Voronoi Treemaps in D3

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ABSTRACT
Blah blah blah

1. INTRODUCTION

Treemaps are a category of visualizations used for displaying hierarchical data. While node-and-edge diagrams are often used for visualizing hierachical structures, treemaps offer some significant advantages. Primarily, treemaps are space-filling, and therefore allow each node in a hierarchy to have more viewing area devoted to it than in a node-and-edge diagram. This allows both larger hierarchies to be visualized, as well as more detail to be shown on each node, such as additional text, colors, or glyphs to show attributes of the node.

The majority of treemap layouts used are variants of rectangular treemaps. These Have the advantage of being relatively fast to layout and in cases of limited scale produce reasonably understandable treemaps. However, there are three drawbacks to rectangular treemaps.

First, as hierarchies become deeper, the treemap cells can become increasingly extreme in aspect ratio, resulting in narrow rectangles more difficult to see than if their area was distributed in a more square-like space. This problem is mostly mitigated by various tweaks to the treemapping algorithm to try to keep the aspect ratio of regions close to one.

Second, the borders between different regions in the hiearchy can become difficult to see. In particular, two cells neighboring one another in the treemap but not siblings in the hierarchy can appear to share a common edge delineating the same inner node is their parent, when this is in fact not the case. Finally, rectangular treemap algorithms naturally only fill rectangular regions which could be undesirable for aesthetic or practical reasons.

Voronoi Treemaps eliminate these problems. Firstly, Voronoi Treemap cells are arbitrary polygons but as will be discussed later, the generation algorithm results in generally low aspect ratio cells. Secondly, the fact that Voronoi Treemap cells are arbitrary polygons means edges between cells will fall at any angle, rather than only vertical or horizontal, and so two neighboring cells will generally never have a continuous-looking edge unless they are in fact siblings in the hierarchy and thus share the edge of their parent node's cell. Finally, Voronoi Treemaps can be produced for any arbitrary polygonal region, and so do not restrict the shape to be filled by the treemap.

Multiple Voronoi Treemap algorithms have been created in recent years (CITE). However, none are available for use in a web framework. Our work has been to implement one of the fastest algorithms (CITE) for use in the D3 web framework. Despite the optimizations employed by the algorithm creators, generation of a Voronoi Treemap is still a computationally intensive task. Therefore, we have additionally written the D3 module with features to try to allow Voronoi Treemaps to be used for web visualizations without causing a poor user experience even on complex datasets.

The remainder of the paper is structured as follows: Section 2 has a discussion of related work including a brief introduction to Weighted Voronoi Diagrams and a discussion of the algorithms created for Voronoi Treemaps. Section 3 describes the implementation of our work in D3 and optimizations added for client-side web usability. Section 4 shows the use of our framework on several datasets and an evaluation of the computational burden of our system. Section 5 discusses the potential applications of our system. Section 6 concludes with proposals of future work to be done in this space.

2. RELATED WORK

3. METHODS

4. RESULTS

5. DISCUSSION

6. FUTURE WORK

7. ACKNOWLEDGMENTS

8. REFERENCES