ITMD 465/565
Rich Internet Applications

Lecture 9

Fall 2019 – October 16, 2019

Tonight's Agenda

- Midterm questions?

- Couple more AJAX Examples with POST

- HTML5 APIs Introduction

- Canvas API demos (maybe depends on time)

HTML5 APIs

Quick starting look

HTML5 Video & Audio

- Built in support for playing audio and video in the browser without plugins like flash or silverlight

- Uses the <video> or <audio> tag for basic support.

- Traditionally format/codec support was mixed between browser manufacturers and we needed to supply different formats

- As of 2016 h.264 mp4 and mp3 is supported in most browsers

- You can provide fallback content inside the tag if the browser doesn't support it

- There are attributes for controls, autoplay, loop, preload. See element docs

- https://developer.mozilla.org/en-US/docs/Web/Guide/HTML/Using_HTML5_audio_and_video

- https://developer.mozilla.org/en-US/docs/Web/HTML/Supported_media_formats

HTML5 Video & Audio

- The <source> tag can be nested inside the <video> or <audio> tag to supply multiple formats

- <video src="http://v2v.cc/~j/theora_testsuite/320x240.ogg" controls>
    <p>Your browser does not support the <code>video</code> element.</p>
</video>

- <video controls>
    <source src="SampleVideo.ogv" type="video/ogv">
    <source src="SampleVideo.mp4" type="video/mp4">
    <p>Your browser does not support the <code>video</code> element.</p>
</video>

- The <video> and <audio> elements have methods attached for controlling playback

- https://www.html5rocks.com/en/tutorials/video/basics/

Geolocation

- The **geolocation API** allows the user to provide their location to web applications if they so desire. For privacy reasons, the user is asked for permission to report location information.

- The API is published through the navigator.geolocation object

- getCurrentPosition() method is used to query the browser for a location object

- Takes a callback function that runs when the browser responds with a location

- watchPosition() method can be used to continually update the position

- navigator.geolocation.getCurrentPosition(function(position) {
      do_something(position.coords.latitude, position.coords.longitude);
  });

- https://developer.mozilla.org/en-US/docs/Web/API/Geolocation/Using_geolocation

- Check if permission is denied: http://stackoverflow.com/questions/6092400/is-there-a-way-to-check-if-geolocation-has-been-declined-with-javascript

- Fire fox bug: http://stackoverflow.com/questions/5947637/function-fail-never-called-if-user-declines-to-share-geolocation-in-firefox

HTML5 Storage

Storage

- There are a few major storage APIs
  - http://www.html5rocks.com/en/features/storage

- Web Storage
  - https://html.spec.whatwg.org/multipage/webstorage.html

- Indexed Database
  - https://www.w3.org/TR/IndexedDB/

- Web SQL Database – This has been deprecated and will no longer be developed or supported in the future.
  - https://www.w3.org/TR/webdatabase/

- File Access
  - https://www.w3.org/TR/FileAPI/
  - https://developer.mozilla.org/en-US/docs/Web/API/File

Web Storage

- Simple and fairly widely supported way to store data in the client browser.

- Simple string only Key/Value storage – **IMPORTANT if you want to store a JavaScript object you must use JSON.stringify() and JSON.parse().**

- Different than cookies as this is a JavaScript API

- There two areas you can store data in
  - localStorage – persistant storage after browser is closed
  - sessionStorage – only stores for current browser session

- Data is saved per origin and there is a data limit
  - Firefox is around 10MB

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

- https://developer.mozilla.org/en-US/docs/Web/API/Web_Storage_API/Using_the_Web_Storage_API

Web Storage

- The storage object is exposed on the window object

- window.localStorage or just localStorage

- You can access key/value pairs in multiple ways

```
localStorage.colorSetting = '#a4509b';
localStorage['colorSetting'] = '#a4509b';
localStorage.setItem('colorSetting', '#a4509b');
localStorage.getItem('colorSetting');
localStorage.removeItem('colorSetting');
```

- There is also a storage event that fires that you can listen for

Indexed DB

- IndexedDB is a low-level API for client-side storage of significant amounts of structured data, including files/blobs, which also enables high performance searches of this data using indexes.

