Process Book

Overview

On the 16th of July 1945, the first ever nuclear device was detonated at the *Trinity* test site in the United States. Since then, at least 2121 nuclear tests have been conducted in the world, totalling a yield of 540,849 kilotons, or in other words, more than 30,000 times the yield of the Hiroshima bombing.[1] How many kilotons of explosions are being detonated each year? And by who? The aim of this visualization is to show the repartition and rate of nuclear testing around the world using an interactive map, enriched with contextual informations, such as the name of the test (when available), the explosion yield, the type of explosion, and even a link to a relevant wikipedia page when possible. The visualization would also display general statistics pertaining to nuclear weapons, such as per-country and global stockpiles of nuclear warheads.

Related work

The idea for this work originally came from a video created by the artist Isao Hashimoto[2]. This video displays nuclear tests on a map of the world, using sonification on explosions to convey the density of tests. While the general idea is quite similar to our visualization, we wanted to make something more interactive and informative than this.

Dataset

The main dataset comes from the nuclear explosion database from the Geoscience Agency of Australia. Surprisingly, the website has disappeared a few days after we scraped it. We reached out to the webmaster for more informations. The website consisted of a search form with fields to select a date range and to select one of the nine countries which have nuclear weapons. Once submitted, the form would return a list of nuclear tests, which the scraper would parse and save into a JSON file. To retrieve the data, we ran the scraper and the biggest date range possible (from 1945 to 2017, although data stops earlier than 2017) and we ran it once for each country.

This yielded 2065 data points with fields such as the time and date of the test, the magnitude of the explosion, the name of the site and its coordinates. Some of the tests did have a site but no coordinates were given. For those data points, the coordinates were either manually sourced, or extrapolated using the coordinates from other points in the dataset that happened at a site with the same name. One point had to be discarded because it had neither a site nor coordinates, nor any info that could have helped to identify it. Once cleaned, the data was then exported to a TSV file.

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[1] *List of nuclear weapons tests*. Retrieved from
https://en.wikipedia.org/wiki/List_of_nuclear_weapons_tests on 26/11/2017
[2] *1945-1998* by Isao Hashimoto. Retrieved from
http://www.ctbto.org/specials/1945-1998-by-isao-hashimoto/ on 26/11/2017

Questions and design decisions

Which countries conduct those tests? Where do they happen? How powerful are the warheads that are being tested? The questions which we try to answer in this visualization are quite simple. However, representing their answer so that anybody can easily understand them is not so straightforward. Indeed, one of the main issues when talking about nuclear weapons is the mostly unrelatable scale of their power. Indeed, a quantity such as "15 kiloton" is a somewhat abstract quantity to someone who is not a nuclear expert. To solve this problem, our solution is to display the magnitude of explosions in terms of the surface of each displayed points, and more importantly to show a chart with reference quantities in relatable terms (this is not implemented yet). On the next image you can find the initial idea of our representation before starting the code.

Implementation
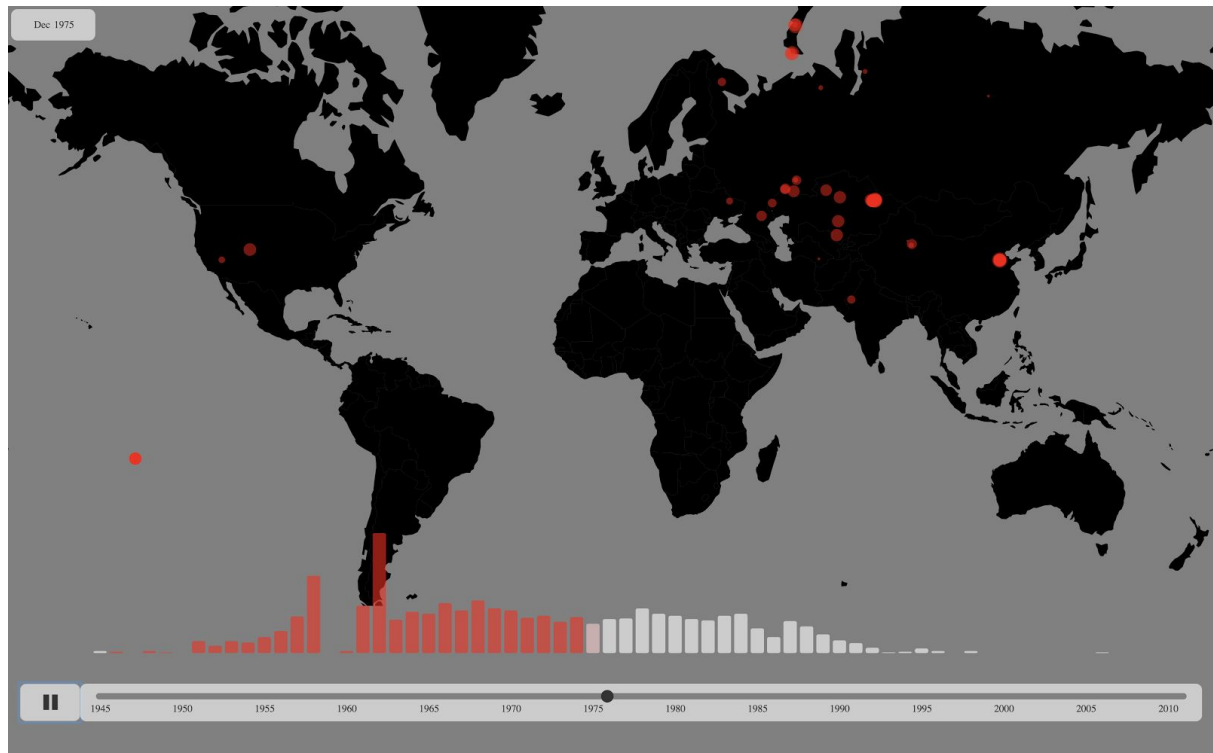
The visualization is made of two main parts, relying on the same data set. The first part is an animation which displays each nuclear tests on a map of the world, in chronological order. When hovering over an explosion, contextual info is displayed such as the name of the test or the yield of the bomb. For historically important data points, contextual info is displayed by default (not implemented yet). The explosions are colored according to the country which conducted the test (not implemented yet). The animation can be started and paused with a dedicated play/pause button. The second part of the visualization is an histogram which also acts as a slider to move forwards or backwards in time for the main animation. The histogram shows how many test were conducted per year, and by which country (per country display is not implemented yet).

Evaluation

Some features are not yet implemented, but we can already see a few things with the visualization in its current state. First, we can see that nuclear tests do have an impact on slowing or stopping nuclear testing. the moratory of 1959-1960[3] is especially visible, as is the effect of the Comprehensive Nuclear-Test-Ban Treaty[4]. Those treaties will be made visible on the timeline on the next iteration of the development of the visualization.

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[3]*The Partial Nuclear Test Ban Treaty*. Retrieved from
https://en.wikipedia.org/wiki/Partial_Nuclear_Test_Ban_Treaty on 26/11/2017
[4]*The Comprehensive Nuclear Test Ban Treaty.* Retrieved from
https://en.wikipedia.org/wiki/Comprehensive_Nuclear-Test-Ban_Treaty on 26/11/2017

We can also see that in term of scale, the bombings of Nagasaki and Hiroshima does not account for much compared the warheads 100 to 1000 times more powerful that have been routinely tested in the 30-40 years that followed. Contextual info for those points and some other historically significant points will be added in the next iteration.

The main missing feature is per-country statistics and coloring of explosions and bars, which will allow to see how USA and the USSR are themselves responsible for more than 80% of the tests.