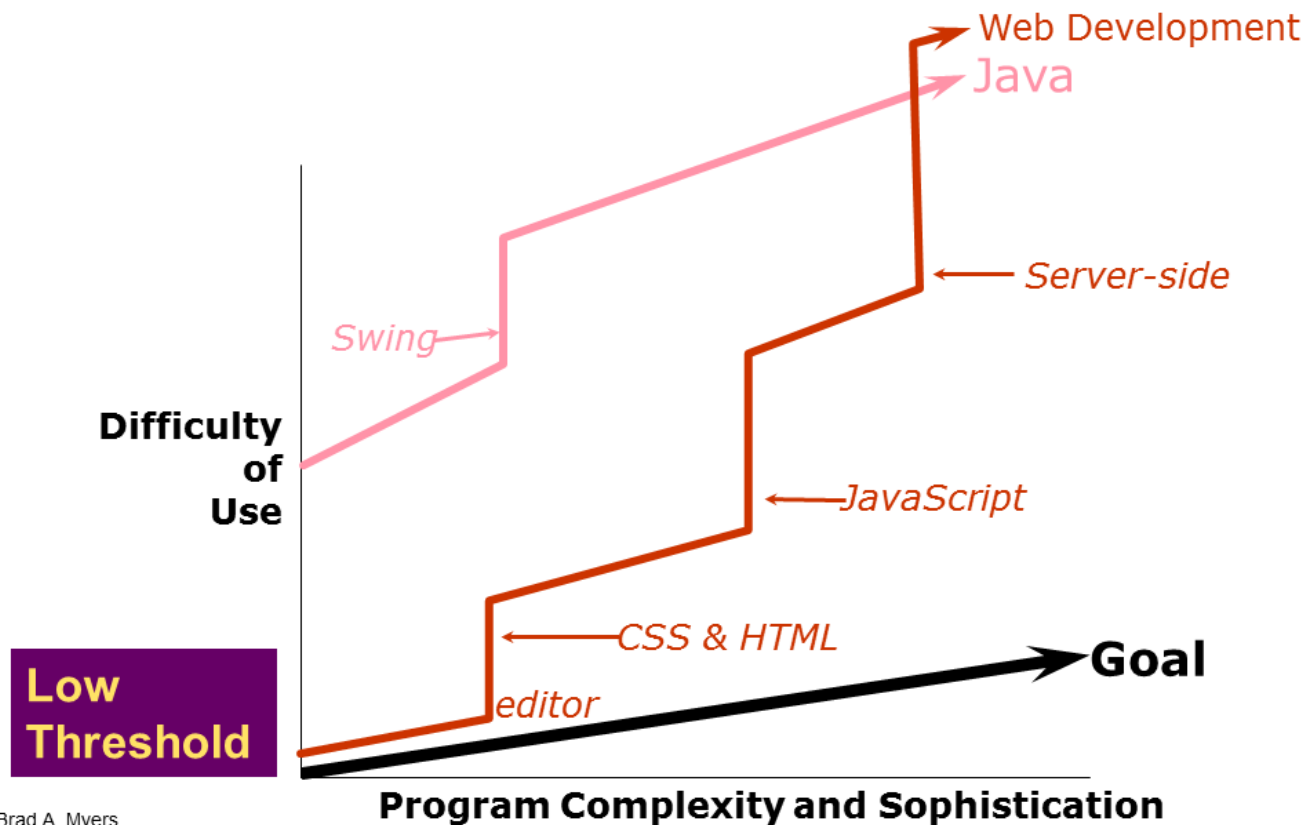
Web development learning curve

Goal: Gentle Slope Systems

Human-Computer Interaction Institute



High Ceiling



More complicated than you think

- Front-end:
 - HTML, CSS, JavaScript
 - Libraries and frameworks: Angular.js, React.js, ...
- Back-end:
 - Databases: MySQL, MongoDB, Redis ...
 - Language: Ruby, Python, Java ...
 - Frameworks: Rails, Django, Java Spring ...

