CS7DS4/CSU44065 DATA VISUALIZATION 2019-2020

ASSIGNMENT 1.2

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DECLARATION

"I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at http://www.tcd.ie/calendar.

I have also completed the Online Tutorial on avoiding plagiarism 'Ready Steady Write', located at http://tcd-ie.libguides.com/plagiarism/read-steady-write

The project includes an all-inclusive dynamic recreation of 2 historical visualizations. All details regarding the project (source code, data etc.) can be found here. Further details regarding each visualization and tools used are mentioned as follows:

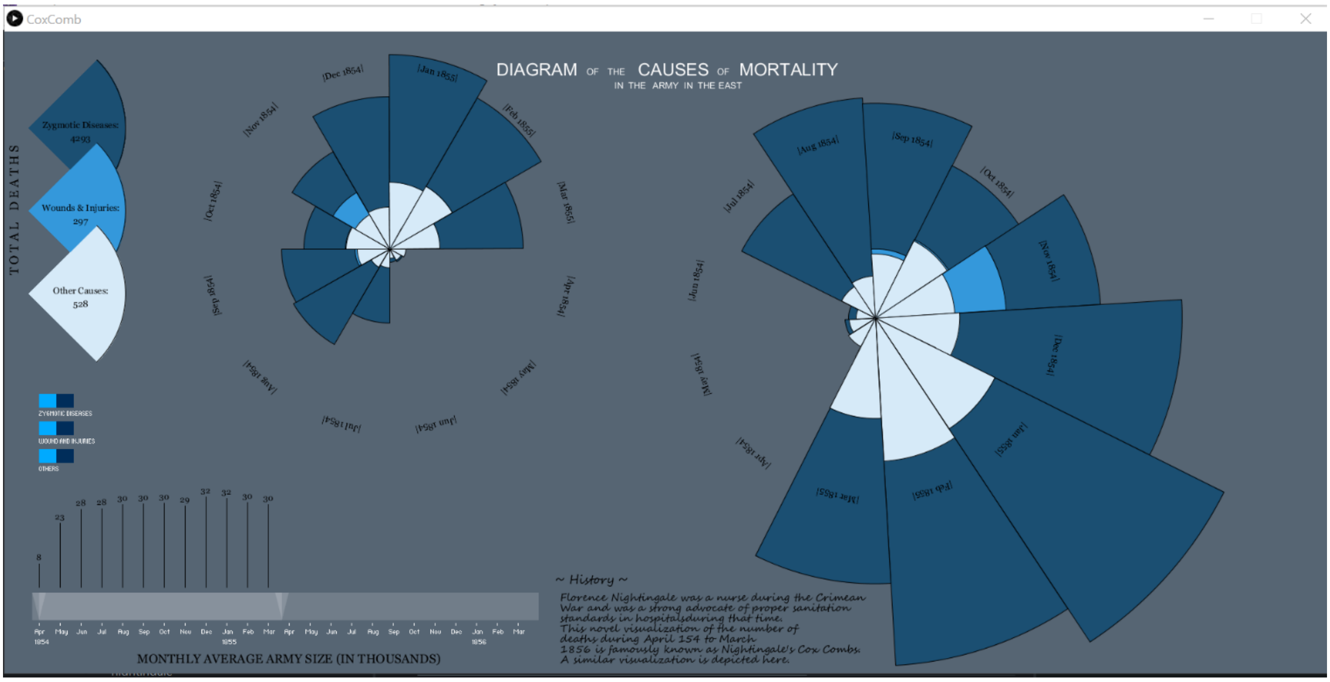
Tools/Software Used:

The following tools/packages have been used to recreate the visualizations:

1. Processing: The project uses the 'processing.core' and 'processing.data' libraries to build the visualizations, by extending the PApplet class. The entire project is built on Processing using Java. Processing Version used: 3.0.
2. Unfolding Maps: Unfolding maps is used to create the dynamic map background for Minard's Map visualization, that enables zooming and panning, with the help of the various map providers available under the package. Version used: 0.9.92.
3. ControlP5: Control P5 controllers are used to make the sliders, buttons and other control features available in the dynamic visualizations.
4. Gluegen, Jogamp dlls: Graphics tool native dll files were used to render the dynamic maps for Minard's visualization.
5. Log4J: for logging.
6. Git: Version control and repo.
7. Eclipse: Java IDE and builder.

