THE UNIVERSITY OF UTAH

Visualizing Global Terrorist Attacks -Process Book

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Website: https://sreeja-coder.github.io/DataVizProject-code/

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Overview and Motivation:

With the technological advancement in the weapon sector the threat of terror attacks has been on rise ever since. We have read about a lot of attacks that have happened globally. Processed details of the attacks. But the database of the information available is vast and it would be difficult to assimilate all the information, and the attacks have happened over a period and if we want to compare the impact or any minute details we would have to plough through a lot of textual data.

This is where data visualization steps in. The human brain processes information very differently; for us using charts or graphs to visualize large amounts of complex data is easier than poring over spreadsheets or reports or newspaper articles. Thus, Data visualization is a quick, easy way to convey concepts in a universal manner – moreover you can experiment with different scenarios by making slight adjustments.

So with our project we give a global picture of the attacks that have happened over a period of time. Which makes it easy to compare them and also derive important details of the attacks. Since it is available online it can be shared and viewed and discussed in meetings conducted across the world. Also our project allows to filter the attacks based on few parameters such as weapons used or intensity of the attacks which could help the officials extrapolate the spike in sales of weapons in black market etc.

We therefore propose Visualization of Terrorist Attacks as a tool that will help officials and interested people to gain useful insights into global terrorist attacks.

Questions:

The dataset available to us is an assimilated information about attacks from 1971 to 2018. It takes you through specific locations and the intensity of attacks and other details. The aim of our project is to visualize this heavy data in a more meaningful and useful manner and hope to answer the following questions:

1. Which is the most active terrorist group in a country over a period of time.

2. How the mode of attack has changed over the course

3. Frequency and intensity of attacks

4. The shift in target locations

Data:

http://eventdata.parusanalytics.com/data.dir/atrocities.html

Exploratory Data Analysis:

We used python to analyze the missing values and accordingly subseted the data.
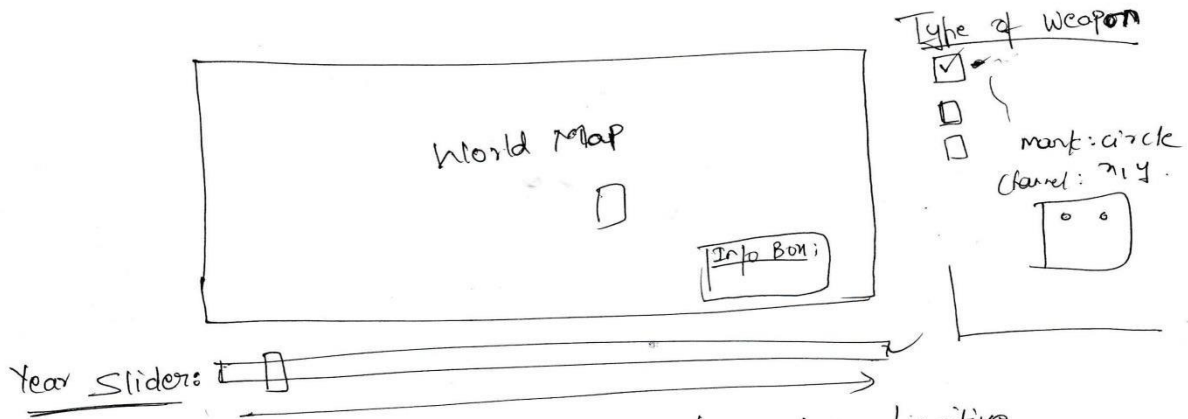
Design Evolution:
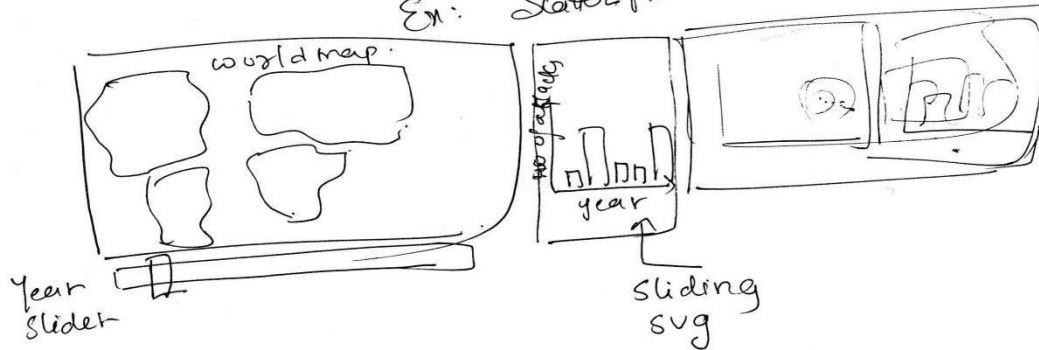
Project Proposal Designs:

Design 1:

→ Ideas.

with cols: Event_id, year, month, day.

