Geography 485L/585L - Internet Mapping

Karl Benedict - kbene@unm.edu

Spring 2016

Contents

Chapter 1

GEOG 485L/585L Module 1 - Introduction and Outline

Overview

- Introductions
- Review of the Syllabus
- Topics to be Covered
- Basics/Definitions

Introductions

- Who am I?
- Who are you?
- What brought you here?

Syllabus Review (link)

Class Topics

- Internet Mapping Clients: Basic HTML, Javascript, CSS; Google Maps API; OpenLayers javascript library
- Geospatial Services Oriented Architectures (SOA)
- Open Standards: Open Geospatial Consortium (OGC - WMS, WFS, WCS, KML); Extensible Markup Language (XML)
- Desktop client use of Open Standards
- Data sharing/publication using Open Standards

Basics

Outline

- What is Internet Mapping?
- Definitions
- Tools

What is Internet Mapping

Extended Desktop Mapping Use of open standards based remote data and map services in desktop applications

Geospatial Data Sharing Establishing open standards based services to share geospatial data and mapping capabilities over the Internet

Web-client Mapping The delivery of mapping and geospatial data tools through web browsers, again based upon open standards

Definitions

Internet The global computer network of computers that typically connect with each other over TCP/IP

World Wide Web The subset of applications that are run over the Internet, typically using the HTTP protocol in combination with data (HTML, XML, XHTML), presentation (CSS), and behavior (JavaScript) components

Mapping The generation of cartographic products that include map images (pictures of geospatial data) and other elements (e.g. legends, tools, scale information, north-arrow)

Definitions

Analysis The development of models (statistical and otherwise) that enable the exploration of geospatial data and testing of hypotheses using those data

Open Standards While the definition varies from one organization to the next, Open Standards are often characterized by the following:

- Developed through a public process by a national or international standards group
- May be implemented royalty-free

Definitions

Interoperability Ability of systems to share data and information with each other

COTS Commercial Off-the-Shelf Software. Applications that are "purchased" from vendors, often with license terms that restrict the use the software to the specific platform for which it is licensed. Often comes with implicit or explicit technical support

Open Source Software licensed under terms that are consistent with the Open Source definition, which includes access to source code, and freedom to modify and redistribute

Definitions

Data Actual values associated with geographic locations. For example - numeric elevation values associated with locations within a Digital Elevation Model.

Metadata Data about a particular data product or service. Metadata provide critical documentation that supports the discovery and use of data products and data and mapping services

Tools

Computer Hardware Requirements

- At least 2 GB RAM
- At least 20 GB of available disk space
- Internet Connection (broadband [>728 Kb/sec] recommended)

Software Requirements

- Supported Operating System
- Geographic Information System (GIS)
- Text Editor
- Secure File Transfer Protocol Client
- Secure Shell (SSH) Client
- Web Browser (at least one of the following)
- A desktop Git/GitHub client for your operating system of choice

Chapter 2

GEOG 485L/585L Module 2a - Web-based Mapping Clients. HTML, CSS & Javascript

Overview

- Web Development
- Parts of a web page
- Web Site Components
  - Structure (X/HTML)
  - Presentation (CSS)
  - Behavior (Javascript)
- Simple Web Pages
- More Complete Web Page Example

Web Development

- Requirements
  - Web Server
  - File location that the web server accesses for requested content
  - Files must be readable by all users
- General Process
  - Create basic content in HTML or XHTML (structure)
  - Change appearance of content through the definitions of styles using CSS (presentation)
  - Add dynamic capabilities to content through Javascript (behavior)
  - REPEAT over and over and over and over again

Parts of a Web Page

```
1 <html>
2     <!-- The HTML block is the container for all of your page content -->
3     <head>
```

```
        <!-- The head is where you include pointers to external resources
        (i.e. style sheets and javascript files), blocks of Javascript code
        , styles, etc.  -->
        <title>The page title also goes in here</title>
    </head>
    <body>
        <!-- The body is where you put all of the content for the page
        (i.e. the material that will be displayed in the web browser)  -->
        <h1>Headers</h1>
        <div>Generic blocks of content</div>
        <p>Paragraphs</p>
        <table>Tables</table>
        <img ...>Images</img>
        <form ...>Forms</form>
        <ul>Unordered Lists</ul>
        <ol>Ordered Lists</ol>
        <li>List Items</li>

        <!-- Javascript can go here as well -->
    </body>
</html>
```