Topics

- Html5
- JavaScript Libraries and frameworks
 - JQuery
 - Angular.Js
- 3D Web Application: WebGL
 - Three.Js
 - Babylon.Js

HTML 5

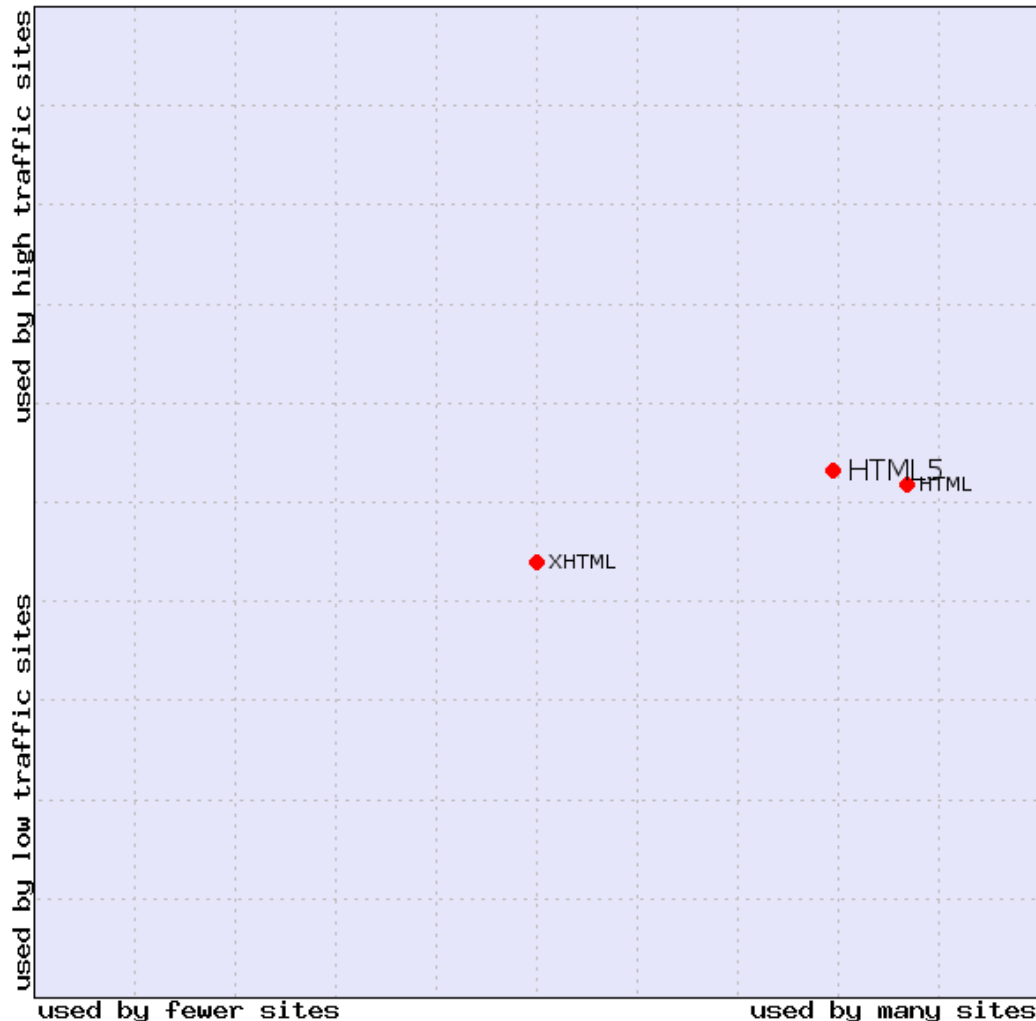


- Markup language
- Published in Oct 2014 by World Wide Web Consortium.
- A candidate for cross-platform mobile applications
- Supports scalable vector graphics content.