Type of weapon

World Map

Info Box;

mark: circle
Channel: x, y

Year Slider:

Marks: Basic graphical element / geometric primitive
(Point, line, area & volume)
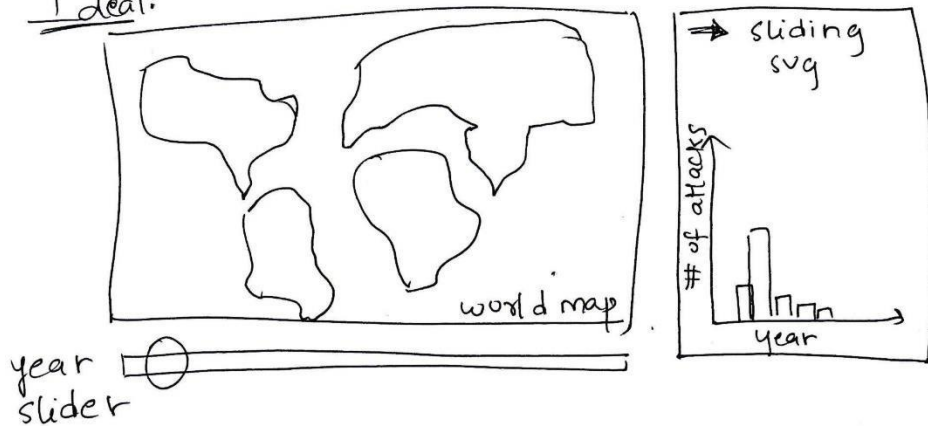Channel: Control appearance of mark
—Position, size, shape, ck
Ex: Scatter plot (x,y position

world map.

no of attacks

year

sliding
svg

Year
Slider

Design 2:

Sheet 1 - Brain Storm.

Ideal:

year slider

Marks:

Area (for bar chart, when selected a particular country on the map)

World Map. (plotting attacks as per the year)

Geometric figure to indicate intensity of attacks

eg: △ for intensity < 100

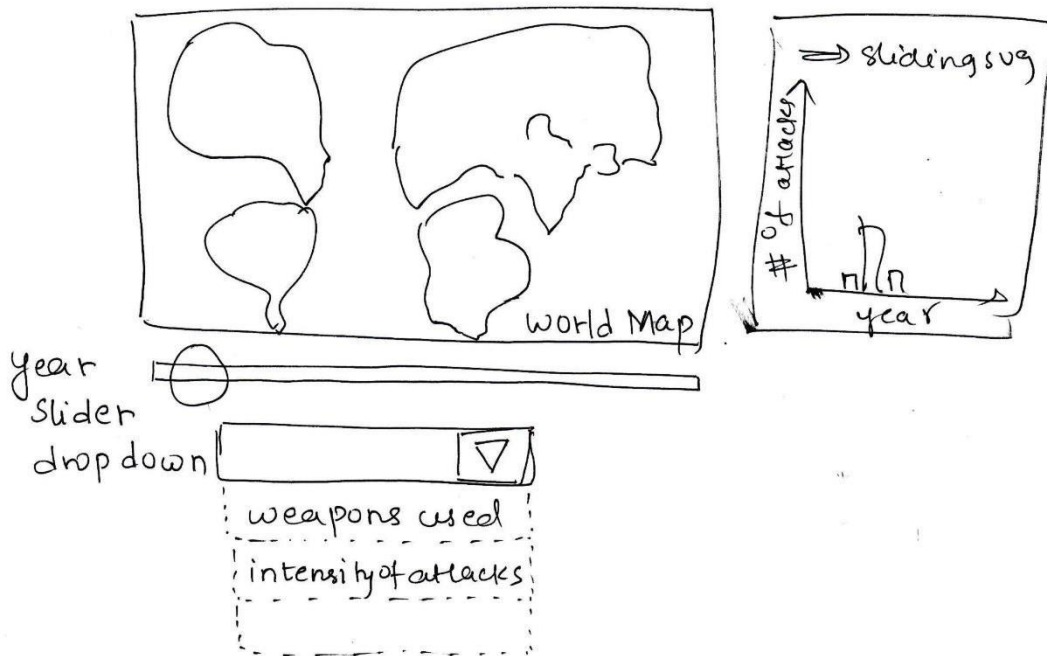☐ for intensity > 200

Channels:

length (# of attacks in that year.)

longitute / latitude (for maps position)

colour (when particular country is selected)

Design 3

Sheet 2: Brain Storm.

Idea 2:

year Slider

drop down

weapons used

intensity of attacks

Marks:
   Area (for barchart, when selected a particular country map)

World map (ploteing attacks).

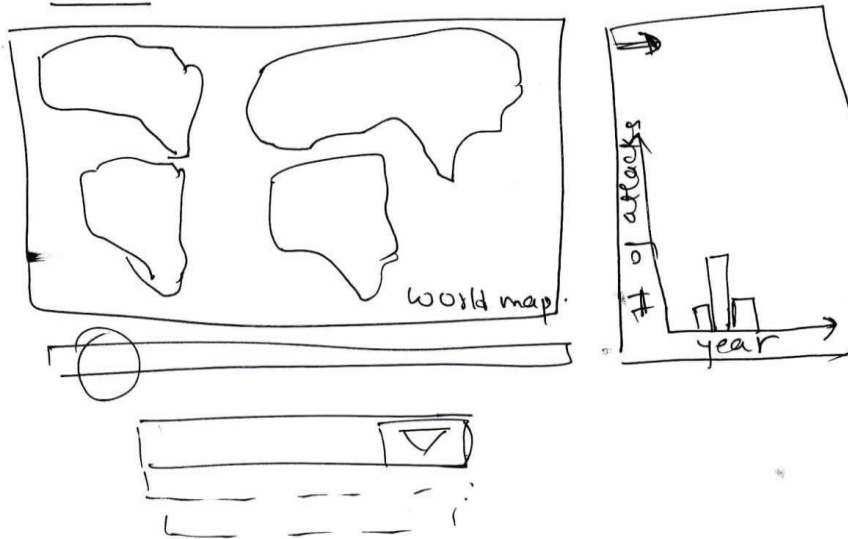Geometric fig (to indicate intensity of attacks)

