Global Terrorism Visualization

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Abstract

The novel visualization that I tried to do is to visualize the Global Terrorism Database (GTD) by D3.js in a way that not had been visualized before. GTD is a database of incidents of terrorism from 1970 to 2016 (with an incomplete data of 1993 due to issues with that year) which maintained by the University of Maryland. This visualization is for user centric, which means it tries to engage the user and convey insight to the audience, and it features three technical elements which are multiple coordinated views, animated view and interactive manipulation of the view.

1 Instructions

I have submitted the source code together with the dataset in a zip file, you can also get the runnable code and dataset from my Github repository: https://github.com/Hou-J/visualization_assignment4. The code can be run by PyCharm, WebStorm or other IDE as long as it has a web server to load the dataset to the explorer. I have also put it on my Github page, so it can be viewed here: https://hou-j.github.io/visualization_assignment4/.

2 Tasks

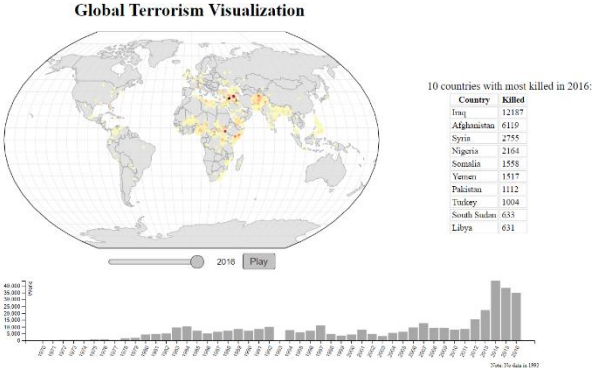
The main task of my visualization is to exploit information that has already been generated in the global terrorism dataset and generate new material in the meantime.

I am trying to visualize the global terrorism in a world map animated by years that can show the location of each incident and use a color scale to show how severe the incident was (measured by how many people died in that incident) year by year and for those incidents which died too many people, are encoded to a black rotating cross. The incident can also be clicked by the user to see more detailed information.

Other than the map, I also want to draw a table that can show top ten severe countries in that year and list the number as well.

Lastly, I want to draw a bar chart that can show the number of people died from terrorism country by country which responded by user's click to the country on the world map.

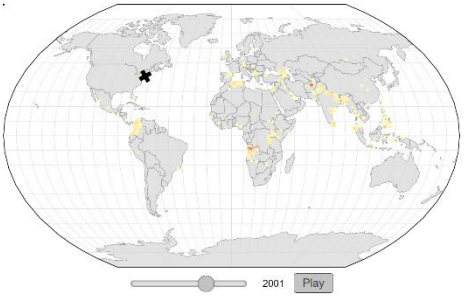
3 Introductions of the Design



There are three main views in my visualizations, the world map with incidents circles on the left, the top ten table on the right and the bar chart on the bottom.

3.1 World Map with Incidents Circles

The world map is drawn by a TopoJSON file. Each country is showed in the map as a light grey area with a darker border, and when you move your mouse to a specific country, the area of that country will become darker and the country name will show up. After clicking the country, the bar chart below the world map will be changed to show that country's data.



Each incident is encoded to a color filled circle at the location of the incident. For those incidents which died too many people, for example, 911, are encoded to a black rotating cross. The encoding channels are marks, positons and colors. When you move your mouse on the circle, the border of the circle will change to black, and after you clicked the circle or the cross, an info window will pop out which indicate the detailed information about the specific incident.

The slider behind the world map is responsible for the year change. The slider itself can be dragged by the user to view a specific year. The play button can control the animation of the world map, it can pause or start the animation and after the animation is done you can click it to play the animation again.

3.2 Top Ten Table

The top ten table is calculated by the front-end every time the world map is changed. It can show the ten most severe countries (measured by how many people died that year in the country).

3.3 Bar Chart

The default bar chart is showing the data of the whole world and with each click of the country in the map, it will change the bar chart to that specific country. The encoding channels are size and positions.

