

Assignment 1: Parallel Coordinates

Due: 10-12-2016, 11:59pm (midnight)

Exploring multidimensional data is a fundamental challenge in visualization. In this assignment, you will be using Processing to create a visualization of multi-dimensional data with a layout called Parallel Coordinates. Parallel Coordinates is a common and effective visualization method that has been used in many different domains. The key to a successful Parallel Coordinates visualization is the ability for a user to interact with the data and the layout in order to identify different patterns. For this assignment, you will be learning how to parse and store multi-dimensional data and to design and implement effective interaction techniques

Basic Requirements for This Assignment:

1. Create a multi-dimensional dataset. This file should have the following properties:
 - a. It should be a simple CSV file.
 - b. The data format should only contain $m+1$ columns, each column represents one of the dimension of data (e.g., age, grades, height, etc.). The $+1$ column is for the first column, which should be used to store the name of each data item (e.g., "Alvitta")
 - c. There should be $n+1$ rows where n is the number of data items. The $+1$ row is for the first row of the data, which should be used to store the name of each column.
2. In Processing, do the following:
 - a. Parse the input file in the above format and read in the data.
 - b. Layout the data using Parallel Coordinates ([http://en.wikipedia.org/wiki/Parallel coordinates](http://en.wikipedia.org/wiki/Parallel_coordinates))
 - c. Implement the following:
 - i. Draw labels for the columns
 - ii. Allow the user to draw a bounding box, and highlight all lines that pass through (intersect) with the box
 - iii. Implement hovering. Highlight all the lines under the mouse.
 - iv. Allow the user to flip the orientation of a dimension
 - v. Let the user select a dimension and use that dimension to color the lines
 - d. As usual, do not assume that n or m will be fixed. Your implementation should be dynamic in layout such that it can handle different values for n and m .

Notes and Extra Credit Opportunities:

1. When grading your assignment, I will be using a different input file that I will create.
2. I will be more than happy to give out extra credit for novel and creative designs. So feel free to experiment and add features to your assignment! Some suggestions include but are not limited to: (note that you are free to do all or part of each list. For instance, for the first extra credit, you can implement the selection along a dimension but not any of the sub-points.)
 - a. Allow the user to select lines along a dimension (constrained interaction).
 - i. While the user is selecting a range, label the range.
 - ii. After the user has selected a range, allow the user to slide that range along the dimension. (<http://vis.stanford.edu/protovis/ex/cars.html>)
 - b. Dimension reordering: allow the user to drag a dimension and put it at a different location (thus rearranging the ordering of the dimensions)

- i. When dragging the dimension, change the cursor to give the user feedback on what is being moved (or draw the dimension under the cursor).
 - ii. Make the transitions animated
- c. Draw the lines as splines
 - i. Consider different types of splines – what types of splines make the most amount of sense?
 - ii. Implement edge bundling.
http://www.win.tue.nl/~dholten/papers/forcebundles_eurovis.pdf
http://www.cse.ust.hk/~zhouhong/articles/Hong_EuroVis08.pdf
- d. Draw categorical data (http://kosara.net/papers/2006/Kosara_TVCG_2006.pdf)
 - i. What about mixed data types? (nominal, ordinal, quantitative?)
- e. Implement simplification (density reduction)
 - i. Lots of examples... One possible one:
<http://webstaff.itn.liu.se/~jimjo/papers/eurovis2008/ev08final.pdf>
 - ii. Follow the related work section of this paper and implement others
- f. Implement “angular brushing”
<http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=22CEB1CD5AF819BD5B5BFC5F7DFC9BFC?doi=10.1.1.12.3700&rep=rep1&type=pdf>

Submission:

1. Submit your work via **Blackboard** by Wednesday October 12, 2016, 11:59pm (midnight). Use the naming convention: “FirstnameLastname_a1” (e.g., AlvittaOttley_a1).
2. In addition to the source code, you must submit:
 - a. The data file that you have generated. Name this file “data.csv”
 - b. If applicable, a text file that tells us where you have posted your assignment online (the URL to your applet). Name this file “location.txt”
 - c. A text file that tells us any extra credit that you might have implemented (see the following section). Name this file “extracredit.txt”

Need Help?

If you have questions about this assignment:

1. First, check Piazza to see if others have had a similar problem.
2. If not, post your question on Piazza.
3. If the question is sensitive, please email the instructors privately.
4. Note that you are NOT allowed to post code or solutions on Piazza – I will monitor the forum and delete any inappropriate posts. Fishing for programming solutions could result in a penalty toward your grade.