Data Visualization (CIS/DSC 468)

Web Programming

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What languages do we use on the Web?
Languages of the Web

- HTML
- CSS
- SVG
- JavaScript
  - Versions of Javascript: ES6, ES2015, ES2017…
  - Specific frameworks: react, jQuery, bootstrap,
HTML Exercise

• What does this HTML mean?
  - <em>This is <strong>cool</strong>. What about <u><strong>this?</strong></u></em>
CSS Exercise

body {
    font-family: sans-serif;
    font-size: 12pt;
}

em { color: green; }

em u { color: red; }

em > strong { color: blue; }

img { border: 4px solid red; }

• What colors are displayed for this HTML (with the above stylesheet)?
  - <em>This is <strong>cool</strong>. What about <u><strong>this?</strong></u></em>
Interactive Data Visualization by S. Murray

- Free version available on the Web
- [http://chimera.labs.oreilly.com/books/1230000000345](http://chimera.labs.oreilly.com/books/1230000000345)
- Representing and drawing with data
- Chapter 3 has a nice overview of Web technologies with examples
- Great resource for D3 as well
Office Hours & Email

- Office Hours: Tu 3-5pm, W 2-3pm, F 11am-12pm
- Scheduled office hours are open to all students
- Office hours are first-come, first-serve
- Please be considerate to other students
- No appointment needed to stop in during scheduled office hours
- If you need an appointment outside of those times, please email me with specific details about what you wish to discuss
- Many questions can be answered via email. Do not schedule an appointment to ask a question that could be answered via email
What is the difference between vector and raster graphics?
Scalable Vector Graphics (SVG)

- Vector graphics vs. Raster graphics
- Drawing commands versus a grid of pixels
- Why vector graphics?

![Diagram showing the difference between Raster and Vector graphics](image)
SVG Background

- Another markup language:
  - Describe the shapes and paths by their endpoints, characteristics
- SVG can be embedded into HTML5 documents!
- Pixel Coordinates: Top-left origin

![Diagram of a rectangle with pixel coordinates](image)
SVG Elements

• Drawing primitives:
  - Lines, Circles, Rects, Ellipses, Text, Polylines, Paths
  - Work by specifying information about how to draw the shape
  - Lots more: see MDN Documentation

• Ordering/Stacking:
  - SVG Elements are drawn in the order they are specified

• Paths: directions for drawing
SVG Example

<svg id="mysvg" width="400" height="300">
  <circle cx="50" cy="50" r="50"
    style="fill:green; stroke:black; stroke-width:4px"/>
  <rect x="150" y="150" width="50" height="20"
    style="fill:red; stroke: blue; stroke-width: 2px;"/>
  <path d="M 200 10 L 300 10 L 300 50 Z"
    style="fill: none; stroke: red; stroke-width:3px;"/>
</svg>

• Note that the style is separate…
• Paths are raw drawing commands (ever see Logo?)
• What does this look like?
SVG Grouping

- Very powerful, useful for animations and transformations
- `<g> <circle .../> <circle ... /> <circle ... /></g>`
- Can add transforms to the group:
  - [http://codepen.io/dakoop/pen/rjpdXp](http://codepen.io/dakoop/pen/rjpdXp)

[SVG Example, Scheidegger, 2016]
SVG Styles

• Can specify styles via CSS, too

...<style type="text/css">
circle { fill: green; stroke: black;
    stroke-width: 4px; }
  .normal { fill: red; stroke: blue;
          stroke-width: 2px; }
#p1 { fill: none; stroke: red; stroke-width: 3px; }
</style>
...

<svg id="mysvg" width="400" height="300">
  <circle cx="50" cy="50" r="50"/>
  <rect class="normal" x="150" y="150" width="50"
        height="20"/>
  <path id="p1" d="M 200 10 L 300 10 L 300 50 Z"/>
</svg>
...
JavaScript in one slide

• Interpreted and Dynamically-typed Programming Language
• Statements end with semi-colons, normal blocking with brackets
• Variables: var a = 0;
• Operators: +, -, *, /, [ ]
• Control Statements: if (<expr>) {...} else {...}, switch
• Loops: for, while, do-while
• Arrays: var a = [1,2,3]; a[99] = 100; console.log(a.length);
• Functions: function myFunction(a,b) { return a + b; }
• Objects: var obj; obj.x = 3; obj.y = 5;
  - Prototypes for instance functions
• Comments are /* Comment */ or // Single-line Comment