

# Chapter 1

## Aesthetics in Data Visualization: Case Studies and Design Issues

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### ABSTRACT

*Data visualization has been one of the major interests among interaction designers thanks to the recent advances of visualization authoring tools. Using such tools including programming languages with Graphics APIs, websites with chart topologies, and open source libraries and component models, interaction designers can more effectively create data visualization harnessing their prototyping skills and aesthetic sensibility. However, there still exist technical and methodological challenges for interaction designers in jumping into the scene. In this article, the authors introduce five case studies of data visualization that highlight different design aspects and issues of the visualization process. The authors also discuss the new roles of designers in this interdisciplinary field and the ways of utilizing, as well as enhancing, visualization tools for the better support of designers.*

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## **INTRODUCTION: DATA VISUALIZATION DESIGN**

Nowadays we are flooded with data of diverse kinds due to the increasing computational capability and accessibility. Specifically, in addition to public data available on the Internet (e.g., census, demographics, environmental data), data pertaining personal daily activities are now more easily collected, for example, through mobile devices that can log people's running distances and time or their manual record of nutrition consumption. Due to such expanded sources of data, there appear new applications that involve data collection, visualization, exploration, and distribution in daily contexts. These applications do not only display static information but also let users navigate the data in forms of interactive visualizations. This emerging trend has brought both opportunities and challenges to interaction designers to develop new approaches to designing data-based applications.

Conveying information has been one of main functions of graphic and communication design since the analog printing era. The focus of information design is the communicative and aesthetic presentation of structured data as in an example of subway route map. In treating the increasing volumes of unprocessed data accessible either from public media or personal devices, the approaches of information design are now more diverse with the influence of other disciplines (Pousman & Stasko, 2007). Specifically, unlike information design in a traditional and confined manner, data visualization starts with the data that did not proceed through structuring and exist often in large volumes and complicated formats (Manovich, 2010). Thus, data visualization requires designers to obtain diverse knowledge and skill sets in addition to their visual aesthetic senses. The new requirements include human visual perception and cognition, statistics, and computational data mining.

Moreover, as data visualization has been more broadly applied to end-user services, interaction and experiential qualities need to be more critically

considered. Those qualities of data application do not only rely on the usability of data perception or task-based navigation but also build up on aesthetics that affords engaging and exploratory data navigation. The latter have been remained as a less investigated area than the former due to the strong disciplinary tradition of data visualization in computer science and cognitive science.

Furthermore, visualizations are presented, used, and shared in diverse contexts from science labs to online journalism sites, to personal mobile devices. This means that data visualization has become a truly interdisciplinary field of research and practice by weaving informatics, programming, graphic design, and even media art (Vande Moere & Purchase, 2011).

In what follows, we overview current design approaches and tools for data visualization, then introduce five case studies for further discussion of design issues, process and tools in regard to aesthetics in data visualization.

## **CURRENT TOOLS AND PROBLEMS IN AESTHETICS OF DATA VISUALIZATION**

In recent years visualization scientists, mostly from computer science, have suggested many visualization-authoring tools with a hope of expanding the creators of visualizations and the contexts of their use. We suppose these tools are largely categorized into three kinds—1.) a standalone programming language and its Integrated Development Environment (IDE) such as Adobe Flash ActionScript (Adobe) and Processing (Processing 2), 2.) online or installation-required programs that provide visualizations of given chart topologies, such as ManyEyes (IBM) and Tableau Public (Tableau, 2013), and 3.) libraries, toolkits or component model architecture integrated with existing programming language, such as d3.js (Bostock, 2012) and gRaphaël.js (Baranovsky) for web documents.

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