Channels:
   length
   graticule.
   Colour

Design 4

Sheet 3:

Idea 3:

we can use heat maps to plot the intensity of attacks globally for a year
we can also select drop down menu and change the representation of heat maps.
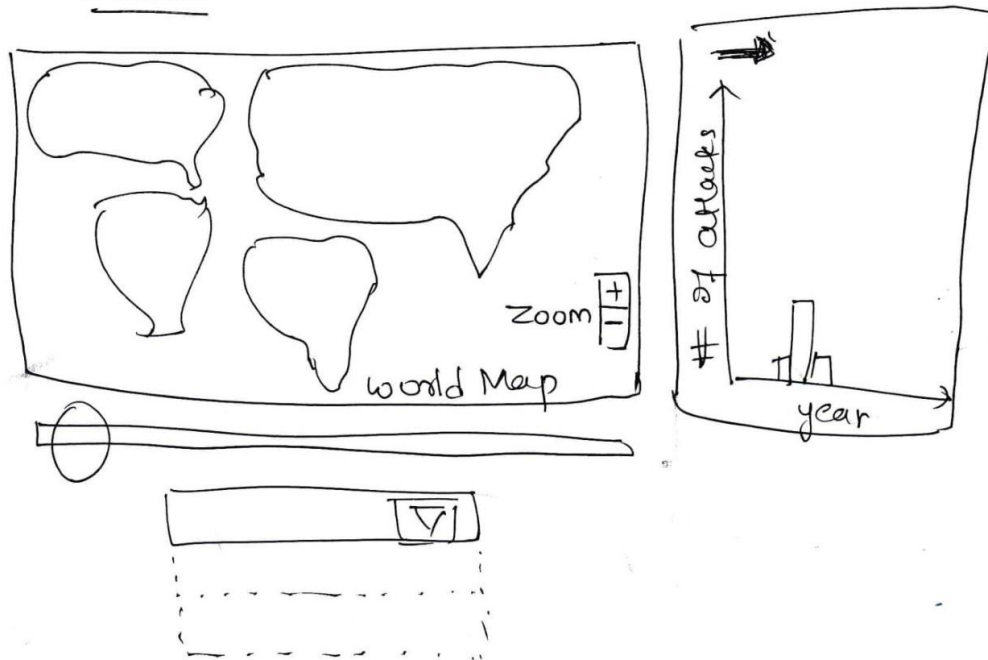
Marks: area , world map, geometric fig

Channels: length, graticule, colour.

Design 5:

Sheet 4.

Idea 4:

- use heat maps to plot the ~~inseih~~ intensity
  of attacks.

- we can use zoom feature to drill
  down to the target location
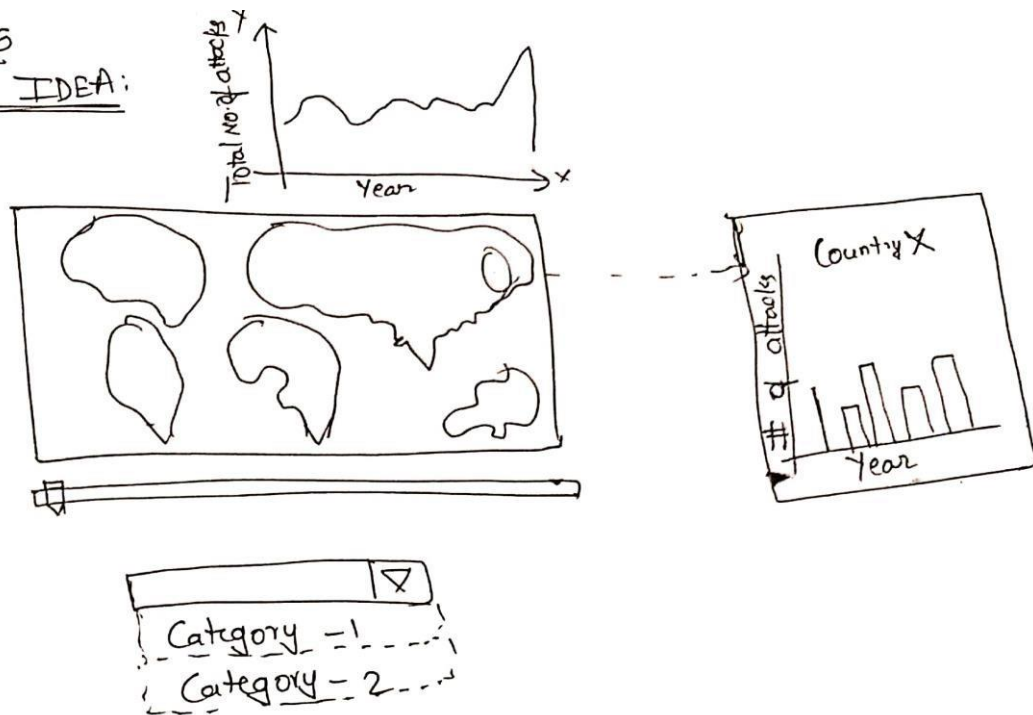
Marks: area, world map, geometric fig.