Link to example/Preview

Web Site Components - Structure

Content is defined in terms of the structural elements available in HTML/XHTML

- Sample HTML/XHTML Tags
  - Paragraphs (i.e. blocks of text) are contained within `<p>...</p>` tags
  - Headings (i.e. section headings, sub-headings) are contained within numerically defined header tags: `<h1>...</h1>, <h2>...</h2>, <h3>...</h3>`, etc.
  - Tabular data are within `<table>...</table>` tags
  - List are specified within `<ol>...</ol>` or `<ul>...</ul>` tags, depending upon whether the list is ordered (numbered) or unordered (e.g. bulleted)
  - User input elements are put within `<form>...</form>` tags
  - Blocks of content (i.e. sections or divisions) are defined within `<div>...</div>` tags
- Structure is translated into the Document Object Model (DOM) for later use by CSS and Javascript

Web Site Components - Presentation

Modifications to default rendering of HTML/XHTML elements are made through styles defined in CSS

- Styles may be
  - defined in an external file that is referenced within the `<head>` block (the preferred method when doing "real" web development)
  - directly defined within the `<head>` block of a web page
  - directly embedded in the elements to which they apply (generally not a "Good Thing")
- When not embedded within an element, a style definition consists of

  - A selector
  - The style definition, enclosed in “curly-brackets”, separated by “semi-colons”
  - For example: `h1 {color:red; font-size:18px;}`

CSS Selectors

Selectors may be based on several criteria

- Element name: `h1`, `p`, `table`, `ul`, etc.
  - Element: `<h1>A top level heading</h1>`
  - Selector: `h1 {color:red; font-size:18px}`
- Element ID: a unique name assigned to HTML/XHTML elements within the structure of the document
  - Element: `<p id="para01">Some text goes here</p>`
  - Selector: `#para01 {color:blue; font-size:12px}`
- Class ID: a name assigned to multiple elements which may be modified through reference to their class
  - Element: `<p class="instructions">Here are some instructions</p>`
  - Another Element: `<p class="instructions">Here are some more instructions</p>`
  - Selector: `.instructions {color:red; font-size:12px; text-decoration:blink}`
- Selectors may be combined in a variety of ways

Web Site Components - Behavior

The most interoperable language for adding dynamic behavior to web sites is *Javascript* - supported by most browsers on most operating systems

- A full-fledged programming language
  - A non-trivial undertaking to become proficient in
  - Experience in other programming languages can contribute to learning Javascript
- Defines actions that may be taken on/by DOM elements
- Allows for modification of existing DOM elements, creation of new DOM elements after the page has finished loading from the server, retrieval of new content after page loads
  - An interactive web page that may behave like a local desktop application

Reference Links

- w3schools.com
  - HTML 4.0 / XHTML 1.0 Tag Reference
  - Cascading Style Sheet (CSS) selectors and elements
  - Javascript reference
- World Wide Web Consortium (W3C)
  - HTML and CSS Background
  - HTML and CSS Tutorial Links Page
  - Validators Page
- Webmonkey.com
  - HTML Cheat Sheet
  - CSS Guide

Simple Web Page

```
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html;charset=utf-8" />
        <title>This is a simple web page</title>
    </head>
    <body>
        <h1>They don't get any simpler than this!</h1>
        <p>OK, not much simpler than this.</p>
        <p>Hello World?</p>
    </body>
</html>
```

link to example/Preview

Simple Web Page with CSS

```
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html;charset=utf-8" />
        <title>This is a simple web page - with styling</title>
        <style type="text/css">
            h1 {color:blue; font-size:large}
            p.para {color:#777777; font-size:small}
            #annoying {color:red; text-decoration:line-through}
        </style>
    </head>
    <body>
        <h1>They don't get any simpler than this!</h1>
        <p class="para">OK, not much simpler than this.</p>
        <p id="annoying" class="para">Hello World?</p>
    </body>
</html>
```

