Using Super Ellipse Based Glyphs To Visualize n-Dimensional Data in SimVis

Andreas Eknes Lie*
Visualization Group
Department of Informatics
University of Bergen

Glyphs have proven to be a very effective in displaying n-dimensional datasets. The task given in this INF 219 project was to construct a glyph capable of displaying data for several attributes simultaneously, and implement this glyph. The framework in question, SimVis, is a sophisticated tool for data mining in n-dimensional datasets. This framework already has strong statistical functionalities, but lacks a proper Glyph based rendering to support visualization of the data. By externalizing the glyphs, embedding them in an image, different glyph designs could easily be interchanged with no changes needed to the framework itself.

1 Designing the Glyph

Glyphs are limited by the fact that they either are the more simple kind displaying few attributes, but which are easily comprehended, or the more advanced ones, that can display very many attributes, but suffer from occlusion caused by size, or too many visual characteristics that would distract or mislead the user looking for important data. We chose to make a glyph that would have clear characteristics which could express the underlying data, whilst not confuse the user. A simple 2d glyph drawn as a billboard would result in the most visual coherence for similar values. The shape chosen was the super ellipse. The super ellipse has a nice range varying from small exponent values (square like), through diamond shape, circle shape and ending in a steep star shape for high exponents. The idea was to allow two different super ellipses to be joined, one in the upper part, and one in the lower part, thus allowing the clearly depiction of two disjoint values in the upper and lower parts of the glyph. The glyph also has the possibility to map rotation, size and aspect/ratio to its shape. The SimVis framework adds color and opacity to each glyph, depending on the data values mapped to color, and the Degree-Of-Interest (DOI) of the selection made (opacity). The total number of values that can be simultaneously viewed on the glyph is seven.

1.1 The Glyph Atlas

The Glyph Atlas is a prominent idea to externalize the glyph design, and save it in an image. This would make it very easy to change or add new glyphs to the already existing framework. The shapes are drawn in a rectangular manner, ranging from one extreme to the other. By embedding the shape data in the alpha channel

*e-mail: andreas.lie@student.uib.no

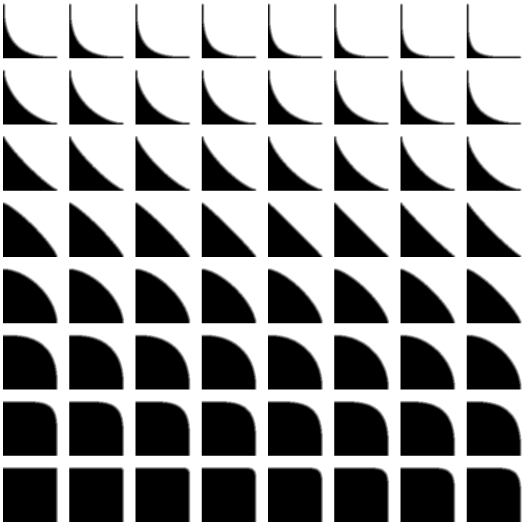
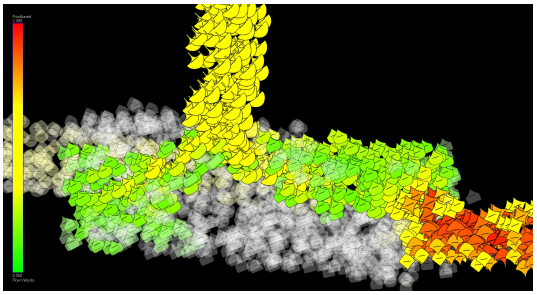
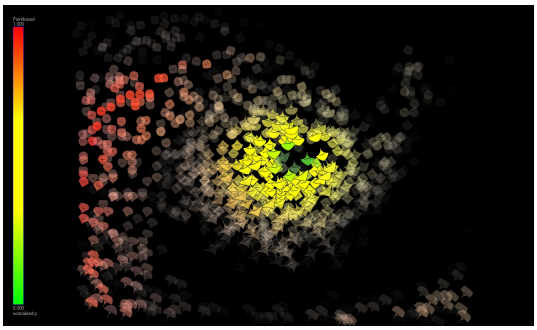


