Design Elements and the Perception of Information Structure

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Abstract
Can background structural elements of information visualization, even minor and seemingly meaningless design properties, contribute to the perception of the data's semantic properties? By altering simple design elements of five types of basic charts, we significantly affected participants' subjective ratings of visualized data.

Results
All of the design elements except for outlined area produced significant differences in at least one of the ten semantic variables we tested. We also found a number of significant interactions among the four design elements. We found few significant interactions among chart type and design, suggesting that these design effects are largely constant across the visualization types we chose.

We chose four design elements which we hypothesize to carry structural information about data: filled area, bordered parts, joined/separate parts, and outlined area.

Our participants rated imaginary companies based on simple charts of departmental spending. Reactions to a chart often reflected its implied physical properties, which were sometimes metaphorically extended to semantic judgements of the data.

We applied these design elements to five different simple chart types. Each chart type comes in sixteen configurations, demonstrated below on stacked bars.

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