CSC 544 Assignment 5 (Final Project Report)

Bijan Anjavi

December 6, 2017

Goal

The goal of this project is to analyze data regarding narcotics in Iran using the "data-driven approach" to create a choropleth, and display that data over an interactive visualization. The dataset is from the Iranian Statistical Yearbook, year 1392 (2013-2014) [1]. The "data-driven approach" method is detailed in a recent data visualization paper from VIS 2016 - "A Survey of Colormaps in Visualization" [2]. This dynamic choropleth is also be paired with a linked view of a bar graph showcasing the distribution of different narcotic types for each Ostan. The combination of this linked view, as well as the different, toggle-able colors of the colormap of Iran, would give insight as to how different variables such as population, total narcotic disclosure, and the unemployment rate, interact with the drug seizure crisis in Iran.

Extended Abstract

The paper I base this project on, "A Survey of Colormaps in Visualization", is an in-depth analysis of the concept of a colormap, specifically a 1D colormap as opposed to a bivariate colormap, and how to improve its function. There are three main goals this paper set out to accomplish: (1) Review current colormap generation techniques, (2) classify colormapping techniques, and (3) create a reference for colormap choices [2]. For the final class project, I focus on the first goal - specifically, the generation of a choropleth/colormap by first considering the data and shaping the features of that visualization around the data. This is why a bar graph showing the distribution of narcotic types per Ostan was combined with the choropleth showing how population, narcotic seizure, or unemployment varies across each Ostan.

Implementation Details

This project was implemented mostly in Javascript, HTML, and CSS. The Javascript libraries used include d3, d3-queue, d3-scale-chromatic, and topoJSON. NodeJS was used for executing JavaScript code server-side, necessitated by the inclusion of topoJSON. The narcotics.csv file containing the dataset was created by me as I searched through tables in the three PDFS located in the assets folder (judicial affairs, manpower, population), and combined the data into a table with records for each Ostan.

Captures of the working demo, the sources of data from the Iranian Statistical Yearbook for the CSV file I wrote, and the paper this project was based on, can all be found in the **assets** folder in the zip turned in. The project can be run in a repository running NodeJS and visting the localhost address (index.html is the homepage).

The Future

As I was working on this project, I realized there was so much more I could do in order to make this a really insightful visualization. On my to-do list is the following:

- Fix the button issue - currently, I have to manually change the var mapType to the type of choropleth and legend I want ("narcotic", "population", or "unemployment"). I did not have enough time to fix the button issue not correctly changing this var.
- Use c.tile.openstreetmap to add background of surrounding countries to the iran-ostan map, improving the iran-ostan map. This will help users remember that Iran shares a border with Afghanistan and Pakistan (responsible for some of the world's largest opium production, in a region referred to as the "Golden Crescent").
- Create a new csv file containing the x- and y- coordinates of several drug rehab centers in Iran, and plot their location on the iran-ostan map. There are not as many rehab centers as there should be to combat a crisis of this scale, in my opinion. I would like to implement this feature to contrast the severity of the opioid crisis with the scarcity of medical resources (although this has improved greatly in the last few years since the dataset became available).
- Incorporate narcotics, population, and unemployment data for as many years as possible into this visualization. There is data available back from the earliest years of the Iranian statistical yearbook publication. I would use this time data to add an interactive slider that would allow a user to go through a period of years (e.g. 1994 - 2014) and see how the colors on the map per Ostan change (e.g. did a particular Ostan experience a lessening in unemployment, an increase in narcotic seizures, etc.).
- Make improvements in the overall layout, user experience, and interaction. Might need to look into some more javascript libraries to help create a really smooth and clean visualization.

A Note on Ethics

The ethical nature of this choropleth and its depiction of the chosen variables lies with the dilemma of extraneous variables. Such variables include drugs disclosed / seized not being an accurate way to measure the severity of the drug epidemic, external third-party variables not considered such as population density, etc. If someone recreating this project were to take advantage of a user's lack of awareness when it comes to one of these extraneous variables, they could easily use the data in a manipulative way to further a particular agenda. In simpler terms, lying by omission (not mentioning the third-party variables that could explain for a perceived correlation) could be dangerous.

Conclusion

When I first started this project in MATH 363 one semester ago, I was not particularly interested in any data sets – I just knew I found the d3.js framework interesting, and was hoping to find a data set that could make for a good map visualization project. I did not think I would find a data set that would strike a chord with my own life, and affect my post-course plans at all.

However, when I found the Iranian Center of Statistics, I came across the section in the yearbook entitled Judicial Affairs, and it was in that section I first learned about the narcotic epidemic in Iran, specifically in regards to opium. I began watching videos about the opium crisis in Iran, and how narcotics were affecting citizens of the country. After learning about first-hand experiences dealing with the situation from members of my own family, I felt a personal connection to the problem and thought learning more about it through a statistical analysis would be a great way for me to expand my understanding of the crisis. Hopefully, I can use the demo I created in CSC 544 to create a more thorough and effective visualization within the next few months. I want to create a highly interactive map visualization of the drug epidemic in Iran that really makes it clear to the common layperson what is happening in Iran and why the issue is a severe one.

References

[1] Iran statistical yearbook 1392 (2013-2014). `https://www.amar.org.ir/english`, year=2014.

[2] L. Zhou and C. D. Hansen. A survey of colormaps in visualization. *IEEE Transactions on Visualization and Computer Graphics*, 22(8):2051–2069, Aug 2016.