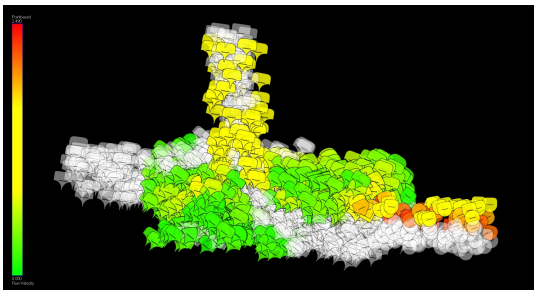
Figure 1: Glyph Atlas

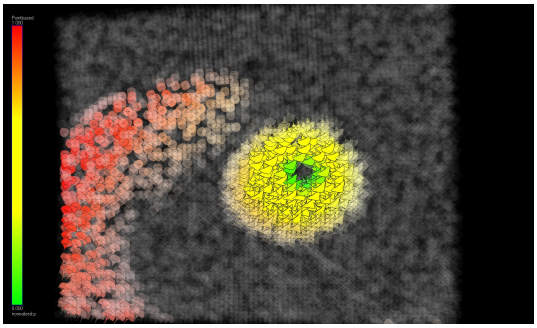
of the image, other data could be inserted into the r,g and b channels without ruining the atlas. The atlas made included size equalization data in the r-channel for size normalization of the glyphs, and data for halos in the g-channel. These halos would make the glyphs easier to distinguish from another and since they are separated from the shape data itself, would enable the user to toggle halos on and off. The shader will take the whole atlas as input, using only the correct quadrants of data to visualize the glyph.

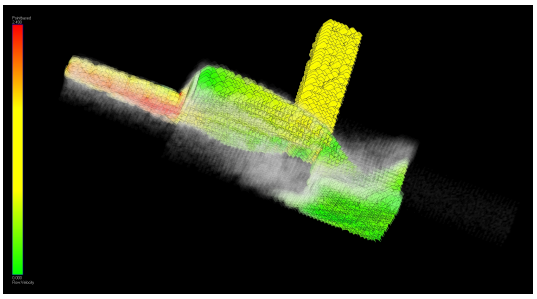
2 Results

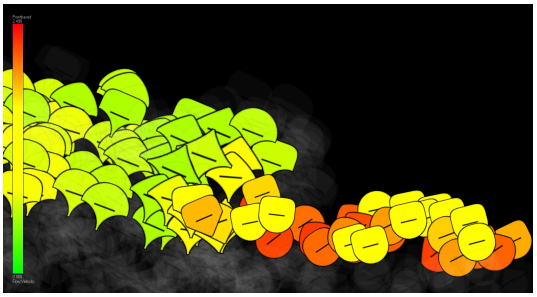


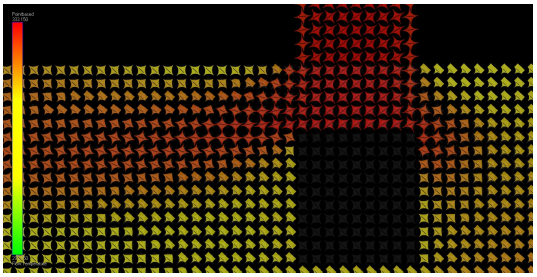


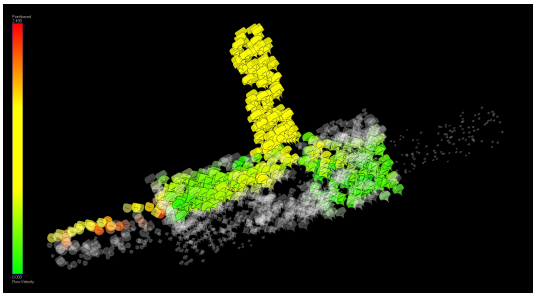












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