Toolkits for Web programming

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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 2**
- Easily to build animated, interactive content; Adding plug-in component, e.g. Flash

**Phase 3**
- Rich Internet Application (RIAs) that combines collaboration and interaction

Netscape Navigator
Browsers

- Mosaic (Mar 1993)
- Netscape (Oct 1994)
- Internet Explorer (Aug 1995)
- Opera (April 1995)
- Safari (June 2003)
- Chrome (Dec 2008)
- Firefox (Nov 2014)
Web Programming is so popular

<table>
<thead>
<tr>
<th>Language Rank</th>
<th>Types</th>
<th>Spectrum Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. C</td>
<td>🌐📱💻</td>
<td>100.0</td>
</tr>
<tr>
<td>2. Java</td>
<td>🌐📱💻</td>
<td>98.1</td>
</tr>
<tr>
<td>3. Python</td>
<td>🌐💻</td>
<td>98.0</td>
</tr>
<tr>
<td>4. C++</td>
<td>🌐📱💻</td>
<td>95.9</td>
</tr>
<tr>
<td>5. R</td>
<td>🌐💻</td>
<td>87.9</td>
</tr>
<tr>
<td>6. C#</td>
<td>🌐📱💻</td>
<td>86.7</td>
</tr>
<tr>
<td>7. PHP</td>
<td>🌐💻</td>
<td>82.8</td>
</tr>
<tr>
<td>8. JavaScript</td>
<td>🌐📱</td>
<td>82.2</td>
</tr>
<tr>
<td>9. Ruby</td>
<td>🌐💻</td>
<td>74.5</td>
</tr>
<tr>
<td>10. Go</td>
<td>🌐💻</td>
<td>71.9</td>
</tr>
</tbody>
</table>

Source: http://spectrum.ieee.org/computing/software/the-2016-top-programming-languages
Web development learning curve

**Goal: Gentle Slope Systems**

- **Low Threshold**
  - CSS & HTML
  - Swing
  - Server-side
  - Java
  - Web Development

- **Goal**

**Program Complexity and Sophistication**

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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.
Companies that use HTML5 including
https://w3techs.com/technologies/details/ml-html5/all/all
## New elements in HTML 5

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>article</strong></td>
<td>Mark up parts of the content that is independent, for instance blog post, article etc.</td>
</tr>
<tr>
<td><strong>aside</strong></td>
<td>Used to mark up relevant additional information, like a sidebar.</td>
</tr>
<tr>
<td><strong>audio</strong></td>
<td>Used for natively including audio in a web page.</td>
</tr>
<tr>
<td><strong>footer</strong></td>
<td>The counter-part to header; could be used for any footer section per context.</td>
</tr>
<tr>
<td><strong>header</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>hgroup</strong></td>
<td>Used for grouping several headers, for instance, a main heading and a sub-heading.</td>
</tr>
<tr>
<td><strong>nav</strong></td>
<td>Used for marking up main navigation.</td>
</tr>
<tr>
<td><strong>section</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>time</strong></td>
<td>Used to mark up a time or date.</td>
</tr>
<tr>
<td><strong>video</strong></td>
<td>Used for natively including video in a web page – lots of interesting work is coming along here in terms of web browser support.</td>
</tr>
</tbody>
</table>
## How well your browser support html 5

<table>
<thead>
<tr>
<th>desktop browsers</th>
<th>tablets</th>
<th>mobiles</th>
<th>other</th>
<th>latest</th>
<th>search</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERVIEW</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chrome</td>
<td>Opera</td>
<td>Firefox</td>
<td>Edge</td>
<td>Safari</td>
</tr>
<tr>
<td>Upcoming</td>
<td></td>
<td>53</td>
<td>474</td>
<td></td>
<td>10.2</td>
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<tr>
<td>Current</td>
<td>57</td>
<td>519</td>
<td>474</td>
<td>473</td>
<td>406</td>
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<tr>
<td></td>
<td></td>
<td>52</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Older</td>
<td>56</td>
<td>519</td>
<td>489</td>
<td>471</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>37</td>
<td>489</td>
<td>471</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>30</td>
<td>309</td>
<td>479</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>30</td>
<td>12.10</td>
<td>309</td>
<td>466</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>12.10</td>
<td>309</td>
<td>465</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>12.10</td>
<td>309</td>
<td>465</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>12.10</td>
<td>309</td>
<td>456</td>
<td>456</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>12.10</td>
<td>309</td>
<td>456</td>
<td>456</td>
</tr>
</tbody>
</table>

https://html5test.com/results/desktop.html
How well your browser support html5

### BROWSERS

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

<table>
<thead>
<tr>
<th>Browser</th>
<th>519</th>
<th>474</th>
<th>+</th>
<th>+</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrome 57</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Firefox 53</td>
<td></td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

### difference

<table>
<thead>
<tr>
<th>Feature</th>
<th>Chrome 57</th>
<th>Firefox 53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text-level semantic elements · ping attribute on the a element</td>
<td>Yes ✔️</td>
<td>Disabled ✗</td>
</tr>
</tbody>
</table>
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 Frameworks

**TOP 3**

**Most used JS Libraries & Frameworks**

- **jQuery 56.5%** (1st)
- **Angular 17.8%** (2nd)
- **React 8.7%** (3rd)

Only 8.5% use native JS

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

JQuery

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

Each browser has a slightly different DOM interface
JQuery

Import

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

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

Basic syntax

`$(selector).action()`
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

```html
<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)
What is 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

- 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

```javascript
var camera, scene, renderer;
var geometry, material, mesh;

init();
animate();

function init()
{
    camera = new THREE.PerspectiveCamera(75, window.innerWidth / window.innerHeight, 1, 10000);
    camera.position.z = 1000;

    scene = new THREE.Scene();

    geometry = new THREE.BoxGeometry(200, 200, 200);
    material = new THREE.MeshBasicMaterial({
        color: 0xff0000,
        wireframe: true
    });

    mesh = new THREE.Mesh(geometry, material);
    scene.add(mesh);

    renderer = new THREE.WebGLRenderer();
    renderer.setSize(window.innerWidth, window.innerHeight);

document.body.appendChild(renderer.domElement);
```
Three.Js

How to Make WebGL Animations with Three.Js
Three.js Example

https://www.youtube.com/watch?v=b9DB2Uun8zA
Three.js Example

https://www.youtube.com/watch?v=b9DB2Uun8zA
Babylon.js

- Open source library
- Released in the summer of 2012
- Made by Microsoft employees.
// 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;
Thanks for listening!