- Transactional based database system, non-sql based, JavaScript-based object-oriented database.

- Store and retrieve objects based on a key.

- Asynchronous API that uses a lot of function callbacks

- Storage limits do exist but much larger than Web Storage and differ by browser
  - https://developer.mozilla.org/en-US/docs/Web/API/IndexedDB_API/Browser_storage_limits_and_eviction_criteria

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

Indexed DB

- The basic pattern that Indexed DB encourages is the following:
  - Open a database.
  - Create an object store in the database.
  - Start a transaction and make a request to do some database operation, like adding or retrieving data.
  - Wait for the operation to complete by listening to the right kind of DOM event.
  - Do something with the results (which can be found on the request object).

- https://developer.mozilla.org/en-US/docs/Web/API/IndexedDB_API/Using_IndexedDB

- http://code.tutsplus.com/tutorials/working-with-indexeddb--net-34673

Canvas, 2d, web gl 3d

- These are all APIs used for drawing on a <canvas> element on the page using JavaScript

- Canvas is a raster-based where the canvas objects are drawn in immediate mode. Once the item is drawn to the canvas it is forgotten. If you are doing animation you redraw the entire scene each frame.

- This is different than svg which is vector-based and the shapes are remembers as objects in a scene graph or DOM and then rendered to a bitmap. If an svg object attribute is changed then the browser can automatically re-render.

- There are many libraries for canvas that add scene-graph capabilities to the canvas element.

- Very low level api. Much easier to use a library, especially for hit detection.

Canvas

- https://en.wikipedia.org/wiki/Canvas_element

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

- https://developer.mozilla.org/en-US/docs/Web/API/Canvas_API/Tutorial

- Many canvas libraries, some are listed on the Canvas_API page above, another is easeljs http://www.createjs.com/easeljs

- Web GL is a 3d implementation of canvas
  - Conforms closely to OpenGL ES 2.0
  - https://developer.mozilla.org/en-US/docs/Web/API/WebGL_API
  - Libraries to make it easier like three.js http://threejs.org/

Animation

- Animation can be canvas, web gl, or just DOM manipulation

- Animation requires rendering a scene with changes at a frame rate
  - Old way is with setInterval() – new way is with requestAnimationFrame()

- https://css-tricks.com/using-requestanimationframe/

Web Workers

- Web Workers provide a simple means for web content to run scripts in background threads.

- Basically adds a threading model to JavaScript

- The main script and worker scripts post messages to each other and can include standard JavaScript data

- https://developer.mozilla.org/en-US/docs/Web/API/Web_Workers_API/Using_web_workers

- http://www.html5rocks.com/en/tutorials/workers/basics/

- http://www.w3schools.com/html/html5_webworkers.asp

- https://en.wikipedia.org/wiki/Web_worker

Websockets

- The WebSocket Protocol is an independent TCP-based protocol.

- WebSocket is designed to be implemented in web browsers and web servers, but it can be used by any client or server application.

- WebSocket is a protocol providing full-duplex communication channels over a single TCP connection.

- Often used for real time data communications from browser to servers.

- https://en.wikipedia.org/wiki/WebSocket

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

- http://www.websocket.org/#

- https://html.spec.whatwg.org/multipage/comms.html#network

Other links

- http://html5demos.com/

- http://www.html5rocks.com

- http://fff.cmiscm.com

- http://html5index.org/

- http://www.creativebloq.com/html5/developer-s-guide-html5-apis-1122923

- https://www.w3.org/standards/techs/js#w3c_all

- https://davidwalsh.name/more-html5-apis

Assignments

Reading/Assignments

- Lab 4 will be available tonight and due Sunday October 27 by end of day. See blackboard for full details.

- Please try to make a basic node project like demonstrated in class to make sure your node installation is working correctly.