One-For-All: Visualization of the Information Visualization Symposia

Soon Tee Teoh*   Kwan-Liu Ma*
Department of Computer Science
University of California, Davis

We developed our own tool to visualize the history of the Infovis Symposiums. We call our tool "One-For-All", because we want to generate one image to at once answer all four tasks of the contest effectively (though not necessarily optimally). Furthermore, we designed the tool to be intuitive, that is, we would like the user to immediately make sense of the visualization, even without a legend or a user guide. These are ambitious goals, but we believe that a good visualization should meet these criteria.

Much preprocessing was needed before visualization. First, we have to coalesce the keywords, for example, we manually group "hierarchy" and "hierarchies" as the same keyword. Next, we find the most important keywords, with the most number of papers. We use these keywords as research areas within information visualization. We also notice that many of the 2002 papers do not have keywords, so we have to manually insert keywords according to their titles. We are not allowed to look up external information, that is, we cannot find their actual keywords from the publication. Next, we re-arrange the areas using MDS such that those areas with the most cross-references are placed near to one another. Since there is so much data, we find the important papers/authors, according to how much they are cited, and we emphasize them in our visualization.

In the overview visualization of Figure 2, we show a lot of information, for example, (1) important keywords and all the papers under them, (2) related research areas (eg. graph is next to hierarchies), (3) citations, (4) important authors, (5) important papers, and (6) important external papers. A key design feature is that all these very different information can be visualized clearly in one single display. The way this is achieved is through color-coding, so that if any user is interested in any particular information, he/she just has to focus attention on that color. For example, if you focus on the cyan words, you see all the first authors, and everything else fades away (try it out yourself!).

The important papers are represented by bigger circles according to how many citations they have within Infovis. Their titles are also labelled. The two most important papers also have their citations highlighted. In this way, the important papers are immediately visible. We can see that the top two papers are both in the earliest year (1995), and they are also in two very different topics, since they only have two common papers refer to them.

The layout consists of vertical grey columns of research areas within Infovis. The areas that contain more papers are thicker and are labelled with darker text. We can clearly see that the most important area is "hierarchies" and this area contains many recent papers. "Graph drawing" particularly has many papers in 2001. "Information retrieval" has many papers early in 1995, but no papers in recent years. Adjacent to "Information retrieval" is "Information analysis", which has many papers from 1996 to 1999. This is interesting because analyisis logically follows retrieval, so it makes sense.
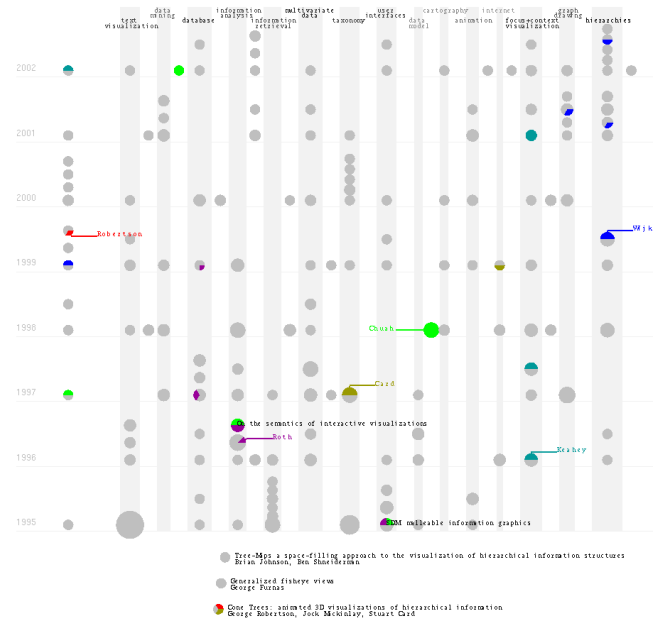
*{teoh,ma}@cs.ucdavis.edu

Figure 1: Visualizing the important authors, publications, and research areas within Infovis.

We can also see the authors, especially the important authors. We can see for example that M. Chuah is responsible for papers in many different areas. More about this in the next image. In contrast, A. Keahey is very focused on one research area: "focus+context visualization". Over the years, he has three papers in under this category, and none in other categories. We can very quickly notice his papers in one column. We see that M. Chuah and S. Roth collaborated on two papers, highlighted in Figure 1. They are the only authors of "On the Semantics of Interactive Visualization," and they are two of four authors of "SDM: Malleable Information Graphics." After 1996, they each wrote other papers, but no longer collaborated on the same papers.