Nightingale's Rose Chart Visualization:

A static image of the visualization is as follows:



~ History ~

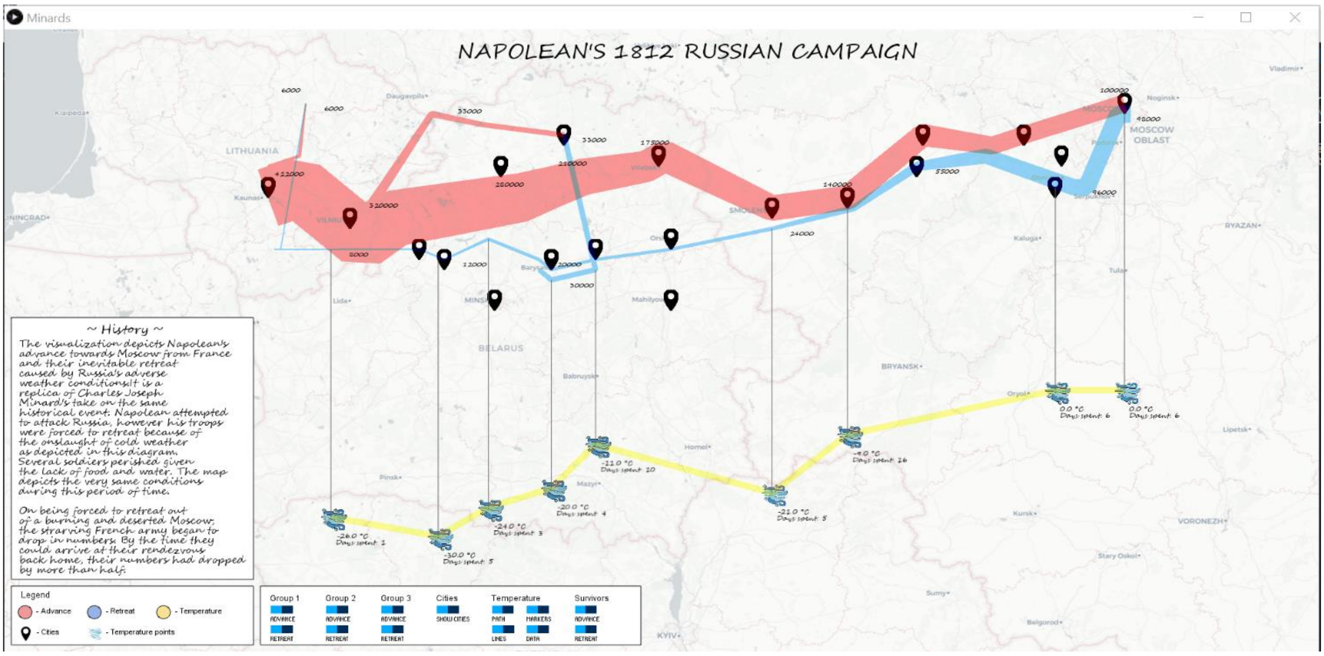
Florence Nightingale was a nurse during the Crimean War and was a strong advocate of proper sanitation standards in hospitalsduring that time.
This novel visualization of the number of deaths during April 154 to March 1856 is famously known as Nightingale's Cox Combs.
A similar visualization is depicted here.

A dynamic visualization video can be found here. The above image displays the first 12 months of data, with the left coxcomb containing the non-zoomed version, while the right coxcomb contains a zoomed-version and differently rotated version of the same data. The slider can be changed and updated to select different months and ranges. Also, the average army sizes are displayed above the slider, and is also dynamic, which changes based on the slider. The toggle buttons enable and disable each of the 3 arcs for the causes of deaths, so as to get a better idea of each. The data for Nightingale's

Rose Chart was simple and without any discrepancies. Therefore, no clean-up and manipulations were required for this data to be visualized accurately. However, a scaling factor was applied as a constant so that the smaller arcs (with minimal data) could be visualized properly. This constant value is updatable at a single point, ensuring re-usability. The data shown as filled arcs are the monthly annual rates of mortality per 1000. Arcs (available as a processing function) is used to depict this data.

Minard's Map Visualization:

A static image of this visualization is as follows:



~ History ~

The visualization depicts Napolean's advance towards Moscow from France and their inevitable retreat caused by Russia's adverse weather conditions.It is a replica of Charles Joseph Minard's take on the same historical event. Napolean attempted to attack Russia, however his troops were forced to retreat because of the onslaught of cold weather as depicted in this diagram. Several soldiers perished given the lack of food and water. The map depicts the very same conditions during this period of time.