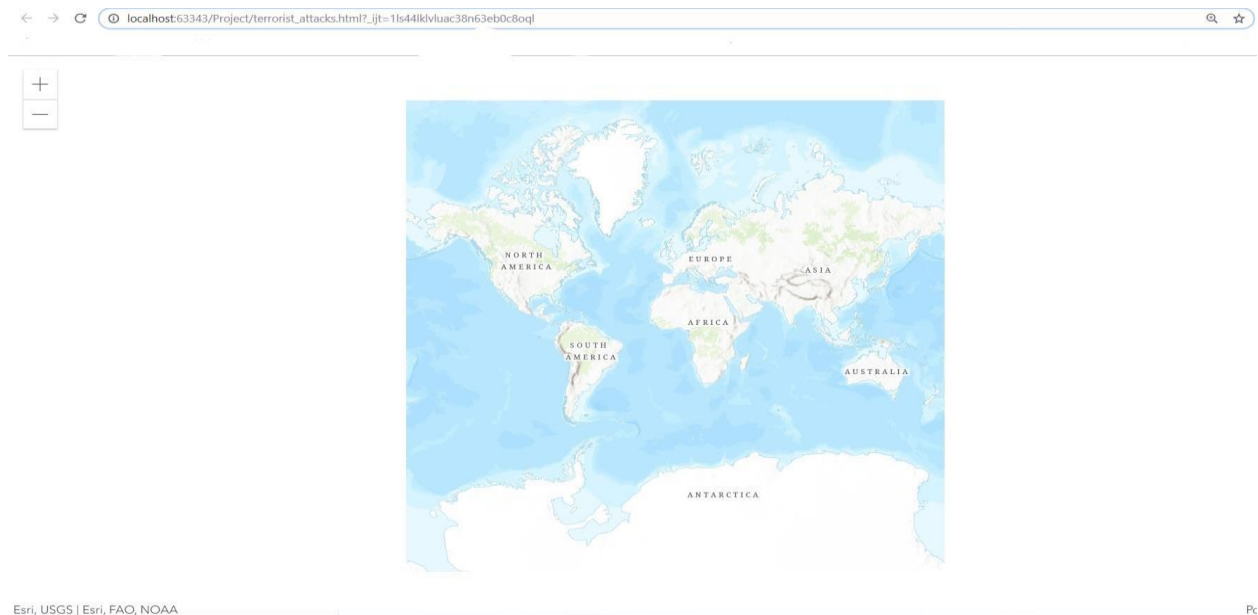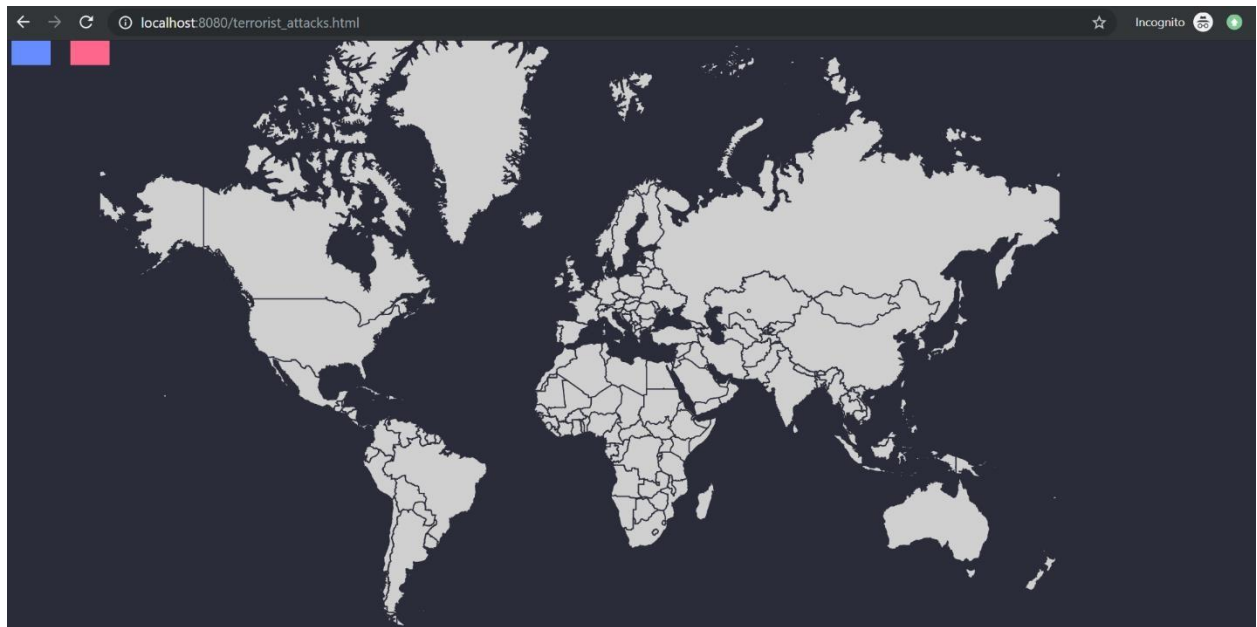Channels: length, graticule, colour

Final Design:

Sheet-5

Final IDEA:

Total no. of attacks (y-axis), Year (x-axis)

