Information Visualization
Assignment 2 - Creating Interactive Visualizations

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Visualization: https://piotrlenczew.github.io/artvis-visualization/

1. Introduction & Assignment 1 Recap.

In the first assignment, we defined some target users and sketched up the visualization. Attending to the feedback received in that assignment, we now only focus on one target user: journalists.

Just as a recap, the main goal of our visualization is to show in a comprehensible way the distribution of different art exhibitions around the whole globe. Initially we focused on Europe, but we are extending to the whole world. With that we try to illustrate what were the most influential places where art was exhibited in the beginning of last century.

To do so, a world heatmap is used as the main view, as it presents the distribution of exhibitions clearly in an intuitive way. There is a blue shade scale that colors each country depending on the quantity of art exhibitions, from light to dark (less to more).

As it is important that the user is aware of how the number of exhibitions changes during the years, the number of exhibitions is not normalized per year, meaning the years with more exhibitions in total will show an overall darker heatmap than the years with less number of exhibitions. The range slider will allow the user to filter information per each year. Shades differences are maintained to still be able to differentiate the number of exhibitions in different countries in the selected year.

Furthermore, the user is able to click in each country to see how many exhibitions were held in it. By clicking, the total number of exhibitions in the country is shown in a big font and a bar chart is plotted to specifically see the exact number of art events held in each city. Apart from that, we included extra information in this assignment:

- Bar chart coloring. We use a stacked bar chart with different colors to be able to distinguish how many exhibitions from a certain type (group, solo, auction) are held.

- Artwork names. A list of the artwork names exhibited is shown per country.

2. Visualization analysis.

Let's deep into the specific aspects of our visualization:

- **Techniques**: world heatmap as the main visualization tool, helped by a year range slider to filter the whole time period, a bar chart to easily communicate the amount of exhibitions in each country's context and a list of artwork names exhibited per country.

- **Domain.** As mentioned previously, our user target is a journalist in the artwork domain. The previous specified techniques match perfectly this domain as information is shown in the most clear and visually appealing way posible, easy to understand by any person without an engineering background.

  The time domain of the artworks is addressed with the range slider, making it easy to understand in which specific year exhibitions were more/less popular. The geographic factor is perfectly addressed with the world map, as regions are differentiated with color shades attending to the number of exhibitions. Specifically for a journalist numbers are important, since usually their main goal is to create attractive titles with outstanding information and this visualization shows quantitive data about exhibitions and their popularity back in the day. Additionally, with just a click the most popular titles in a specific year are shown, making it easy for journalists

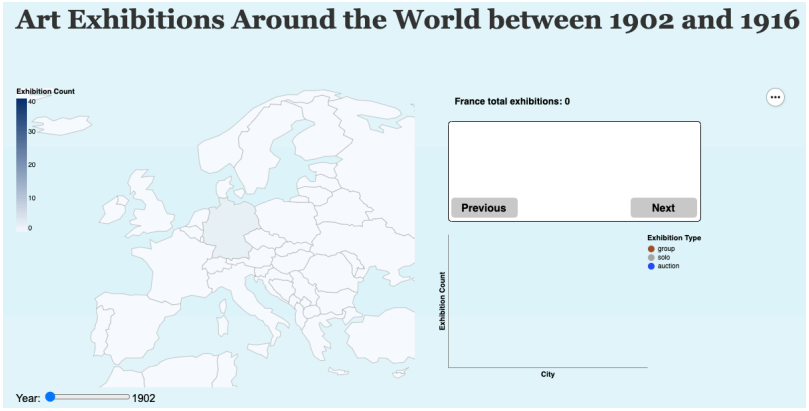
to focus on the top artworks on the period, which tend to be the most interesting when trying to make a catchy article.

- **Interaction methods**: zoom, scroll and click. These interaction methods are effective in the context of art exhibitions around the world because they enable the user to easily navigate around the visualization without any code understanding or specific knowledge details.

- **Features' usage.** Zooming makes it easy for the user to deep into a specific geographic region or even a specific country that in the general world view heatmap may not be easily identified. Scrolling enables the user to navigate around the world map from side to side changing continents. Moreover, scrolling is used to select the year in the range slider in the bottom part of the visualization. Finally, clicking plays an essential role as it is the way the user can select a specific country to see its detailed information and navigate in the top artwork's window (next & previous).

