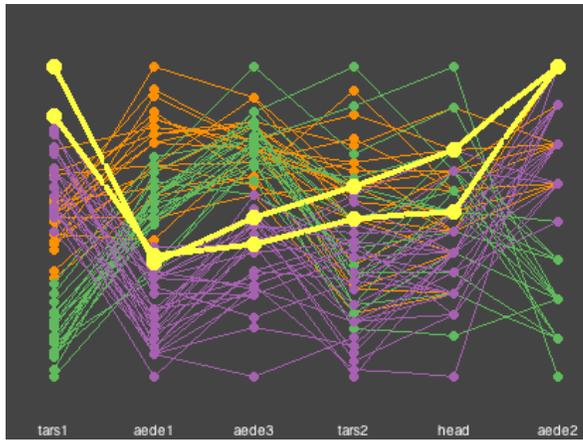
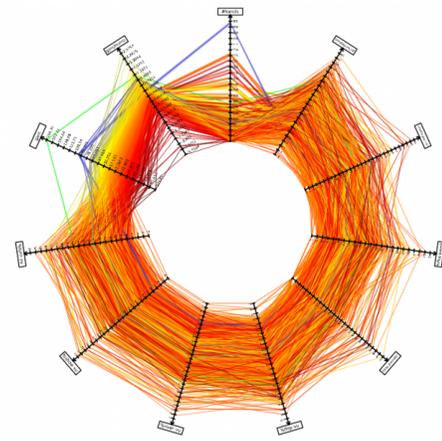


Exploring Combined Dimensions with Parallel Coordinates



(a)



(b)

Parallel coordinate plots ($||$ -coords) are a popular method to visualize multidimensional data sets where each observation in the data is mapped into a parametric continuous line intersecting each of the parallel axes (a). Variants of $||$ -coords use a circular layout (b) where axes are placed around a circle instead of linearly. The advantage of using parallel coordinates is that certain geometrical properties in high dimensions can be easily seen as 2D patterns.

Combined dimensions are linear or non-linear combinations of two or more dimensions of a dataset. In many situations, examining data in terms of combined dimensions is useful. Consider a dataset for an industrial biscuit baking process where you need to examine the *height* of a biscuit in relation to two parameters at the same time: e.g. the *heat* and *humidity* of the oven. In this case, we are interested in examining the relationship between one dimension *height* and a combined dimension of *heat* and *humidity* (e.g. $\text{heat} + \text{humidity}$ or $\frac{1}{2} \text{heat} + 2 * \text{humidity}$). Combined dimensions are also a method to reduce data dimensionality.

This project builds on a previous project **EVE** (www.aviz.fr/EVE) where combined dimensions are generated using an Interactive Evolutionary Algorithm (IEA) and are placed as extra columns in a scatter plot matrix. The intern will work on achieving the following sub-goals:

1. Use the existing EVE framework to generate new combined dimensions in the context of a parallel coordinate plot.
2. Investigate a design space for adding combined dimensions to a parallel coordinate plot.
3. Implement a prototype application (preferably on the web) to demonstrate some of the design choices and ideas.
4. Evaluate the scalability of the chosen design method with different types of data sets.

Requirements

1. The project involves implementing a multidimensional data visualization tool. Thus, the student should be familiar with at least one major programming language such as Java, C++, C# or D3.js
2. Knowledge of Interactive Evolutionary Algorithms is not required but a plus.
3. Communication about this project can be either in French or English.

Supervision

This project will be jointly supervised by Nadia Boukhelifa (www.aviz.fr/~nb) and Evelyne Lutton (<http://evelyne.lutton.free.fr/>).

(a) http://en.wikipedia.org/wiki/Parallel_coordinates

(b) <http://tulip.labri.fr/TulipDrupal/?q=node/331>