Designing Transparent Overlays

Lyn Bartram
School of Interactive Arts and Technology
Simon Fraser University

1 Overview

Multiple related displays and windows are common in monitoring and business environments where the user is trying to integrate different data views into a coherent information picture. Our particular application is the design of efficient visualizations for the management and operation of high-performance buildings, and our users are the planners and building operators responsible for making decisions about energy and building use in both the short and long term. Good design practice suggests that multiple variables are often best presented in a series of similarly indexed displays – the well-known "small multiples" method [1]. Sometimes, however, this approach is not optimal, especially in monitoring tasks where the allocation of display space may be restricted. For example, building operators need to monitor many aspects of building performance across a continuous time range, and to compare subsets of these ranges. Rather than replicate many data displays (one per range) it would be preferable to support overlays that subdivide the range into meaningful yet overlapping periods. We are exploring the use of transparency to visualize such event and interval overlays.

2 Transparency

Designers often use transparency in accommodating visual elements that are meant to be subtle and to float on top of the visual hierarchy. The first prototypes generated by our designers (**Figure 1**) used a series of equally transparent layers that resulted in a compositing model effect where the bottom layer in the hierarchy is the most translucent and subsequent layers on top are additively more opaque. What was immediately apparent was a "banding" effect. Instead of seeing multiple overlapping layers, people who looked at this interpreted this as a set of contiguous differently coloured bands. We investigated adding both geometric cues (the angled shower curtain effect) and interaction pointers (the arrow heads delineating an interval) (Figure 2). While this helped somewhat it did not solve the problem sufficiently. Moreover, even where the bands were the same colour and therefore hopefully should have been interpreted as at least belonging to the same level or value, contrast effects resulted in them being seen as quite different (e.g., band 2 and 4 in the zoomed-in section of Figure 2).

What may be going on here is that we are trying to create transparency without the aid of critical contextual cues called *X-Junctions* [2]. X-Junctions are defined by the presence of four contiguous regions (*q,r,s,t*; see Figure 3) of an image with a characteristic spatial arrangement. Psychophysical studies have shown that the intensity relationships between these four regions must lie within certain bounds for perceptual transparency to occur. Our challenge is both to understand whether we can use transparency without these cues, and further to determine all the appropriate cues in our toolbox needed to effectively elicit the percept of layers and visual hierarchy.

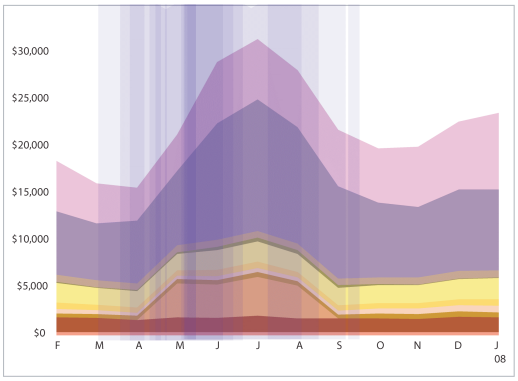

Figure 1. Transparent washes over time graph.

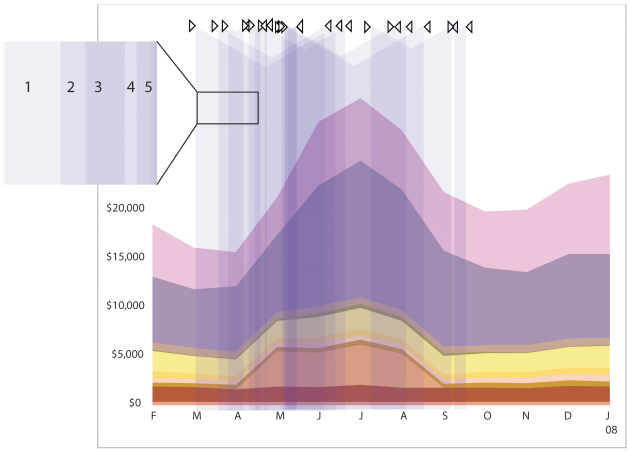

Figure 2. Adding bracket "handles"

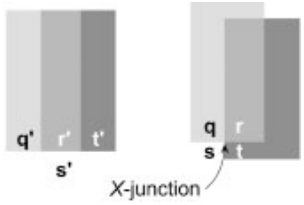

Figure 3. Spatial cues elicit transparency perception [2].

Acknowledgements

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References

[1] Tufte, E. (2001). The Visual Display of Quantitative Information. Graphics Press.

[2] Cavanagh, P. (1999). Top-down processing in vision. In Robert A. Wilson, & Frank C. Keil (Eds) MIT Encyclopedia of Cognitive Science. pp. 844-845.