4 Dataset

4.1 Overall

Dataset Name	Dataset Description	Dataset Type
GTDFiltered.csv	A filtered GTD dataset	Tables
GTDByCountryByYear.csv	Count number of kill by country each year	Tables
world-110m2.json	World map topoJSON dataset	Geometry
world-country-names.tsv	Show country name on the map	Tables

4.2 GTDFiltered.csv

GTDFiltered.csv is a filtered GTD dataset. I pre-filtered the data and only leave the variables and data that I need to manageable size. I have filtered the data by deleting those incident which no one is died, and deleting the features like target type, weapon type, etc. The GTD is a database of incidents of terrorism from 1970 to 2016, with an incomplete data of 1993 due to issues with that year. The database is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland, College Park in the United States. It is also the basis for other terrorism-related measures, such as the Global Terrorism Index (GTI) published by the Institute for Economics and Peace.

4.3 GTDByCountryByYear.csv

The GTDByCountryByYear.csv is a dataset created by myself. It was calculated by taking the sum of each nkill (number of kills) of each country year by year.

4.4 world-110m2.json

The world-110m2.json is a geometry dataset, the format is topoJSON an extension of GeoJSON that encodes topology. Rather than representing geometries discretely, geometries in TopoJSON files are stitched together from shared line segments called arcs. The SHP (shapefile) can then be converted to geoJSON and then onto topoJSON. This is needed because D3 deals in geoJSON and topoJSON formats.

4.5 world-country-names.tsv

The world-country-names.tsv is a dataset which contains the name of each country or region. I use this dataset to put a country name on the world map.

5 Implementation Process

The whole process of my developing can be found on my Github repository. There are mainly five part of the implementation which are showing the map, showing the circles and the cross, implementation of the animation with a controllable slider, adding the top ten table and adding the responsive bar chart.

I choose this dataset because terrorism is now a serious problem and I want to see how it changed through time. Since I am new to D3.js and front-end coding, I start early on the assignment. By the help of some YouTube tutorial, I finished a simple world map on March 16 and a fully functional world map animation with the slider on March 22. After adding the top ten table, I put the assignment on my Github page and ready to write the report.

Since there is an extension to the assignment, I added another feature, the bar chart. I did not do any country selections at the beginning because neither the country codes nor the country names in the dataset I used are matched. It means I have to change the dataset by hand, which is a hard and dirty work. I wrote some script to generate the data I need during the extension period and added the feature eventually.

There are plenty of examples code about D3.js on the internet and I have list most of them on the reference.

6 Novelty and Complexity of the Visualization

I have found some visualization towards this dataset, but most of them are focusing on analyst centric, which means their main focus is on analyze the type of the attack, weapon or target. There are of course some visualization focus on the user centric, but I did not find any about visualize it by year and by country like what I made. This is a very big dataset and I found my own, and I think the overall complexity of this visualization is medium high.

7 Strengths and Weaknesses

7.1 Strength

My visualization including all three technical elements required. For the multiple coordinated views, I have a world map with incidents drawn on it, a table with top ten killed country name and figures and a bar chart indicating the world data or the selected country. For the animated view part, the world map are changed every two second together with the table. For the interactive part, the slider can be controlled by user to change the years, the circle or cross which indicate the incident can be clicked to show the detailed information widow and the bar chart can be toggled to individual country by clicking on the country on the map.

7.2 Weakness

There are many flaws in my work most of them are due to time limits and the reason that I am not familiar with front-end developing like HTML, CSS and JavaScript.

For example, the table are not centered to its header, the size of the detailed information window are not well designed when there are too many additional note.

Also, as there is no data in 1993, I should have deleted this year in the slider and the bar chart.

Other than that, the table on the right side is not related to the map, there should be a highlighting the country area feature after clicking on the country name in the table.

References

[1] Global Terrorism Database Wikipedia: https://en.wikipedia.org/wiki/Global_Terrorism_Database

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[6] Sequential, diverging and categorical color scales: https://github.com/d3/d3-scale-chromatic#schemeYlOrRd

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[8] D3 map with states and countries: http://bl.ocks.org/MaciejKus/61e9ff1591355b00c1c1caf31e76a668

[9] Animated scatterplot through time: http://bl.ocks.org/darrenjaworski/5544599

[10] Bar Chart: https://bl.ocks.org/mbostock/3885304

[11] D3.js: Create an HTML table using d3.js and JSON http://bl.ocks.org/jfreels/6734025