

Assignment 3 Description: Creating Interactive Visualization Software



In this assignment, you will explore the issues involved in implementing interactive visualization software. You must choose the data domain as well as the techniques you wish to implement. For example, you might implement the interactive technique of **dynamic queries** -- first explored in the **HomeFinder** (<http://www.cs.umd.edu/hcil/spotfire/>) application. Similarly, you might implement interactive **treemaps** (<http://www.cs.umd.edu/hcil/treemap/>) which were originally developed to display hierarchical file structure, and were recently adapted to the problem of interactively depicting a **map of the stock market**. (<http://www.smartmoney.com/marketmap/>) We have seen many other examples of interactive visualization techniques in class and in the readings. The goal with this assignment is not only for you to gain hands-on experience implementing a visualization technique, but also for you to think about the effectiveness of the specific visualization techniques you re-implement in the context of the data domain you work with.

One challenge is to scope the assignment so that you can finish it by the due date. You can work by yourself or with a partner for this assignment. Groups of three or more are **not allowed**. Your group must write code for this assignment. You are free to write the code in any programming language/environment you prefer, including Javascript, C++, Java, etc. In addition you may use any software toolkit to help you build the code. **I strongly recommend using Javascript and D3 for this assignment but I have listed a few other possible toolkits later in this assignment description.** No matter what language/libraries you use I would like you to submit a final executable program that I can execute on my own on either a Mac Os X or a Windows machine. If this is a problem for you, please talk to me right away.

Deliverables

1. Describe the data domain and storyboard interactive visualization techniques you will use.

Start either by choosing a data domain or choosing the interactive visualization techniques you will implement. Think about why the domain and the techniques are a good match for one another. Then write a description of data domain and the interactive visualization application you will build. The description should include a storyboard of the interface/displays you will create. Be sure to explain the features of your application. Most importantly you should explain why the interaction techniques you will implement will be effective in the context of your data domain. The goal of this exercise is to think through the various concerns that go into the software implementation. This is why it is important that you perform this task **first**, before actually building the software.

2. Implement your design.

Use the programming language and toolkit of your choice to implement your design (though we strongly recommend using Javascript and D3). You may wish to spend some time looking into the various toolkits that are available. I have listed some of them at the end of this document. You are free to use any publicly available language and toolkit. However, I would like you to submit a final executable program that I can execute on my own on either a Mac OS X, or a Windows machine. If this is a problem for you, please talk to me right away.

3. Produce a final writeup.

Your final submission should include:

- The description with storyboards from part 1.
- A brief description of your final interactive visualization application.
- An explanation of changes between the storyboard and the final implementation.
- The bundled source code for your application, uploaded as a webpage or file (either a .zip or .tar.gz archive). Please ensure that the software submitted is in working order. If any special instructions are needed for building or running your software, please provide them.
- For submissions by groups of two, please also include a breakdown of how the work was split among the group members.
- Finally, please include a commentary on the development process, including answers to the following questions: Roughly how much time did you spend developing your application? What aspects took the most time?

Resources

Data Sets

I placed a [list of data sets \(https://canvas.uw.edu/courses/1128430/pages/online-datasets\)](https://canvas.uw.edu/courses/1128430/pages/online-datasets) on Canvas for assignment 2. But, as in assignment 2, your best bet is to pick a data set or a domain that you are particularly interested in. Make sure to document where you get your data in your writeup of this

assignment. Most importantly, **be sure to choose a data set that is sufficiently large and complex so that a multi-view interactive visualization is appropriate!**

Interactive Visualization Techniques

- The lecture on [Interaction \(https://canvas.uw.edu/courses/1128430/pages/interaction\)](https://canvas.uw.edu/courses/1128430/pages/interaction) includes links to several interactive visualization applications. Think about adapting one of these techniques to your data set.
- We have read a lot of papers in class on interactive visualization techniques. If you are looking for more ideas check out the papers in the [IEEE Visualization \(http://scholar.google.com/scholar?q=IEEE+Visualization&hl=en&lr=&btnG=Search\)](http://scholar.google.com/scholar?q=IEEE+Visualization&hl=en&lr=&btnG=Search) and [IEEE Information Visualization \(http://scholar.google.com/scholar?num=100&hl=en&lr=&q=IEEE+Information+Visualization&btnG=Search\)](http://scholar.google.com/scholar?num=100&hl=en&lr=&q=IEEE+Information+Visualization&btnG=Search) conferences of the last few years.
- A bunch of examples are in our [Visualization Gallery \(https://canvas.uw.edu/courses/1128430/pages/visualization-gallery\)](https://canvas.uw.edu/courses/1128430/pages/visualization-gallery). The Collections and Commentary section at the end of the page may be particularly inspirational. But note that not all of these are interactive.

Software Tools

A variety of useful toolkits have been designed to help support information visualization applications. Some include support for the full visualization pipeline from data to interactive graphics, while others focus only on a subset, typically graphics and interaction.

- **D3** (<http://d3js.org>) - A Javascript library for creating visualizations. It is currently the most widely used library for creating visualizations on the web. (Javascript).
- **Protovis** (<http://protovis.org>) - A Javascript library for creating visualizations that was the precursor to D3. It offers a higher-level API but is less efficient and flexible than D3 (Javascript).
- **Prefuse** (<http://prefuse.org>) - The Prefuse information visualization toolkit, from Jeff Heer (Java)
- **InfoVis Toolkit** (<http://ivtk.sourceforge.net>) - The InfoVis Toolkit, from INRIA France (Java)
- **Piccolo** (<http://www.cs.umd.edu/hcil/piccolo/>) - The Piccolo user interface toolkit, from the University of Maryland (Java and .NET)
- **Processing** (<http://processing.org>) - A Java-like graphics and interaction language and IDE
- **HTML/JavaScript/XML** - use standard web technologies to build the visualization

In addition, you are free to use another library not presented here, including lower-level libraries such as WebGL, OpenGL, Java2D, or GDI+. Just be sure to document your choice of tools and explain your decision.

A number of tools for creating visualizations without programming are also available (Tableau for example). While you are free to use them to explore your data set and try out design ideas, you **must**

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program the final application yourself. If you have any questions about the status of a given tool, please ask me.

Submission Details

Please upload your work to an external website, such as your own website or OneDrive. Please make sure you have permissions enabled for URL sharing.

You must submit the work via **Assignment 3: Creating Interactive Visualization Software** (<https://canvas.uw.edu/courses/1128430/assignments/3969405>) the URLs of:

- A write-up (either as a PDF with embedded images or in the content of an external website) which includes the deliverables described above.
- The bundled source code for your application, as either a webpage URL or file URL (.zip or .tar.gz archive).