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Ray labeling: dynamic directional labeling for compact term hierarchies

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text analytics. As described by Fekete and Plaisant [4], the labeling problem consists in finding a position for each label in such way that it is readable, related to its graphical object and non occluded by any other object. A major difficulty lies in defining appropriate labeling strategies in line with the user tasks and the visual encoding.

On the one hand, static labeling displays as many labels as possible at object position, causing visual clutter in dense areas due to label occlusions. DocuBurst [3] adjusts label size and orientation in a Sunburst depending on node size and orientation. While undisplayed labels induce important information loss, interactive adjustment of node size reveals hidden labels but distorts the initial visual encoding. On the other hand, dynamic labeling shows a subset of labels on demand. More informative than single label tooltips, excentric labeling shows the labels of multiple nodes falling in the focus area. The labels are shown outside of the circular neighborhood of the mouse pointer and are linked to their object by a line.

Several extensions address limitations of excentric labeling in dense areas, e.g. by adding label scrolling and focus adjustment [2], or by clustering objects and displaying details on user interaction [5]. More recently Haunert and Hermes optimize the placement of labels around the focus area [6].

3 THE RAY LABELING TECHNIQUE

In adjacency-based implicit tree visualizations, the nodes of any root-to-leaf path are aligned. In a Sunburst they fall on a radius, whereas they are laid out in the vertical direction in a top-down Icicle plot. Hence, any straight line, or *ray*, following the dominant direction of the visualization will fully delineate a root-to-leaf path. Based on this property, ray labeling consists in drawing a dynamic ray at the mouse position and placing node labels along the ray as in Figure 1(c)(d). This dynamic directional labeling strategy aims to support tasks for which node sequence is of interest to the analyst, which is true for term prefix trees. As the mouse pointer moves from left to right across an icicle plot, the analyst can quickly inspect all term sequences. Sweeping around the center of the Sunburst achieves the same.

Ray labeling can be tweaked in many ways. First, labels can be placed on one side of the ray or alternate on both sides. We expect the former to work better for reading term sequences. Labels can also be separated from the ray by a gap to avoid occluding the graphical representation of nodes, similar to what is done in excentric labeling. Label orientation is another parameter that can be adjusted dynamically based on ray direction for optimal reading comfort, or be fixed. All of these options may impact the usability of the proposed technique, and must be thought out carefully and assessed in a future user study.

Our present implementation of ray labeling adopts dynamic label orientation, as shown in Figure 2. The side of the ray that labels take may be fixed or change dynamically so that labels always follow the ray movement instead of getting in the way of user interaction. To handle very long term sequences, it is also enhanced with an optional 1D fisheye distortion along the ray, in such a way that labels do not overlap, have a readable font size and are close to the objects in the focus area.

4 DESIGN OF A CONTROLLED EXPERIMENT

We intend to compare ray labeling to excentric labeling as described in [4]. The comparison is based on two tasks: 1) finding a sequence of terms; 2) finding multiple suffix sequences that are very distinct in the context of a common prefix sequence. We are considering a between-subject experimental design such that the subjects will use either ray labeling or excentric labeling to complete both tasks, on four different tree structures, two trees using a Sunburst, and the other two using an Icicle plot. So, each subject will see one labeling technique only. To minimize bias, we will randomize tree and visualization order for each subject. One supplementary tree will be

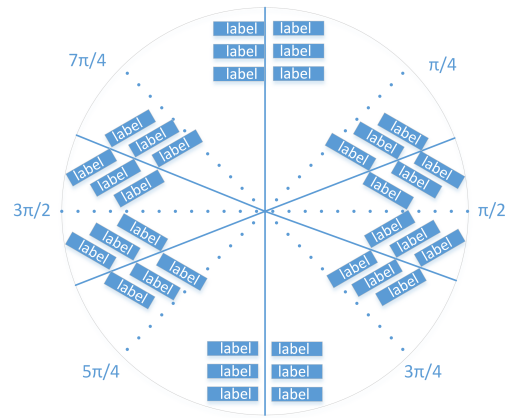


Figure 2: Label orientation changes automatically according to the angle of the ray and the label alignment.

used to train the subjects on the labeling technique, the visualization and the task execution. To select the target term sequences, the subject will click on the last node of the sequence. User performance is captured by task completion time and accuracy. Accuracy is measured by known edit distance functions e.g. Levenshtein or Jaccard between the target sequence and user answers for task 1 and between the selected suffix sequences in task 2. The results are then analyzed tree by tree.

5 CONCLUSION AND FUTURE WORK

The ray labeling technique aims to facilitate the quick visual inspection of large families of term sets, organized in an adjacency-based implicit tree layout. We have implemented it for Icicle plots and Sunbursts. It is enhanced with the automatic adjustment of label orientation and an on-demand fisheye interaction to handle long sequences. In future work, we would like to run a user study to compare it to excentric labeling. We also intend to study its generalization to other visualizations, e.g. to help explore stacked visualizations such as theme rivers.

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