Country X

# of attacks (y-axis), Year (x-axis)

Category —1
Category — 2

Additional Designs:
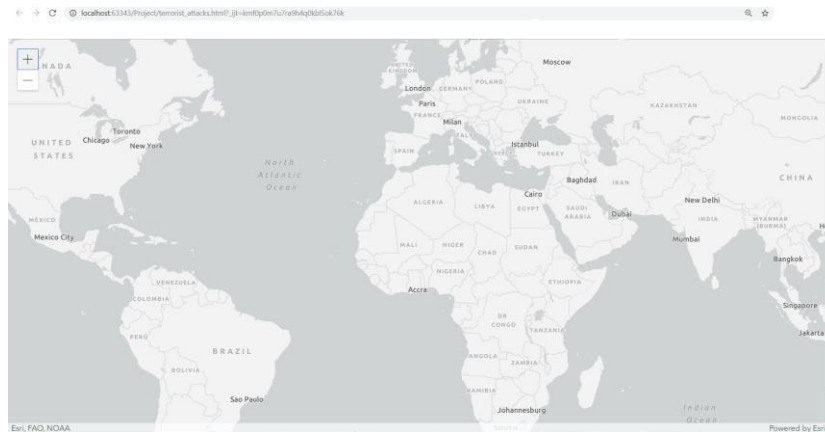
Initial State:

Design decision: Doesn't fit the context and connotation hence dropped it

Intermediate State:

Design decision: Geojson file is too heavy and takes time to load or to zoom in-out the map hence trying to implement the next stage using api.

Next stage:

Next Design:

The next design included plotting the attacks, where the points are coloured based on target type and size based on intensity. However, the using the two visual encodings simultaneously makes it difficult to perceive the
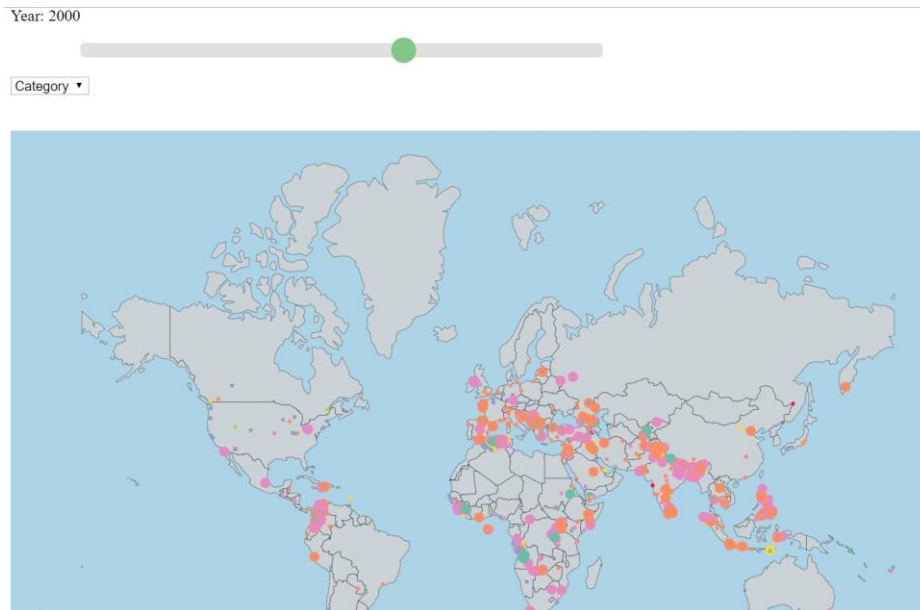

Peer Review:

Project Objectives:

① infer information from
the vizualization

② answer Qs or have storyline

③

Visual Design:

① Useage of color encoding instead of
shape for visualizing the intensity
of attack

② Change the story or the chart
being showed at when selected on
a particular region

③ Include default option in the
Checpdown, & when selecting the
category

④ Add year scale on the year slider

1850   1851   1852   1853
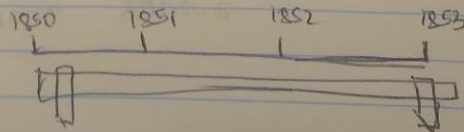
Implementation:

The main elements in the visualization are: Year Slider, Drop Down menu and the maps.

1. Year Slider: The range of year slider is from 1990 to 2018. This slider is used to get the values, statistics of the desired year. Changing the year slider updates all the visualization.

2. Map: It is the most important part of the visualization. The attacks are plotted using the latitudes and longitudes and d3.geoMercator ().

3. Dropdown menu to get insight of the intensity of the attacks.

A dropdown menu has been provided to visualize different categories like intensity, weapon type and attacks. When the intensity category is selected, the visualization on the map changes, the plot points are represented with circles, whose radius corresponds to the intensity or the number of people killed in that attack.
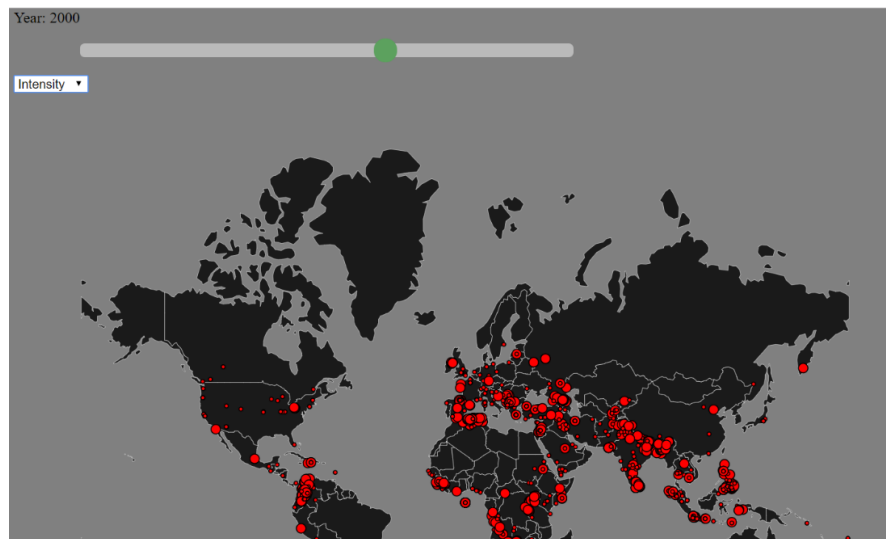