From Figure 2, we see that there are many references within Infoviz, especially in closely-related areas like "graph drawing" and "hierarchies". There are also many references within the same research area, such as within "information retrieval", "graph draing", "taxonomy", and "hierarchies". We also see that two of the most important external papers are related to tree visualization, so they are cited a lot by papers in "hierarchies".
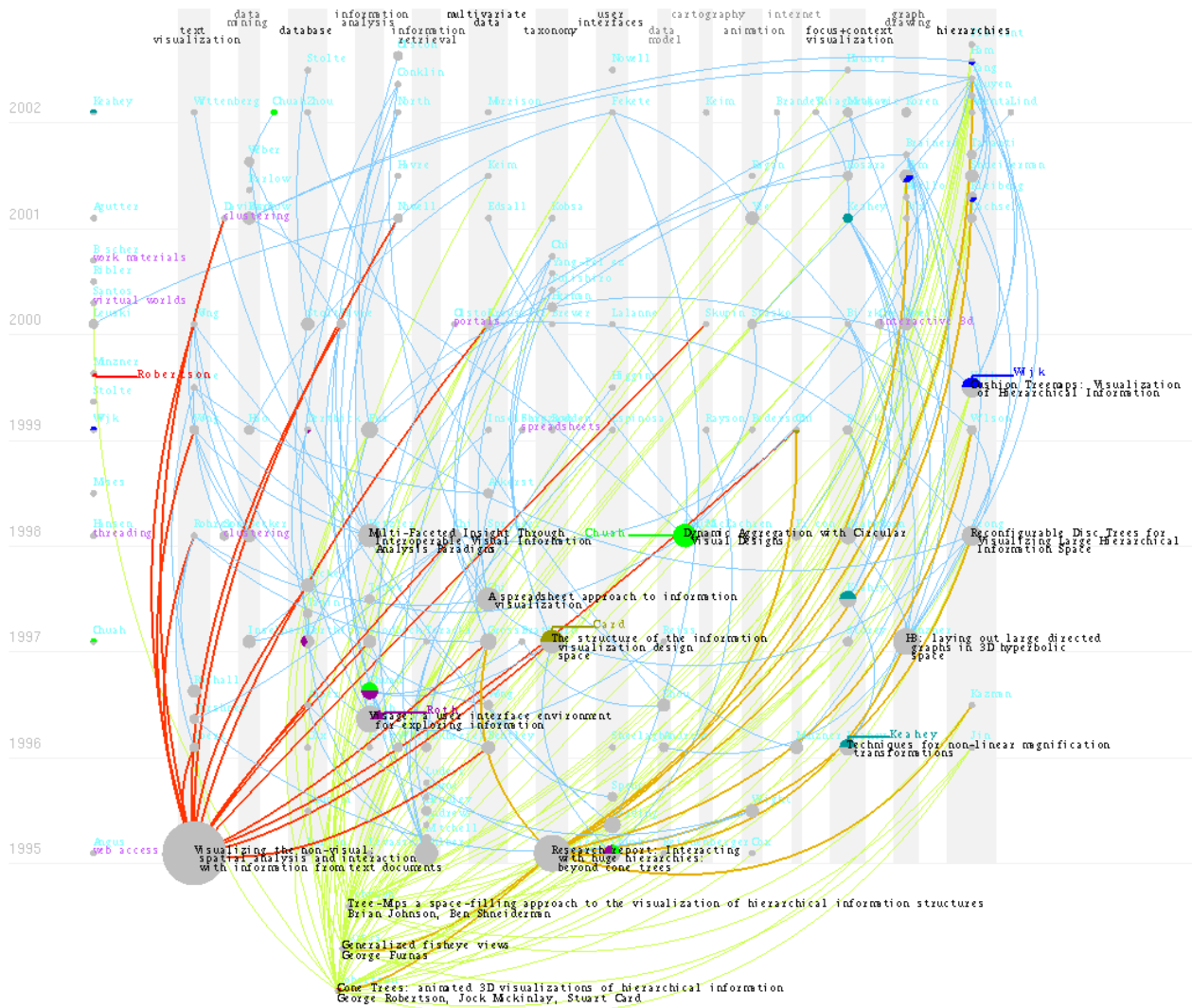
Figure 2: Overview of the IEEE Symposia on Information Visualization. Various aspects of the symposia are shown at once in this visualization, among them: (1) important keywords and all the papers under them, (2) related research areas, (3) citations, (4) authors, (5) references, (6) important authors, (7) important papers, and (8) important external papers. This visualization can be used for two purposes: (1) specifics and (2) overview. For specifics, the user focuses one aspect of the visualization. For example, if the user is interested in the two important papers and their citations, they just have to mentally focus on the two large circles and the red and orange lines. For overview, the user looks at the display, with no particular focus, and gets a general impression of the history of the Infovis Symposia.