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Toward an Analysis of Practitioner-Oriented Resources for Visualization Design

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ABSTRACT

Numerous online resources for supporting visualization design have been developed in recent years. Although many have become popular among practitioners, they have not received systematic analysis in the academic literature. Here we present a preliminary analysis focused on one subset of online practitioner-oriented resources—those that aid in choosing visualization techniques based on a designer's communicative intent. We report the results of a comprehensive search for such resources, and discuss findings of an analysis based on multiple characteristics including communicative intent. Finally, we discuss implications and future research directions.

Index Terms: Human-centered computing—Visualization—Empirical studies in visualization

1 INTRODUCTION

One challenging aspect of visualization design is having to choose among different yet equally viable alternatives throughout a design process. To help designers navigate such decisions, various forms of design support have been developed (e.g., methods, models, and frameworks). Popular forms of support for visualization designers (e.g., [12]) focus largely on issues related to user goals, tasks, data types, visual encodings, and interaction techniques, yet place little focus on a designer's goals and intentions [15]. Supporting design decisions based on designer intent offers a path through a design space that can complement decisions based on other factors. To illustrate, consider an example involving a complex dataset that comprises many different data types and relationships. Even if user tasks and appropriate visual encodings can be identified, there is no single "correct" visualization technique for the situation. Rather, a designer must form an intention about what to communicate—e.g., hierarchical relationships, part-to-whole relationships, temporal changes, or information flow—and make a judgment about which visualization technique to employ. The designer's intention may be informed by factors such as data types and tasks, yet communicative intent is still a distinct factor that can bear substantively on design outcomes. Catalogs and other forms of design support that help designers make decisions based on communicative intent can be beneficial, yet they are currently lacking in the literature.

Although a focus on communicative intent is missing in scholarly works, practitioner-oriented resources appear to focus strongly on this theme. Numerous resources aid designers in choosing visualizations by proposing similar questions regarding communicative intent: "what do you want to show?" [1, 13],"what story are you trying to tell?" [11], "which data relationship is most important in your story?" [7]. Common answers include *hierarchy*, *flow*, *comparison*, *distribution*, *temporal change*, and *part–to–whole*. After a designer selects one of the available answers, these resources typically suggest a set of visualization techniques from which a designer can choose. For instance, selecting "part-to-whole" may lead to a set of techniques including *treemap*, *sunburst diagram*, *stacked bar graph*, *marimekko chart*, *donut chart*, and *pie chart* [13], effectively reducing the space of possible alternatives from which a designer can choose. Although many of these resources appear widely used, there has been no systematic analysis of them to date. Since design methods and models in the visualization literature often aim to be useful for practitioners, it is worthwhile to investigate the supports designers are actually using.

Here we report on our initial analysis of online practitioner-oriented resources that support visualization design based on communicative intent. We describe our method, findings, and plans for future work.

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2 METHOD

To identify resources for analysis, all 3 authors searched online independently using Google and Twitter, and also searched for scholarly articles that discussed online visualization resources. We searched using the following keywords: "chart", "visualization", "designer", "catalog", "resource", "practitioner", "online", "model", "method", "framework", and their various combinations. Our initial search was broad, the only criterion being that a resource should be online. All 3 authors met multiple times during the search period. Early in the process we decided not to include visualization programming libraries and frameworks unless they provided explicit support for designers to make decisions about which visualization(s) to use. At this point we included resources such as the D3 gallery [3] and other similar catalogs, since they are presumably intended to provide design support. Once we determined that our search was reasonably exhaustive, we recognized the need for explicit inclusion criteria, which would ensure that our final list was not too unfocused.

Final inclusion criteria. We established 5 inclusion criteria to sharpen our search—we determined that each resource should: (1) support decisions based on communicative intent; (2) be general, not aimed at highly specific data or visualizations; (3) be online; (4) be freely accessible; and (5) focus on abstract data or information.

3 FINDINGS

Our initial list comprised 23 resources; after employing the inclusion criteria, 13 were removed. Although all were online, 1 was not freely available; 10 did not provide explicit support for design (many were simply large lists of visualization techniques); and 4 were too specific to be useful in general cases. 10 resources met all inclusion criteria [1, 4–11, 13]. A summary is shown in Fig. 1. For each resource, we counted the total number of visualization techniques it contained and the number of communicative intents it included (see Fig. 2 for more detail). We also identified whether it (1) was interactive or static, (2) had tutorials for creating visualizations, (3) had examples of visualizations, and (4) had design tips for selecting or implementing the visualization techniques.