4. Dropdown menu to get insight of the weapon type and its usage across the world.

To get the insight of how frequently a weapon was used. We have used a tree in which each node represents the different kind of weapon with the value being the number of times the weapon was used across the globe to carry out the attacks. When a particular node is selected, the map gets updated.
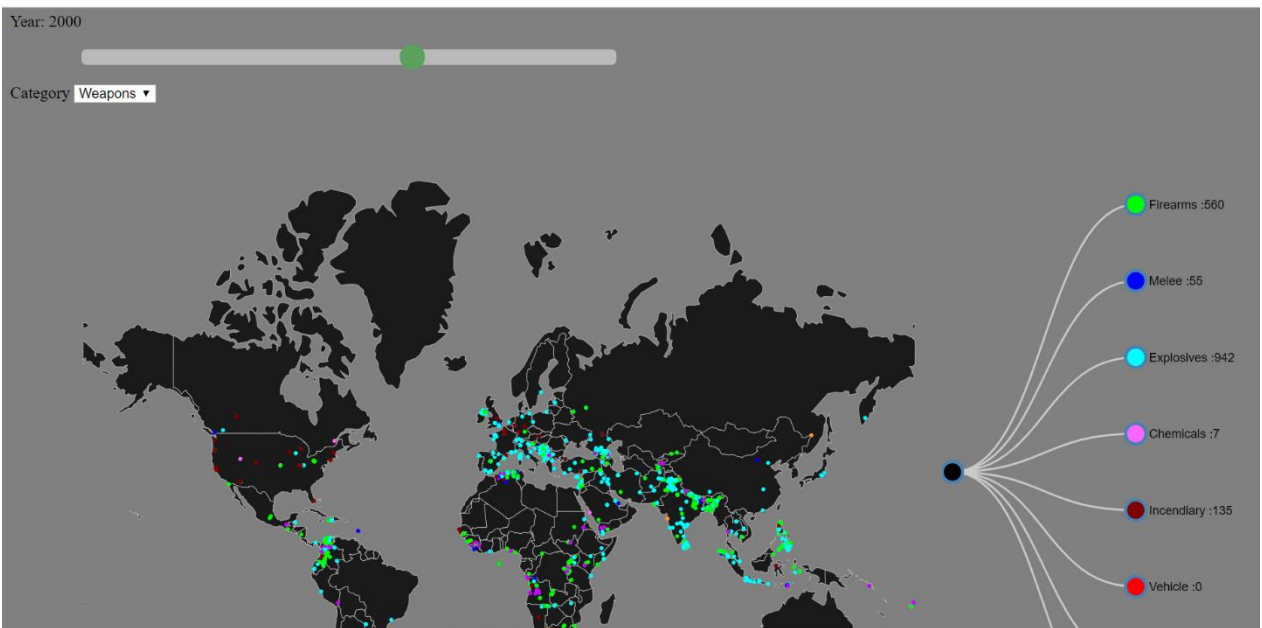
Here when the node, firearm is selected. The map has plotting's where the attack was carried out by the particular weapon.
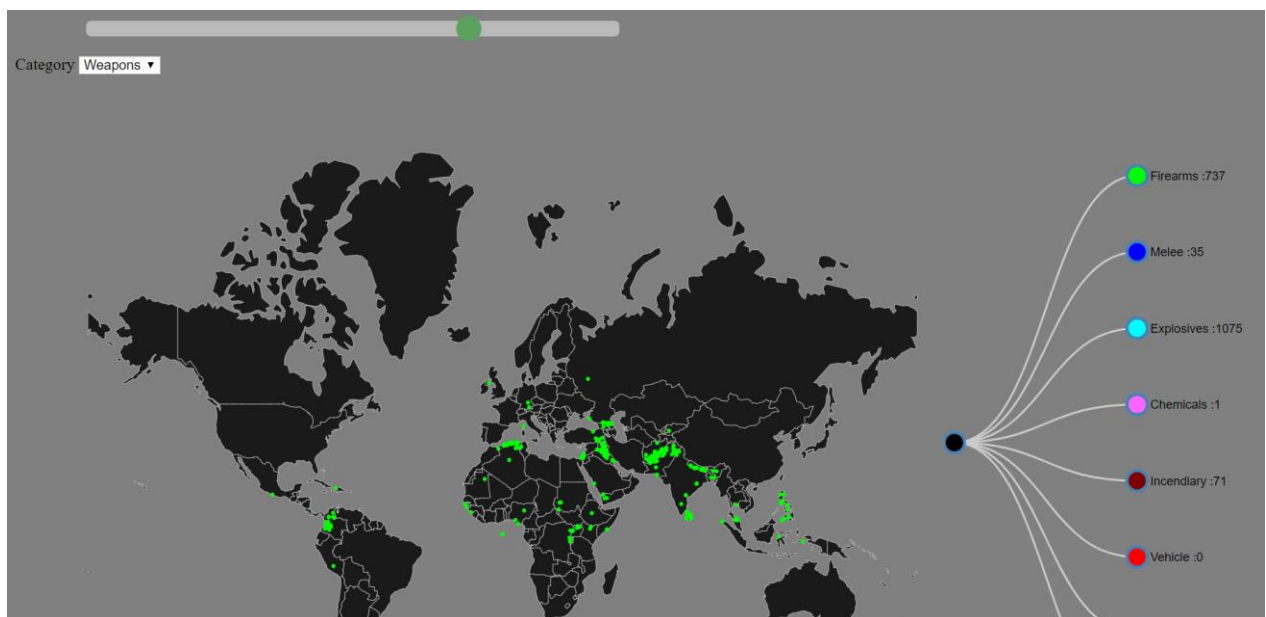
5. Dropdown menu to get the statistics on the mode of attack.