link to example/Preview

Simple Web Page with Javascript

```
<html>
    <head>
        <meta http-equiv="Content-Type" content="text/html;charset=utf-8" />
        <title>This is a simple web page with Javascript</title>
        <script type="text/javascript">
            function genericAlert() {
                alert("You just did something ...")
                document.getElementById("clickMe").style.color = "red"
            }
        </script>
    </head>
    <body>
        <h1>They don't get any simpler than this!</h1>
```

```
        <p>OK, not much simpler than this.</p>
        <p>Hello World?</p>
        <p id="clickMe" onclick="genericAlert();">What happens when you click me?</p>
    </body>
</html>
```

link to example/Preview

More Complete Web Page Example

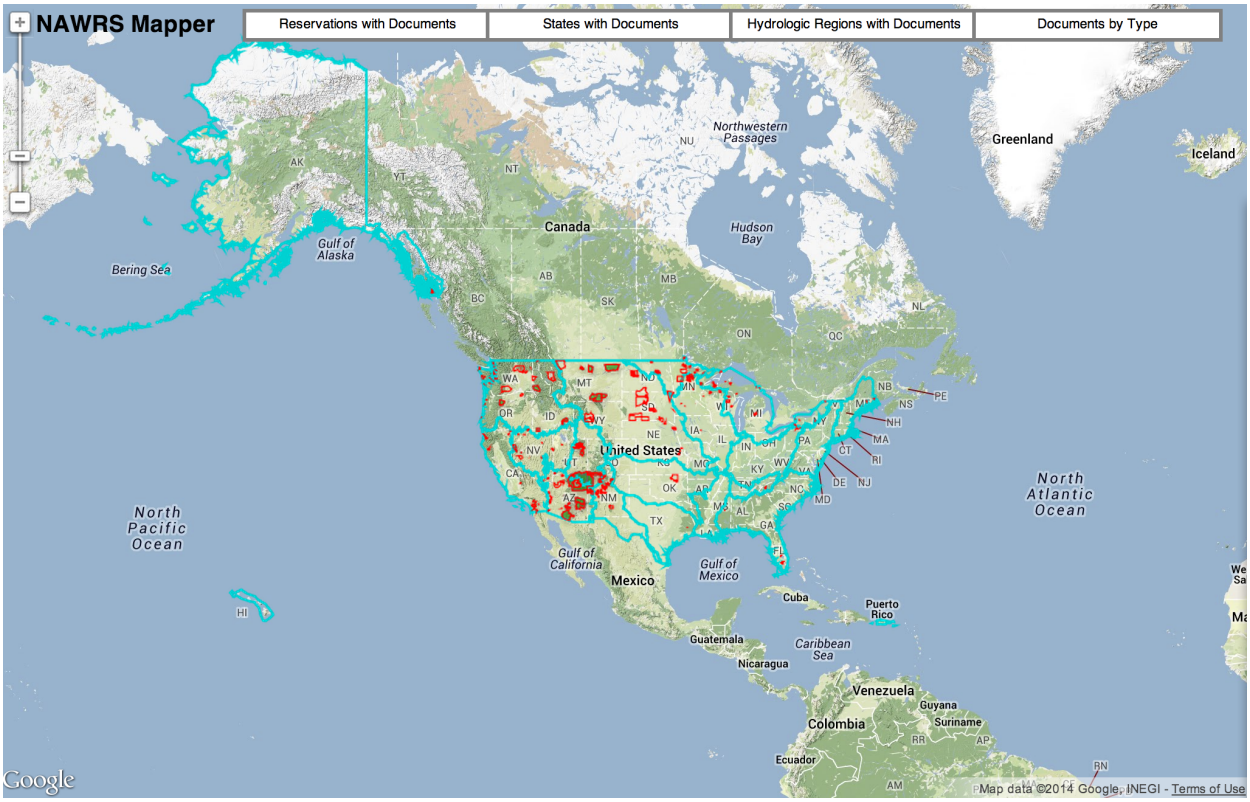

Figure 2.1: NAWRS Mapper. *HTML*: 39 Lines; *CSS*: 136 Lines; *core.js*: 515 Lines + Google Maps API and JQuery Framework

---