Data Visualization

Assignment 2
The Goal of Data Visualization

1. To represent quantities in easy and intuitive manner
2. To decrease cognitive load and complexity
3. To highlight important components of data
Concepts
Standard HTML Tag

\(<p \text{class="hello">Hello World</p}>\)
HTML in Tree

HTML tags can be nested:
- **head** and **body** are the **children** of **html** tag.
- **p** is a child of **body**.
- **html** tag is the root
- **Note**: DOM is a structure to define this HTML hierarchy.

```html
<html>
  <head>...</head>
  <body>
    <p>Hello World</p>
  </body>
</html>
```
Scalable Vector Graphics

- Scalable vector graphics (SVG) is a way to draw “vector graphics” in XML and HTML.
  - Vector graphics are non-pixelated images
  - SVG provides these graphics to show in any scale
- There are many SVG-based tags to draw graphics
  - `<g>`
  - `<circle>`
  - `<polygon>`
  - `<path>`
  - and more ...
SVG Examples

```html
<circle class="icecream" cx="100" cy="150" r="100" />
<polygon class="cone" points="0,250 200,250 100,600"></polygon>
```
Method Chaining

- To put it simply, method chaining is a way to perform multiple function calls one after another before statement has been ended ...
- Example:
  
  ```
  obj.f1().f2().f3();
  ```

- How does this work?
  - Recall that certain functions can be called by certain objects.
  - When a function is called, that statement represents a returned value.
  - e.g. f2() can be called by the returned value of obj.f1().
Putting Things Together

- Similar to jQuery, D3 uses method chaining in JS to:
  - select HTML elements
  - manipulate DOM
  - draw scalable vector graphics
- Simple graphs such as bar chart can be drawn with common HTML tag such as `<div>`.
- When your chart becomes complicated, understanding of DOM and SVG are heavily involved.
The Assignment
The Technology Stack

- Postgres
  - ORDBMS
  - DELPHI

- D3
  - Handles visualizations
Data Binding in D3

- `selection.data()` - binds data to DOM elements
- `select()`, `selectAll()`
  - Select the first element, or all elements matching the query
- `selection.enter()`
  - Creates new data-bound selections if there are less DOM elements than data elements
- `selection.exit()`
  - Select DOM elements that are not bound to any data elements
AJAX with D3

d3.json('url', function(err, data){
    handleError(err)
    renderChart(data)
})

$.getJSON('url', function(data){
    renderChart(data)
}).fail(function(err){
    handleError(err)
})

D3

jQuery
Representing DELPHI Data with D3
Important Note

- Only Part II is graded
  - Part I is a “tutorial” for Part II
  - Showing proficiency Part II indicates you understood materials for Part I
- Assignment 2 is heavily graded on your design skills
  - For this assignment, 60% of your grade depends on usability
  - We will look for how you applied technical skills to design level.
- This is a group assignment!
Recommendation

● Finish Part I before Part II
  ○ At very least, everyone (individually) should have attempted Part I
  ○ This gives good foundation of how to get started for Part II

● Read the resources before attempting Part I
  ○ Some of the resources may have answers to your problem

● Collaborate with your group for Part II
  ○ Everyone should put equal and fair amount of work for Part II

● Start early!
  ○ SQL and D3 are less abstract than OAuth and websocket
  ○ However, SQL and D3 requires more practice to be at proficient level.
Questions?
Interactivity in Data Visualization
A Taxonomy

- 7 Categories
  - Select
  - Explore
  - Reconfigure
  - Encode
  - Abstract / Elaborate
  - Filter
  - Connect
- May not be perfect or comprehensive, but useful to have as a designer
Select

- Mark something as interesting
- Focus and track as other elements change
- Follow/return to items of interest

Placemark pin in a maps app.
Explore

- Show me something else
- Users often limited to seeing a subset of all the data
- Most frequently: some new data items enter, some others are removed

Panning across a map or data representation.
Reconfigure

- Show me a different spatial arrangement
- Reveal different perspectives, find hidden patterns/relationships
- Sort, rearrange, juxtapose, clear noise

Sort by score in a grading app.
Encode

- Show me a different representation
- Includes visual appearance (color, size, shape) of each element
- Type of representation (pie chart -> histogram)

Encoding height information to a map using a spectrum of color.
Abstract / Elaborate

- Show me more or less detail
- Representation is not fundamentally changed, details simply come more clearly into focus or fade away into context
- Subtrees

Zooming into a graph. Stocks 1 yr, 1m 1d.
Filter

- Show me something conditionally
- Users specify a range or condition
- When resetting, hidden items are recovered, data is not changed

Email search. Web Search. Autocomplete.
Connect

- Show me related items
- Highlight associations and relationships between data items
- Show hidden data items that are relevant to a specified item

Clicking HTML element in developer console highlights the bounding box.
Activity!

- 7 groups
  - 1. Select
  - 2. Explore
  - 3. Reconfigure
  - 4. Encode
  - 5. Abstract / Elaborate
  - 6. Filter
  - 7. Connect

- 5 min - Hunt for a visualization that employs your category
  - Submit the link via TopHat

- 1 min - Present/share your findings
  - What is the high level goal(s) does the visualization target?
  - Show how your interactive category involved.
  - How does that interactivity help the user interface with the visualization?
    - Is it good, is it bad? ‘Give feedback’ to the creator.

- Slides: [https://goo.gl/t5GPLM](https://goo.gl/t5GPLM)
- [http://vizhub.healthdata.org/le/](http://vizhub.healthdata.org/le/)