Initially, the dropdown menu has the value attacks. Here the attack are basically colure coded with the mode of attacks. A donut chart represents the proportion of each mode of attack. A tooltip is added to enable the end user to get the percentage of a particular mode of attack when hover over the donut chart. The donut chart updates when the ranger slider is moved.

6. The statistics of a country.

When the user click on a particular country, a svg pop-out giving the statistics of the country. The statistics include the states of the country that have been attacked. This is represented by a bar chart. The x-axis has the state names and the y-axis has the number of time an attack has happened. In addition to the, Bar Graph, we have also included a pie chart, representing the percentages of attack by the gangs in that country. Updating the year slider, will also changes the statistics and pie chart.
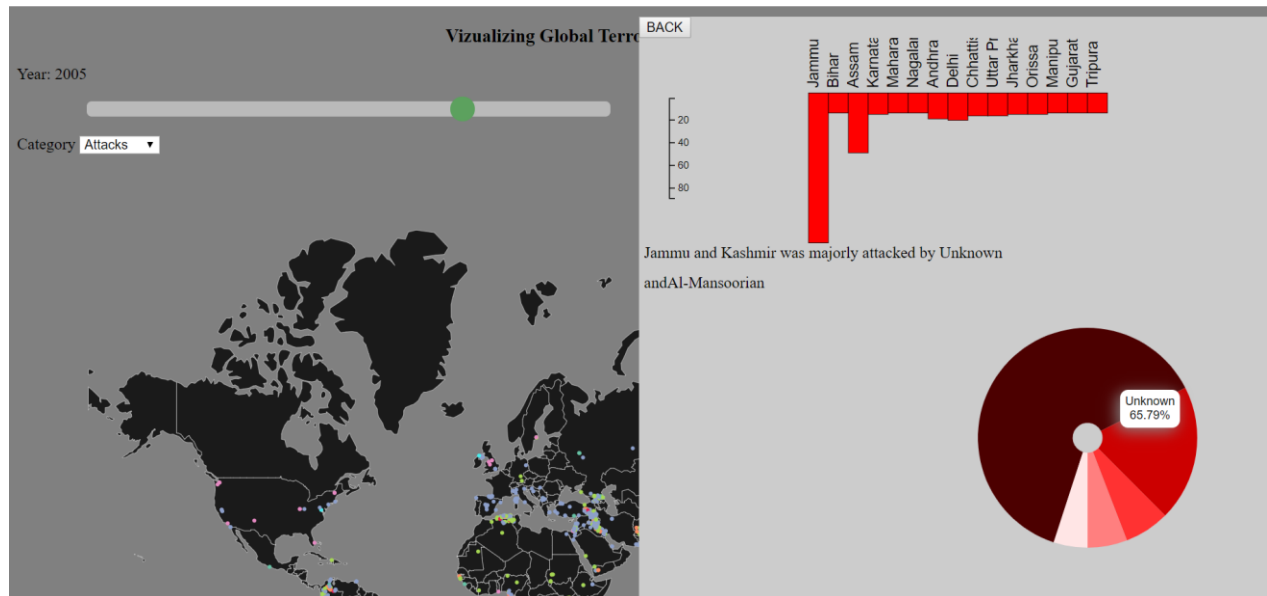
Evaluation:

Insights got from the data using visualization:
- How did the mode of attack changed over the years?
- What are the various target that were attacked? The target types range from public places, private properties and Government Agencies.
- What regions of the country are the most attacked over a period of time.
- The overall picture of the intensity of the attacks happened across the globe.

Visualizations used to answer the Questions:

1. For the how the mode of attacked was changed over the years, we used a donut chart. When the range slider is moved, the plotting on the maps changes and so does the donut chart.


In addition to that, to highlight and enable the user to understand, a text description is given to highlight which mode of attack was predominant in a given year.
To also get the proportion of other modes of attack, a tooltip is added.