HTML 5



HTML5 Market Position, 28 Apr 2017, W3Techs.com



Companies that use HTML5 including



<https://w3techs.com/technologies/details/ml-html5/all/all>



New elements in HTML 5

article

Mark up parts of the content that is independent, for instance blog post, article etc.

aside

Used to mark up relevant additional information, like a sidebar.

audio

Used for natively including audio in a web page.

footer

The counter-part to header; could be used for any footer section per context.

header

Used for headers in its context. Note: not just for the header of a page, but also for each header part in section, article and similar.

hgroup

Used for grouping several headers, for instance, a main heading and a sub-heading.

nav

Used for marking up main navigation.

section

Mark up a generic document section. Easily confused with article, and on top of that you nest either of them, in any order, with the other.

time

Used to mark up a time or date.

video

Used for natively including video in a web page – lots of interesting work is coming along here in terms of web browser support.

How well your browser support html 5

desktop browsers

tablets

mobiles

other

latest

search

OVERVIEW

	Chrome	Opera	Firefox	Edge	Safari
Upcoming			53 474		10.2 419
Current	57 519		52 474	15 473	10.1 406
Older	56 519	37 489	51 471	14 460	10.0 383
	55 507	30 479	50 466	13 433	9.1 370
	54 499	12.10 309	49 465	12 377	9.0 360
	53 499		48 461	Internet Explorer	8.0 354
	52 492		47 456	11 312	
	51 492		46 456	10 265	

<https://html5test.com/results/desktop.html>

How well your browser support html 5

[Show all](#)[Difference](#)

