Icon Abacus and Ghost Icons

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ABSTRACT
Two-dimensional icon layouts are a familiar way to present information about the documents in a collection. We present two techniques that make collection visualizations more informative. Icon abacus uses the horizontal position of icon groups to communicate additional document attributes. Ghost icons show which documents are linked from a selected one by adding temporary icons and by highlighting or dimming existing ones.

Categories and Subject Descriptors
H.3.7 [Information Storage and Retrieval]: Digital Libraries – user issues.

General Terms

1. INTRODUCTION
Visualizations of document collections can help people perform in-depth reading, during which many documents on a topic are read over an extended period of time. A visualization can help the reader find a good document to read next or re-find a previously-viewed document by clearly communicating those document attributes that are most relevant. For example, the user may wish to find documents with a given author, topic, rating or date or documents cited by or linked from a given document.

Document collection visualizations often lay out icons in two dimensions, where each icon represents a document. Document attributes are shown by the color, shape, size, or position of the icons. Position is a particularly effective way to display data because the human eye accurately distinguishes many different positions, and because it works for color-blind users. In addition, if shapes are grouped spatially, users can visually scan the objects in a group rapidly, while ignoring shapes in other groups.

One way to encode attributes positionally is to use grids. However, grids can waste a great deal of space in the common case that data is dense in some parts of the grid and sparse in others. We have developed two new document collection visualization techniques, called icon abacus and ghost icons that use positional coding to communicate document attributes and relationships in a way that uses screen space efficiently.

2. ICON ABACUS AND GHOST ICONS
Icon abacus is like a two-dimensional grid except that the boundaries between cells in a given row need not be a straight line, but are allowed to be jagged. Cells from different columns

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Figure 1. Visualizing a document collection with both icon abacus and ghost icons.

are given different background colors to make the boundary between cells easier to see. For example, in Figure 1, the documents are sorted vertically into sections by date. In addition the display communicates a second attribute, such as whether or not a document has been read, by putting it in either a left-justified or right-justified span of icons. The left-justified icons have a buff background color while the others are on a white background. An icon abacus can save as much as a factor of three over grids in some cases, with typical values ranging from 50% - 89% for the five icon-per-line abacus shown here.

Ghost icons are a way to show all of the documents that are cited by a given document. Instead of providing a list of links to cited documents as is done in some on-line citation databases, the ghost icons approach adds a temporary icon for each cited document, sorting the temporary icons into the same spatial groups as existing icons, so that the attributes of the cited documents can be easily compared to those of existing documents. Highlighting and dimming are used so four icon types can be distinguished: the selected icon, cited icons already in the collection, other cited icons, and the rest of the icons. Animation is used during the transition into ghost icon mode, so it is easy for the user to see where the new icons are being added and where existing icons are being moved. Icon abacus and ghost icons can be used together so document metadata and citation relationships appear together in the same compact layout.

3. REFERENCES