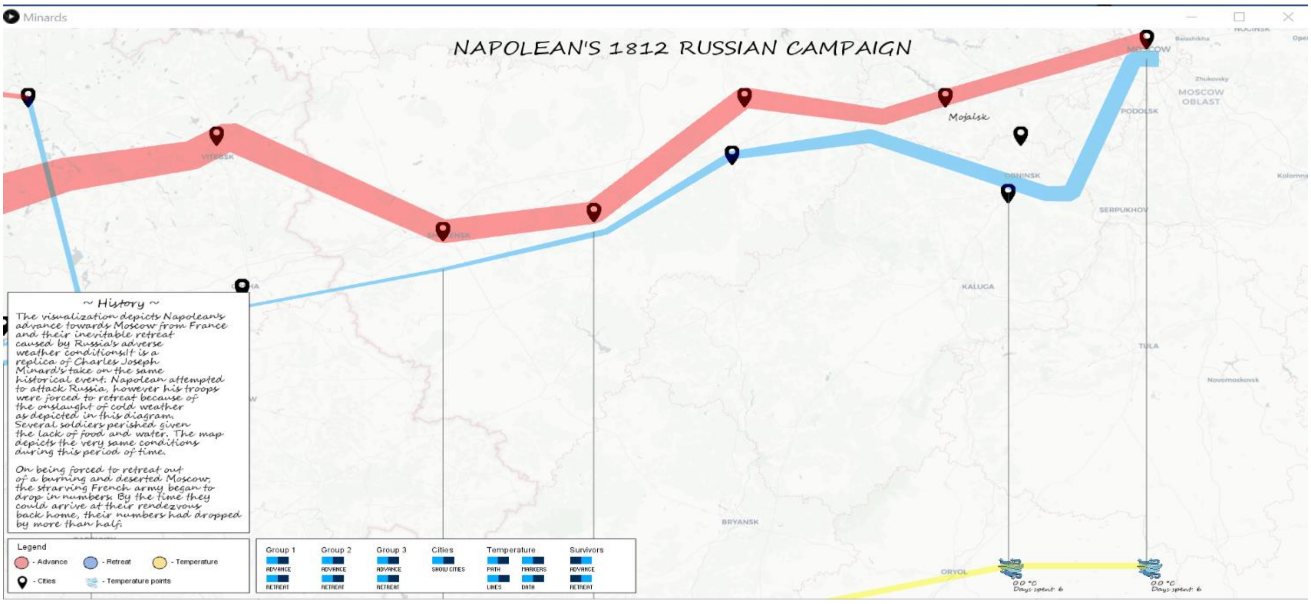
On being forced to retreat out of a burning and deserted Moscow, the strarving French army began to drop in numbers. By the time they could arrive at their rendezvous back home, their numbers had dropped by more than half.

The visualization is built on a dynamic map provider, so that it is zoomable and pan-enabled. There are several controllers that enable paths, locations and temperature line markers. A dynamic visualization can be found here. The strengths of the army at each location is shown as the thickness of the paths on the map. As the visualization is built over a dynamic map, the city names are automatically displayed as part of the map. However, on hovering the mouse over the city marker, it enables the user to see the city names. Also, the three groups of armies can be viewed separately, using the toggle controllers.

The data for Minard's Map has been collected from the HistData Package available in R. The three separate datasets viz. cities, troops and temperature had been loaded in the Collections framework in Java as HashMaps and Lists to be loaded onto the dynamic map as locations (using the Location class) and markers (extending the various Marker Classes) from the Unfolding Maps library. For example, the city markers were loaded directly from the latitude and longitude data provided in the 'cities' dataset. The 'survivors' column data in the troops dataset were used as the stroke weights for the path markers. The temperature points have also been plotted as Markers, using the temperature value as latitudes.

The data required some level of manipulation and clean-up to increase accuracy. Some longitudes in the temperature dataset were changed to the longitude values nearest in the retreat paths, so that the temperature lines could be exactly attached to the retreat path line. No other manipulation and clean-up was required.

A zoomed snapshot with mouse hover functionality is as follows: (Clear demo is provided in link)



~ History ~

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Source Code, Repository and Resources:

The source code can be found in the git hub repository: REPO. The README file contains further data of using the repo and running the application on any machine. The source codes can be found inside the 'src' folder. Some important classes are as follows:

1. VisualizerSettings.java – Contains the various constants such as colour, location, size etc. for both visualizations. Both visualizations read from this class. It enables re-usability.
2. CSVLoader.java – Contains methods for loading data from CSV files to Java Collections.
3. CoxComb.java – Launcher Class for Nightingale's Rose Chart.
4. Minards.java – Launcher Class for Minards Map.
5. The markers folder under src contains the various types of markers used to point and place data on the map.

The data including csv files and description files can be found under the 'data' folder. The target folder contains all deployables and deliverables. All libraries used have been added in the lib folder and .classpath file.

References:

[1] Processing [Online]

[2] Unfolding Maps [Online]

[3] ControlP5 [Online]

[4] JogAmp and Gluegen libraries [Online]

[5] Minard's Data Set [Online]

[6] GitHub Repo [Online]

YouTube Dynamic Visualization Demo Videos:

Cox Comb Visualization

Minard's Map Visualization