CS 3300

Tuesday, March 8th 2016

Team: Brain Power^2

Curtis Kwan - cck75

Richard Li - rl393

Sarah Le Cam - sdl83

Project 1: Fiber Optics

Our webpage is best viewed when window is in full size

Data

AfricanCountries.json

https://en.wikipedia.org/wiki/List_of_sovereign_states_and_dependent_territories_in_Africa

We copied and pasted the data into our index.html file as an string array. It is used to sort out African countries from world countries internet user data. This data is then used to create the Africa map and also create the bar chart shown next to it.

World-topo-min.json

https://github.com/mbostock/topojson/tree/master/examples

World map json file taken from github directly and is used to create the world map and the zoomed in map of Africa.

Dataset includes attributes: type,arcs,id,properties

Under properties there are also attributes name and color

Name attribute is used to identify the country in order to map the right opacity for internet penetration data.

Cable_data.json

https://www.google.com/fusiontables/DataSource?docid=1OlOQw6lyT-0-F0XDmWYJVqNYdQ7Tsegdq1AVAkRd#map:id=3

Taken directly from the github repository by Huawei marine networks. The data is used to map out the undersea fiber optic cables.

The original data contains the following attributes:
id,cable_id,description,name,color,coordinates,length,rfs,owners,url

We then added an attribute year to the data it is just for easy access of the year cable is built. The data is extracted from rfs (ready for service) which is labeled in inconsistent format from original data set. We did not use all the attributes included in the dataset, these attributes are left in for future development of the project.

Coordinates is used to map out the cables shown in the map. The original data lists out the coordinates in (long,lat,alt). This data gives the shape of the cable. After the json is imported we then parsed the coordinate attribute and just took out the long,lat for our d3 map projection.

Internet-users.json

http://www.internetworldstats.com/list2.htm

We copied and pasted the data from the webpage into excel by hand then converted the data into csv. The data is used to create the different shades of opacity shown in the world map.

The original data contains the following attributes: Country,Size,Population,Internet

A small number of Country attribute is modified slightly to match the country names listed in World-topo-min.json. The Internet attribute shows the internet penetration of the given country (#internet users/ total population). In the original dataset not every country had information on Internet and the value is replaced with -1.

All of the data in csv format is converted to json format using http://www.csvjson.com/csv2json

In terms of data selection we tried our best to included only data from credible sources that are reliable.

Data Representation

For our fiber optic cable data we decided to map out the cable infrastructure on a world map. Since the data given to us had longitude and latitude coordinates, we plotted the coordinates using a d3.geo.mercator projection scale as well as polylines to display the actual cable. We differentiated the cables by color as one of our goals was to show the effect of the cables laid down after 2010. We chose to represent cables placed before 2010 in orange and cables built after 2010 in green.

The thickness of the cables was a discussion point throughout the development process. Making them too thick caused overlap and general obscurity, while leaving them too thin caused visibility issues. The color palette was chosen through the help of Adobe Kuler as contrasting colors were needed to help with our visibility issues. The cables are an almost exact representation but exact paths were changed to make viewing of the path of the cable more easily viewable. For example some of the cables on the west coast of South America were visually shown to stretch far from the coast for easier visualization, however the actual cable is actually much closer hugging the coast.

We displayed the penetration of internet usage across the world using opacity as a medium. Originally, we used a linear scale to plot the data. However, we soon realized that because Africa boosted very low internet penetration it was difficult to see differences between the African countries. By placing the data on a log scale, the differences in penetration were much more apparent.

We chose to display a zoom in on the Africa map using a larger scale, centering and a transform. We displayed countries not in Africa in grey to allow better contrast.

Our bar graph shows the level of penetration in African countries and displays the average level of penetration worldwide. We used the same log scale as there was a large disparity between countries such as South Africa compared to Somalia when it came to internet penetration. We added a x and y-axis, which we rotated, to describe our graph. We scaled the x-axis on a domain of 0 to 0.8 so as to best display our data. We also applied formatting to the x-axis so that it would display in percentage formatting. We chose to use the same opacity scaling in the graph so that users can correlate the data with the map.

Our Story

We chose to study fiber optic cables and internet penetration for our visualization. Our representation is divided into two parts: a world view and a zoom-in on the African continent. This allows us to discuss fiber optics within a broad scope before focusing on a special case. Our representation highlights the growth of fiber optics in recent years and hints at the potential for future growth in the next few decades and especially in Africa.

We chose to use a map representation to show the level of penetration in countries throughout the world and the mapping of cables. Our data showed that North America boasts the highest internet penetration and that Africa has the lowest level of penetration. It was interesting to notice that Canada had more internet users per capita than most other countries, including the U.S. Other countries also showed surprisingly high connectivity, such as Madagascar, Finland, Greenland and Australia. This is likely due to the fact that these countries have lower levels of population in relatively advanced economies.

Another important distinction to note is the pathing of the cables between the different countries. For continents like North America, where terrain is not difficult to traverse, there are very few intra-continental cables while continents like South America and Africa have many. As South America's land is mostly rain forests and Africa has rain forests as well as deserts, building intra-continental cables is extremely difficult. This is shown with the many cables that link countries within South America as well as Africa.

Mapping out the cables according to their year of creation allowed us to visualize the growth of the industry in recent years through the implementation of new wires. It is interesting to see that most of the fibre optic cables in the Western world were created before 2010, while there are many new and projected cables in Africa and Asia. These new cables show that companies have been expanding into emerging markets as fiber optics become increasingly accepted in the industry.

Our focus on Africa allowed to take a closer look at a single continent. In this map, it is easy to see that countries near coasts have higher penetration. We were surprised to find that Madagascar had the highest level of penetration within Africa. This could be due to its easy access to water, being an island.

Additional Citation

Image header on the page is taken from
http://www.americomtech.com/services/fiber-optic/