Search... ×

BROWSERS

Select up to five browsers and compare their test results in detail

519
Chrome 57

474
Firefox 53

+

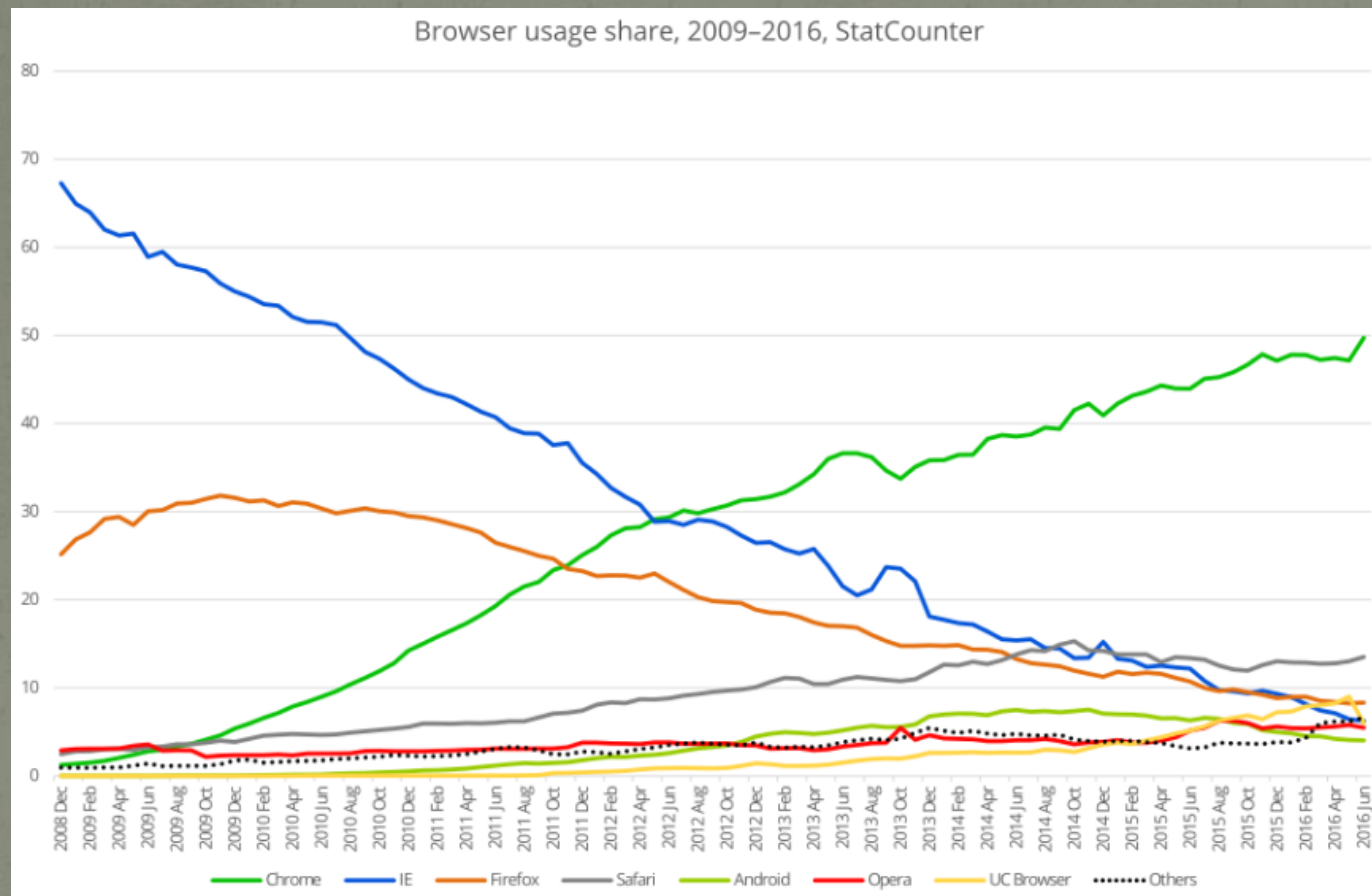
+

+

difference

Text-level semantic elements ▸ ping attribute on the a element	Yes ✓	Disabled ✗			
Text-level semantic elements ▸ time element	No ✗	Yes ✓			
Text-level semantic elements ▸ data element	No ✗	Yes ✓			
Interactive elements ▸ menu element of type toolbar	No ✗	Partial ○			
Interactive elements ▸ menu element of type context	No ✗	Partial ○			

Browser usage share



https://commons.wikimedia.org/wiki/File:Browser_usage_share,_2009%E2%80%932016,_StatCounter.svg

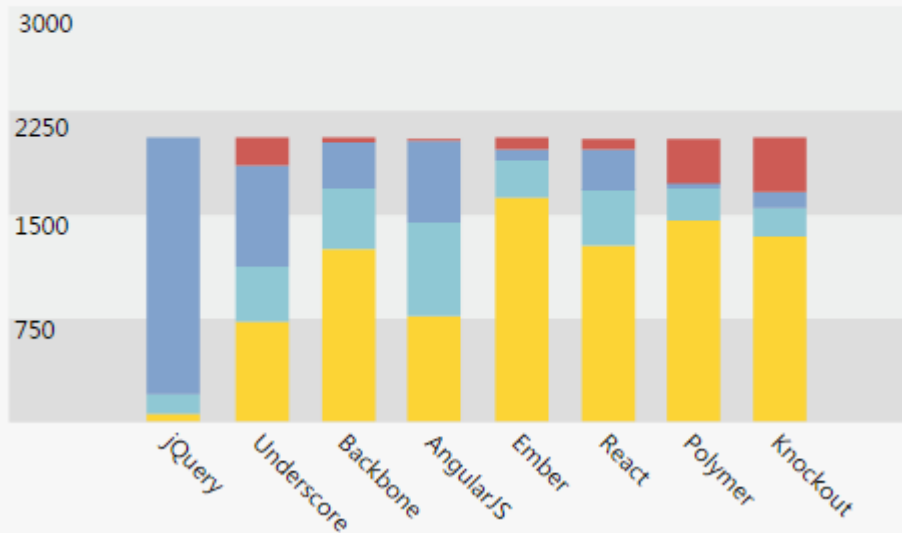
JavaScript

- First appears on Dec 1995
- Interpreted run-time language
- prototype-based
- Alongside HTML and CSS, it is one of the three core technologies of World Wide Web content production