After identifying these 10 resources, we extracted all communicative intents from each one—76 in total. We merged the overlapping ones (shaded cells in Fig. 2), which left 25 distinct intents. We further removed 3—two were not formulated as communicative intents ("table" from [10] and "reference tool" from [13]). Resources [5,8,9]

had an "other" category, which we also removed since it is too vague to be of much use here. The final 22 are shown in Fig. 2.

	Resource	# viz	# categories	Interactive	Tutorial	Examples	Design tips
R1	The Data Viz Project	154	7	■		■	
R2	The Data Visualization Catalogue	60	16	■	■	■	■
R3	Chart.Guide	70	7	■	■	■	
R4	R Graph Gallery	173	8	■	■	■	
R5	Python Graph Gallery	46	8	■	■	■	
R6	Financial Times Visual Vocabulary	72	9	■		■	■
R7	Chart Chooser (Juice Analytics)	17	6	■	■	■	
R8	Qualitative Chart Chooser (v3)	20	5			■	■
R9	Choosing a good chart	23	4			■	
R10	Classification of chart types	27	6			■	■

Figure 1: 10 online practitioner-oriented resources meeting the inclusion criteria. Rows are resources, columns are characteristics.

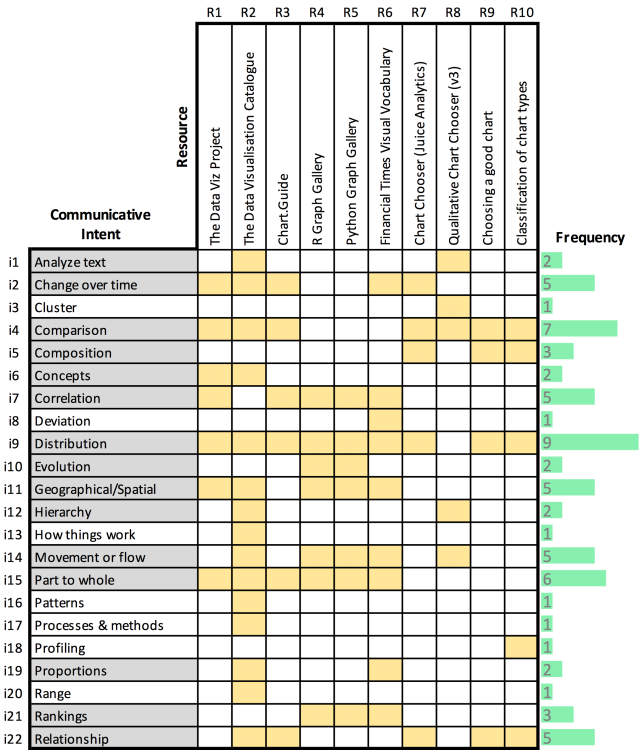

Figure 2: Overview of communicative intents (rows) from the analyzed resources (columns). Shaded intents were present in multiple resources. Frequency bars show the number of times an intent appeared across the resources.

4 Discussion and Future Work

Our analysis reveals a number of interesting points. **First**, practitioners are indeed using forms of design support based on communicative intent. They may even be using them in place of more formal design supports in the visualization literature, although we cannot be sure as we did not set out to investigate this issue. Future studies that examine relationships among visualization design theory and practice, perhaps in the spirit of Rogers [14], can shed light on this issue. **Second**, some intents appeared multiple times in the analyzed resources (see frequency bars in Fig. 2). For example, *distribution* appeared 9 times, *comparison* 7 times, *part–to–whole* 6 times, and *relationship* 5 times. These frequencies may suggest popularity or importance among practitioners, indicating areas in which greater design support can be pursued. **Third**, methodological details for any of these resources are virtually nonexistent, and their development seems to be based mostly on practitioner experience and intuition. **Fourth**, vocabulary across resources is not consistent, making it harder to identify whether terms refer to the same ideas or not. **Fifth**, levels of abstraction differ significantly both within and across resources.

This work highlights a potential gap between visualization theory and practice, and suggests avenues of future research that can benefit visualization practice. Although multiple options for building on this work exist, we plan to engage in the following next steps: (a) expand our scope to include non-online media (e.g., books and papers); (b) develop a comprehensive typology that helps designers choose visualizations based on communicative intent, avoiding the problems mentioned above; (c) integrate both cognitive and observational advantages [2] into the typology to create a larger catalog that supports visualization design; and (d) develop an online interactive version of the catalog to make it widely accessible to practitioners. Our hope is that this work will spur more investigation into supporting design intent of various kinds, and will lead to more actionable forms of design support for visualization practitioners.

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