Data Visualization Final Project – Magellan’s Voyage

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Data Description:

The dataset was designed to outline Magellan’s famous 16th century around the world voyage from Spain to the coast of modern-day Brazil, south through the aptly named Strait of Magellan and then into the unknown Pacific Ocean, past some scattered atolls and into the modern day Philippines where he ultimately perished. The animation concludes showing his crew’s finish to the voyage through the Indian Ocean and around the Cape of Good Hope in South Africa.

The dataset was manually created using an online latitude and longitude generator [1] in text format, dates were added where known [2] and type of visit was encoded by marker style manually for approximately fifty data points over the roughly three year voyage.

The motivation came randomly when considering the map functions shown in the practical part of our class and was initially going to outline a Portuguese explorer’s route as a part of my experience living abroad in Portugal and enjoying the culture and history.

Choices for Visualization:

The inspiration was simply to use the Scattermapgeo application with an animation showing movement across a globe. The inspiration came during practical classes seeing the two-dimensional mapping in Plotly and initially this was the animation – Scattermap. The idea for using an explorer’s route came from discussing Portuguese history with fellow students and having a vague knowledge of former world explorers. As a Canadian the idea of using an explorer of Canada came to mind, Thompson for instance, but somehow I decided upon Magellan’s trans-global route. The problem with this choice was the route of Magellan crosses the International Date Line in the Pacific and so during the animation the points would ‘jump’ from the far left (near Hawaii) of the two-dimensional representation to the far right (near Guam) while drawing a large line between waypoints that spanned the whole map. Enter the idea of using a globe with rotation for the user. Indeed, most of the project’s developments came from researching options in the Plotly documentation and Stack Overflow [3] and then trying to implement each change sequentially while not having a clear idea of the end result.

Reading the Visualization:

The data has been encoded as strings for names and dates and latitudes and longitudes to be plotted. The dataset is not large, a pandas dataframe of approximately fifty rows. Initially the dataset only contained important locations on the route but I subsequently added ‘pass’ points where Magellan had sailed but not stopped. The ‘pass’ points’ dates are not exact but were made manually via estimation of distances and interpolation of known dates and locations. I didn’t attempt to reduce or clean any data for the user after deciding not to use certain datapoints or discarding the idea of datetime objects, all this data was left into the dataset. Data can’t be selected explicitly by the user but can be hovered over for more information on coordinates, name, and date. The legend was made manually in GIMP [4] software on the background image [5] as I struggled to align a legend using the different marker styles from the waypoint trace on the image. I think the visualization is fairly self-explanatory in the slider showing the number of days that have passed since the beginning of the voyage (manually created timedelta category) and legend markers indicating a basic ‘event’ that occurred at each location. These ‘events’ were ‘visit’, ‘pass’, ‘death’, ‘start/end’. The latter giving the voyage began and ended in the same location.

Discussion:

I initially thought I would be ambitious in creating hover over images and interactions where the user could click on a way point and see what occurred at that location and at what point in time. The idea was to have a type of instructional interactive animation where the user could pause the animation, click a waypoint, and an image displaying information on that waypoint with small inset picture would be displayed. This almost materialized in the Dash platform using callbacks and online images’ URLs but ultimately became complicated and the animation choppy. I found a lack of information on most waypoints other than a few major dates and visitations and so the user would have to guess which waypoints could provide this additional pop-up display option. Ultimately I abandoned this method for a simpler hover text box native to Plotly Scattermapgeo where the text would display coordinates and dates on a high-contrast red background (red being used throughout the visualization for contrast to the other images and globe). I think this makes the animation simpler and easier to navigate, pun intended.

Another ambitious idea, although likely not possible using Plotly, was to black out unexplored areas and ‘reveal’ them as Magellan sailed. In this way the waypoints would essentially be shown as moving into darkness and the globe would be ‘discovered’ as the user moved forward in the animation. This doesn’t seem to be an option in Scattermapgeo after some investigating. I also attempted to use Dash – and left the code in to illustrate my difficulties. I found the Dash platform more confusing and difficult to use although I can recognize its power to create more interactive animations. I felt I was spending too much time on too ambitious an idea (the blacked out unexplored areas of the globe) which Dash may not be capable of making anyway, and so concluded with a simpler and cleaner animation.

Markers were also a moment of ambition, using various .svg files to represent different events and possibly a sailboat moving between waypoints was considered, but again, I found the Plotly/Dash framework to be difficult to navigate and online resources in the area of animations to be somewhat slim. I think these ideas would definitely improve the visualization if they were implemented by someone with more experience and knowledge.

References:

1. <https://maps.co/> was used to make latitudes and longitudes text file. Access date: April 4 2022.
2. Knowledge of the voyage was from Wikipedia and general web-based searches. Access date: April 5 2022.
3. Stack Overflow, Dash documentation and Plotly documentation were used for code which was then manipulated where necessary to serve my purpose.
4. GIMP GNU Image Manipulation Program, v. 2.1, www.gimp.org/.
5. Images were all sourced from Wikipedia and <https://pocketmags.com/ca/history-revealed-magazine/september-2019/articles/623463/magellan-s-fatal-voyage>. Access date: April 10 2022.