JavaScript Libraries and Framework

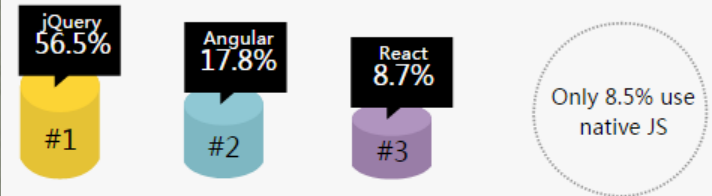
Popular JS Libraries & Frameworks

● Heard of/
Read about ● Used a little ● Feel comfortable
using ● Never heard
of



TOP 3

Most used JS Libraries & Frameworks



The rest is evenly scattered across 0.28-2.97%
; Backbone, Ember, Knockout, Underscore, Polymer

<http://blog.honeyiot.io/popularity-of-javascript-frameworks-and-libraries/>

JQuery



- Initial release: Aug 26, 2006
- Open source on GitHub
- Cross-platform JavaScript Library
- Designed to simplify the client-side scripting of HTML

Why JQuery

JavaScript → JQuery



Each browser has a slightly different
DOM interface

jQuery

Import

```
<script src="jquery.js"></script>
```

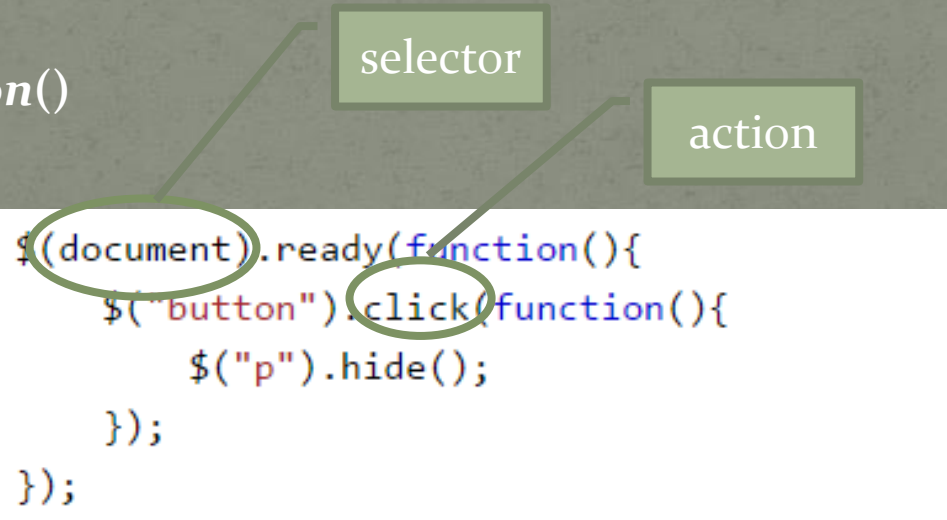
```
<script src="https://code.jquery.com/jquery-3.1.1.min.js"></script>
```

Basic syntax

`$(selector).action()`

selector

action



```
$(document).ready(function(){  
    $("button").click(function(){  
        $("p").hide();  
    });  
});
```

Angular.Js

- Initial released: Oct 20, 2010
- Open source on GitHub
- JavaScript-based front-end web application framework
- Popularized by Google
- Describes itself as an extension to HTML for building complex web apps

Angular.Js

Import

```
<script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.4.8/angular.min.js"></script>
```

Basics

AngularJS extends HTML with **ng-directives**.

The **ng-app** directive defines an AngularJS application.

The **ng-model** directive binds the value of HTML controls (input, select, textarea) to application data.

The **ng-bind** directive binds application data to the HTML view.

Hello Word

(jQuery vs. Angular.Js)

3D Web Application: WebGL

What is WebGL?

3D Web Application: WebGL

What is WebGL?

Web Graphics Library

A JavaScript API for rendering interactive 3D and 2D graphics within any compatible web browser without the use of plug-ins.

WebGL

- Designed and maintained by Khronos Group
- First standard release March 2011
- Based on OpenGL ES 2.0
- Popular Library: Three.js, Babylon.js, Enchant.js...

