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Data visualization: basic principles and common types

The proposed paper is devoted to the review of the most common types of data visualization. The author examines the fundamental design principles and explores the impact of design on perceptions of big amounts of information.

Journalists have been using data for a long time. Data explain the world, so it is hard to imagine journalism without data. The rapid development of digital technologies in the 21st century has created new opportunities for journalists working with data. It is difficult to disagree with Alexander Howard that data journalism is more than traditional journalism with more data [1].

There are several basic steps in working with data: data compilation, editing and cleaning, data analysis and visualization. Authors of the Data Journalism Handbook explain that data visualization merits consideration for several reasons. Not only can it be strikingly beautiful and attention getting□—□valuable social currency for sharing and attracting readers – it also leverages a powerful cognitive advantage: fully half of the human brain is devoted to processing visual information [2]. Data visualization is a powerful way to display data. The goal of the journalist is to turn data into interesting story. Therefore, visualization should be aesthetically attractive and understandable at the same time.

Data visualization can show change over time, compare values or show connections. The basic principles of data visualization are:

- accuracy and reliability of data;
- possibility of data verification;
- completeness of data;
- expressiveness. A set of facts is expressible in a visual language if the sentences (i.e. the visualizations) in the language express all the facts in the set of data, and only the facts in the data [3];
- effectiveness;
- understandability.

Qualitative visualization avoids data distortion, logically organizes large volumes of information, provides the ability to compare data, and so on. The journalist should choose the type of visualization depending on the purpose. He are encoding data using visual cues, or "mapping" data onto variation in size, length, slope, shape, volume or color, and so on.

Each charts (irrespective of type) should have a heading, subtitle, axis labels, legend, and data source [4, 18]. There are several common types of data visualization:

- *pie chart (circle chart)* illustrate numerical proportion; the arc length and angle of each sector is proportional to the quantity it represents;

– *donut chart* is divided into segments, the arc of each segment shows the proportional value of each piece of data;
– *bar charts* (vertical, horizontal, multi axis, stacked, stacked groups) uses rectangles with heights proportional to the count and widths equal to the “bin size” or range of small intervals;

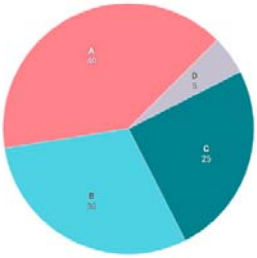

Fig. 1. Pie chart

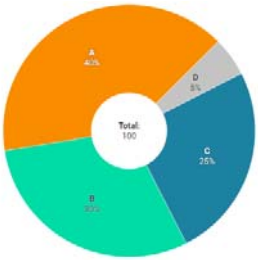

Fig. 2. Donut chart

Fig. 3. Bar chart

– *line charts* is represented by a series of data points connected with a straight line. Line charts are most often used to visualize data that changes over time;

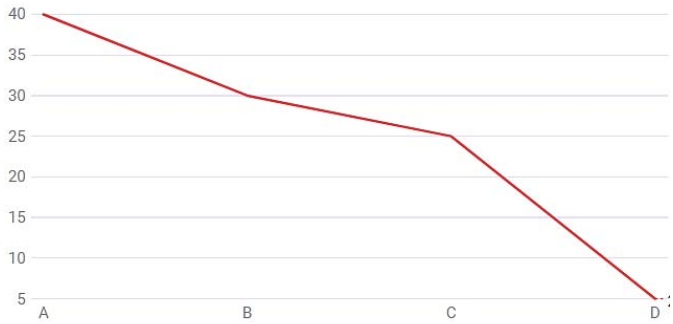

Fig. 4. Line chart

- *area chart* is a line chart with the areas below the lines filled with colors;
- *scatter plot* displays values for two variables for a set of data as a collection of points;
- *bubble chart* is a variation of a scatter chart in which the data points are replaced with bubbles, and an additional dimension of the data is represented in the size of the bubbles.

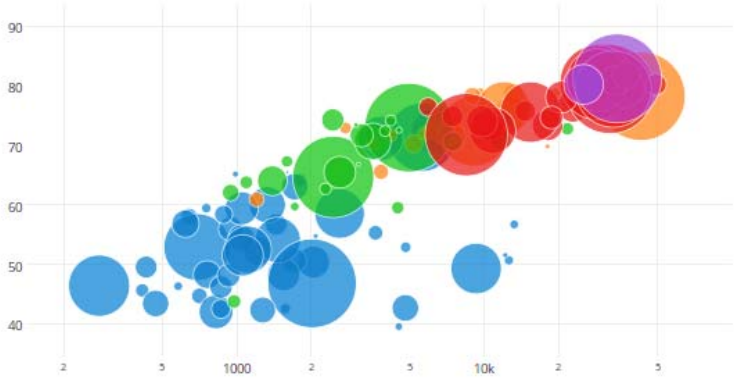

Fig. 4. Bubble chart

Conclusions. Effective data visualizations enable the user to discover a large amount of information without spending a lot of time. There are many ways to visualize the data; we have reviewed only the basic simple charts. Vertical column charts can be used to illustrate change over time. Horizontal column charts can be used for comparison of quantities. We can mix and match bar and line charts to provide a clear visual distinction between datasets. The structure and content of the data visualizations should be readily and accurately perceived and comprehended.

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