2. How to identify different Targets:

When we hover over the attacked points on the map. We get the tooltip to get the target which was attacked and the country of that location.
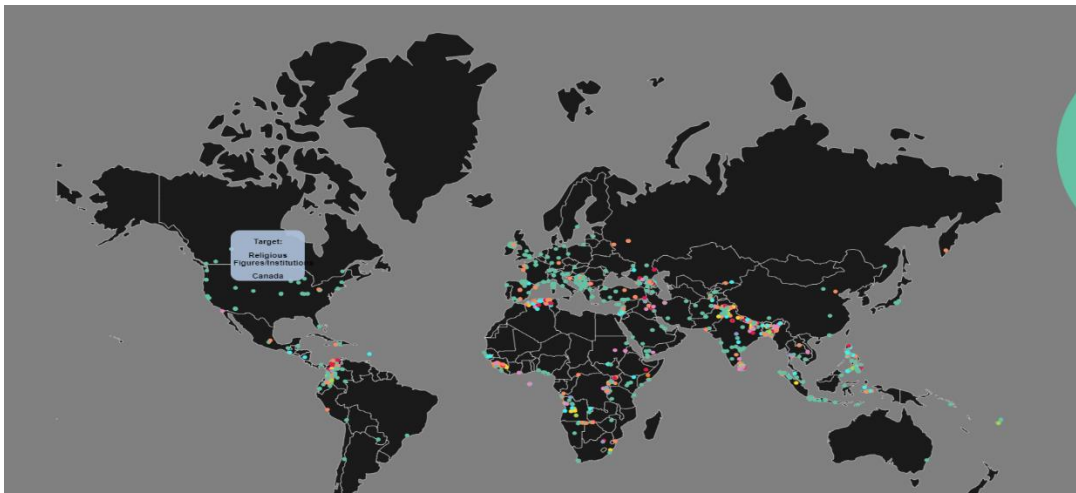
3. What regions of a country are mostly attacked over the given period of time?

When the end-user selects on a particular country in the map, an SVG is popped out which contains statistics related to country. These Statistics include, the states of the country and the number of times the state has been attacked during the year corresponding to the range slider. These statistics are represented using a Bar chart. And when the year slider moves, the bar chart updates, frequency of attacks in the states in the updated year.
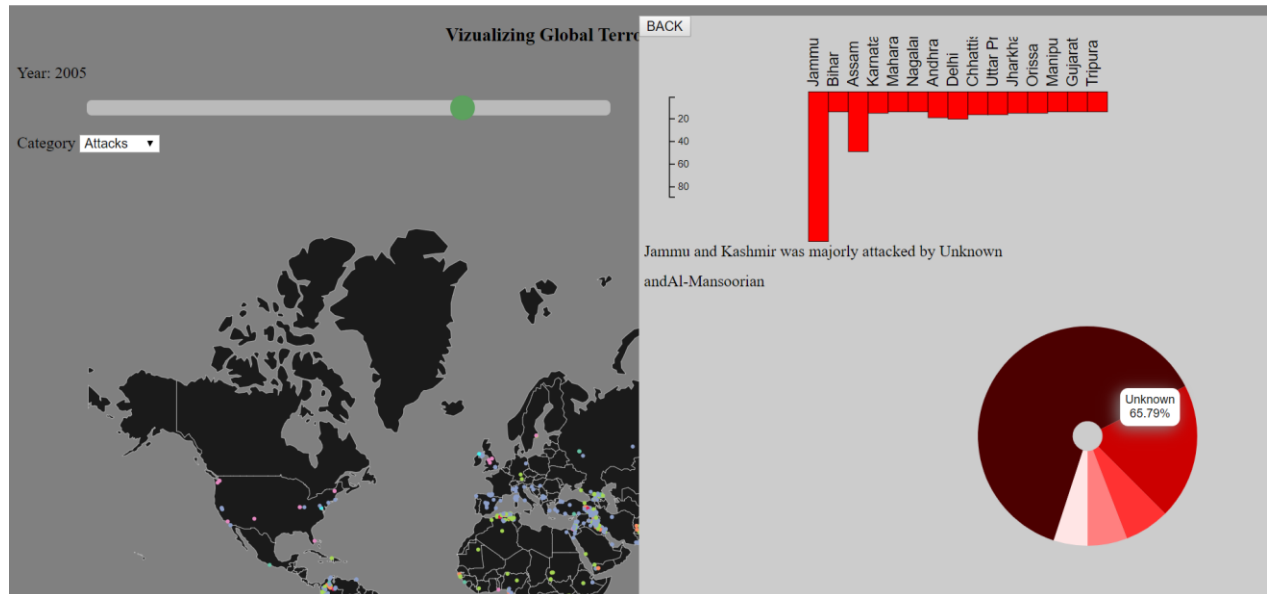
To get the map, we used the JSON file that was provided in the assignment 4. However, rendering the map using the file was taking a lot of time.

Our next Idea was to use googles Maps API to get functionalities like Zoom-in and Zoom-out. Later, we dropped the idea because it was a paid version.

So later we found, world_countries.json file online. To get the desired map outline we have used d3.geoMercator ().

Pre-processing and cleaning the data is the first and foremost step. The data file has too many attributes and number of records was also huge. It contains records for attack from 1970 to 2018, i.e. 25 years of data.

So rendering the attacks on the map for 25 years was taking inordinate amount of time. So we decide to plot the attacks from 1990 to 2018.

To filter out the columns, we have used Python. With python, we were able to see the columns which had maximum number of missing values. Generally, the idea was to use heat map or correlation matrix to filter out the columns. But majority of the columns are in string representation. Hence, removed the columns which had maximum missing values.

Then we have considered many designs, finally we have concluded to one design comprising of map view and statistics view.