Three.js

three.js ^{r85}

featured projects

[more projects](#)

[documentation](#)
[examples](#)

[download](#)

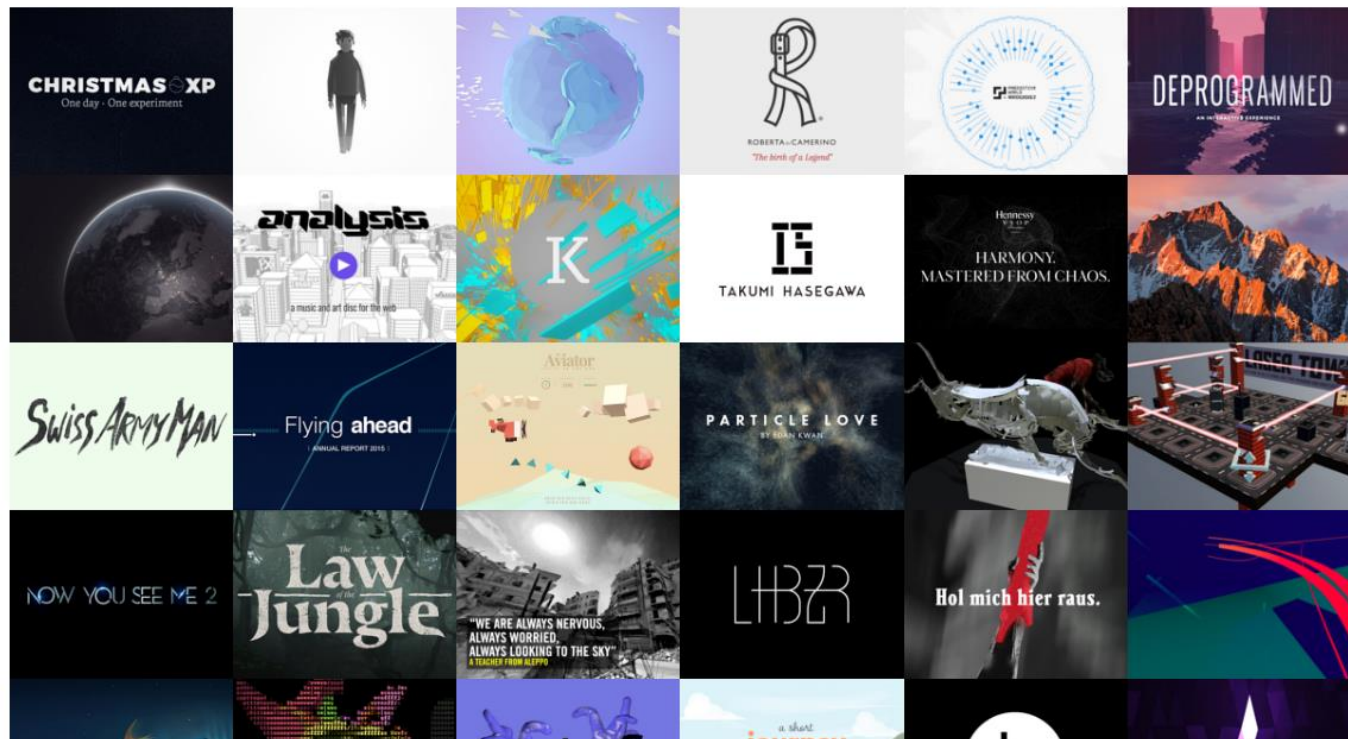
[source code](#)
[questions](#)
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Interactive
3D Graphics
Taught by Eric Haines



UDACITY



Three.js

- Open source, can be found on GitHub
- Provides functionalities like scenes, lights, animations, shaders, etc.
- Supports HTML 5 canvas graphics, Scalable Vector Graphics

Three.js Example Code

```
1 <script src="//cdn.rawgit.com/mrdoob/three.js/master/build/three.min.js">
  </script>
```