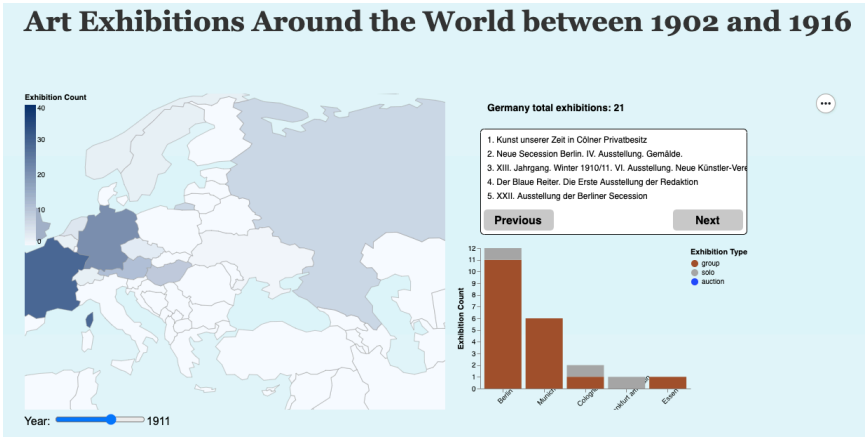
3. Final visualization description.

- **Main view.**



In this screenshot you can appreciate the main default view. The world map is focused on Europe, since most art exhibitions were held in that world region. In this case the detailed information about France is shown. You can see the stacked bar chart is empty, as well as the name list, because there where no art exhibitions in France in 1902.

- **Main view after year filtering and world map scrolling.**



Now, in this photo you can see the year and the part of the globe shown have changed. If the year changes, the amount of exhibitions varies between countries. As specified in the visualization analysis section, all the displayed information can be modified with the interaction methods. Again, you can see the total amount of visualizations is shown and the stacked bar chart has different colors depending on the type of exhibition. The names list includes the artwork titles in Germany, as it is the selected country.

4. Code overview.

The code is developed in Vega. Here is a brief overview of the different code sections:

- To begin, the **metadata** (general configuration) and the **signals**, which control the interactions and dynamic states in the visualization, are configured. These are asome signals defined (between others):
    - delta: Calculates the differences in coordinates between the start and the drag.
    - rotateX and centerY: Adjust the map rotations in the horizontal and vertical axes. rotateX changes based on horizontal scrolling. centerY is limited to a range of -60 to 60 to avoid extreme rotations.
    - selectedYear: Slider that allows you to select a year between 1902 and 1916. The initial value is 1908.
    - clickedCountry: Captures the identifier of the selected country when clicked.
    - totalExhibitions: Calculates the total number of exhibitions for a selected country.

- The **projection** is Equal Earth and it is adjusted dynamically.

- **Data section**: some processing has been done to only display the necessary information in a rational way, e.g:
    - countries: Load world map geographic data from a TopoJSON file.
    - exhibitions: Data about exhibitions, loaded from a CSV file.
    - country_names: List of country names and their identifiers.
    - countries_with_names: Link geographic data to country names using lookup.
    - exhibitionsWithoutVenues: Add exhibitions by removing duplicates based on country, city and type.
    - countryYearExhibitionCounts: Calculates the number of exhibitions per country and year.
    - maxExhibitionCount: Determines the range of exposure counts for color scales.
    - filteredByYearCountryExhibitionCounts: Filters exhibition data by the selected year.
    - More…

- **Scales**.
    - colorScale: Linear scale for coloring countries based on exposure count.
    - Color range: from light blue (#f7fbff) to dark blue (#08306b).
    - xscaleCountry: Band scale to position cities in the bar chart.
    - yscaleCountry: Linear scale to determine bar heights.
    - colorTypeScale: Ordinal scale that assigns colors according to the type of exposure (bar chart coloring).

- **Marks (graphic elements).**

1. World Map
    - Shape type mark that draws the countries.
    - Uses geoshape to project country shapes with colors based on colorScale.
2. Bar Chart
    - Represents the count of exhibitions by city for the selected country.
    - As mentioned before, each bar is colored according to colorTypeScale.
3. Informative Text
    - Shows the name of the selected country and the total number of exposures.
4. List of Exhibitions
    - Box that lists exhibition titles with buttons to navigate between pages.

For more information, please see the README file in GitHub.