Cube Example

```
1 var camera, scene, renderer;
2 var geometry, material, mesh;
3
4 init();
5 animate();
6
7 function init() {
8
9     camera = new THREE.PerspectiveCamera(75, window.innerWidth /
    window.innerHeight, 1, 10000);
10    camera.position.z = 1000;
11
12    scene = new THREE.Scene();
13
14    geometry = new THREE.BoxGeometry(200, 200, 200);
15    material = new THREE.MeshBasicMaterial({
16        color: 0xff0000,
17        wireframe: true
18    });
19
20    mesh = new THREE.Mesh(geometry, material);
21    scene.add(mesh);
22
23    renderer = new THREE.WebGLRenderer();
24    renderer.setSize(window.innerWidth, window.innerHeight);
25
26    document.body.appendChild(renderer.domElement);
27
```

Three.js

```
goto_archive

on setup() {

  W = window.innerWidth, H = window.innerHeight;
  renderer = new THREE.WebGLRenderer();
  renderer.setSize( W, H );
  document.body.appendChild( renderer.domElement );

  camera = new THREE.PerspectiveCamera( 50, W/H, 1, 10000 );
  camera.position.z = 500;

  scene = new THREE.Scene();

  // paste your code from the geometryGUI here
  map = THREE.ImageUtils.loadTexture('../texturez/soup.jpg');
  geometry = new THREE.CylinderGeometry(100, 100, 269.12, 50, 50, false);
  material = new THREE.MeshBasicMaterial({shading: THREE.FlatShading, color: 0xffffffff, map: map});
  mesh = new THREE.Mesh(geometry, material);
  mesh.wrapS = map.wrapT = THREE.RepeatWrapping;
  mesh.repeat.set( 1, 1 );
  scene.add(mesh);

  on draw() {
    requestAnimationFrame( draw );

    mesh.rotation.x = Date.now() * 0.0005;
    mesh.rotation.y = Date.now() * 0.0002;
    mesh.rotation.z = Date.now() * 0.001;

    renderer.render( scene, camera );
  }
};
```

UPDATE HIDE CODE
SNIPPETS RESET ARCHIVE_IT

How to Make WebGL Animations with Three.js

SUBSCRIBE

Three.js Example



<https://www.youtube.com/watch?v=b9DB2Uun8zA>

Three.js Example



<https://www.youtube.com/watch?v=b9DB2Uun8zA>

Babylon.js



WebGL. Simple. Powerful.

A complete JavaScript framework for building 3D games with HTML5, WebGL and Web Audio

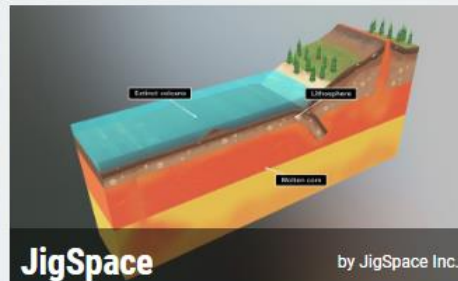
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Demos



Babylon.js

- Open source library
- Released in the summer of 2012
- Made by Microsoft employees.

Babylon.js Example Code

```
// This creates a basic Babylon Scene object (non-mesh)
var scene = new BABYLON.Scene(engine);

// This creates and positions a free camera (non-mesh)
var camera = new BABYLON.FreeCamera("camera1", new BABYLON.Vector3(0, 5, -10), scene);

// This targets the camera to scene origin
camera.setTarget(BABYLON.Vector3.Zero());

// This attaches the camera to the canvas
camera.attachControl(canvas, true);

// This creates a light, aiming 0,1,0 - to the sky (non-mesh)
var light = new BABYLON.HemisphericLight("light1", new BABYLON.Vector3(0, 1, 0), scene);

// Our built-in 'sphere' shape. Params: name, subdivs, size, scene
var sphere = BABYLON.Mesh.CreateSphere("sphere1", 16, 2, scene);

// Move the sphere upward 1/2 its height
sphere.position.y = 1;

// Our built-in 'ground' shape. Params: name, width, depth, subdivs, scene
var ground = BABYLON.Mesh.CreateGround("ground1", 6, 6, 2, scene);

return scene;
```

```
};
```

[Ball Example](#)

Babylon.js Example

Game Example



Thanks for listening!