Basic Info

The project title: Global population from 1960 to 2016
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The project repository is here.

Background and Motivation

World population has changed over years in many respects such as "Age dependency ratio (% of working-age population)", "Age dependency ratio, young", "Fertility rate, total (births per woman)", "Life expectancy at birth, female (years)" and "Female population 00-04". Users may need to study these changes to predict future population so that they can plan ahead to provide good education, healthcare and other services in the future. Different aspects of the world population data are closely correlated to different types of services. For example, studying "Fertility rate, total (births per woman)" and "Life expectancy at birth, female (years)" may tell users how much health services for childbearing will be needed in future years.

There were also interesting changes in values of some attributes throughout years. For example, in the US "Age dependency ratio, young" changed from ~51% in 1960 to <29% in 2016, and "Fertility rate, total (births per woman)" dropped from ~3.6 to ~1.8. In China "Life expectancy at birth, female (years)" increased from ~45 in 1960 to ~78 in 2016. We are interested in visualizing all these changes across countries and years. We also would like to find out explanations (e.g. from economical and political points of view) for these changes if possible. Studying the potential explanation that causes these trends could help users predict the global population in the future and make plans that could meet the current or future needs of people according to different distribution of population.

Project Objectives

The primary questions we are trying to answer:

1. How do values of certain attributes of global population change over the years?
2. How do we compare changes of certain attributes over the years among selected countries?
3. How to visualize the population data of all or selected countries in a fixed year?
4. How to visualize the population data of a certain country in all or selected years between 1960 and 2016? Are there any correlations among attributes that can be observed from our visualization charts?

What we would like to learn and accomplish:

- Give users a global view of population change. Provide users tools to track attributes they may be interested in from a global point of view.
- If we can find similarities in the change trends of population among certain countries, users could try to figure out explanations that may lead to these similarities.
- Users may be interested in certain attributes of certain countries that are correlated to the demand of certain services. Studying the changes in these attributes over the years will provide quantitative information that may help them determine their future plan.
- If we could match economical or political changes of countries with their population changes in certain years, our visualization could help us explain how economical or political changes could affect global or specific regional population.

Data

The dataset was downloaded from a Kaggle link.

Data Processing

No substantial data cleanup is expected. But there might be missing data. We plan to either interpolate data to fill up small holes in data or drop a small amount of lines with too many missing attribute values.

Visualization Design

All attributes we are interested in are options in a selection bar. For different attributes, we show data in a world map with each country colored accordingly. A color bar is displayed beside the world map. There is also a year chart in which users can select a specific year, and a year slide bar with which users can see transition throughout years.

Users can select one country by clicking it on the map. A line chart of year vs. the selected attribute for the selected country will show up next to the world map. Clicking another country will add another line to the line chart, and so on. This line chart shows comparison among selected countries. If users would like to show comparison in another attribute among the same countries, they can keep the selections of countries and select another attribute in the selection bar. By hovering over a line, a tooltip of more details will pop up. Lines of different countries have different colors. Users can remove the line charts they are not interested in any longer by simply clicking the Remove buttons beside those line charts.

To show multiple attributes in one graph, we use parallel coordinates. For a selected year (or a selected country), we plot countries (or years) and attributes as parallel coordinates. By this chart, we can observe correlation between attributes. Each coordinate can be sorted and be moved to be reordered. Use brush to select part of a coordinate and to highlight paths that go through the selected part of the coordinate.

We can also use table to show data for a selected year. The columns of the table are countries and attributes. The table can be sorted by each column. Countries from each continental can collapse to one group.

See the last 5 pages for sketches of the designs.

Must-Have Features

The world map for a selected year and attribute.
Line charts for comparison among countries.
The parallel coordinates for a selected year or country.
Brush, sorting and reordering of parallel coordinates.
Link the world map, the line charts and the parallel coordinates.

Optional Features

The table.

Project Schedule*

10/29 ~ 11/4 Create the world map with the current data. For missing data, either fill up the holes by interpolation or remove the rows or columns.
Map and the legend bar -- Yanyan
The selection bar and the slide bar -- Lin
Data processing -- Lin and Yanyan

11/5 ~ 11/11 Finish the world map and the line charts.
Link between the world map and line charts -- Lin
Line charts -- Yanyan

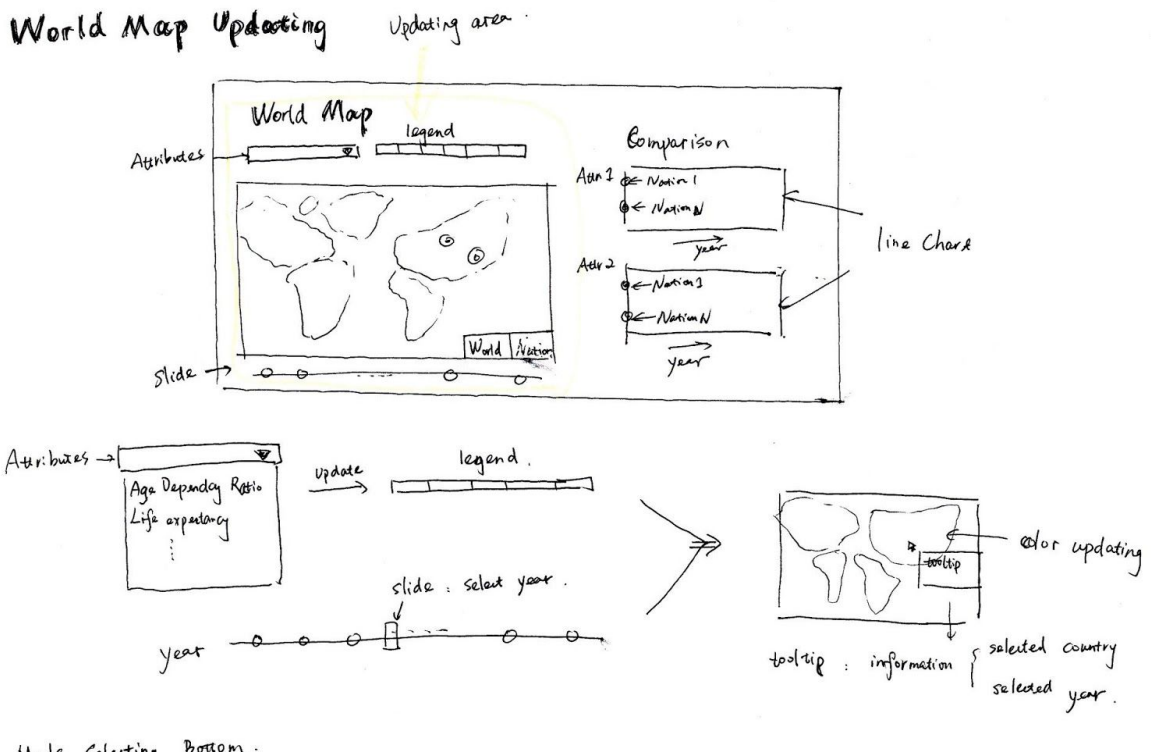
11/12 ~ 11/18 Finish the parallel coordinate chart.
Creating parallel coordinates and brush -- Yanyan
Sorting and reordering -- Lin

11/19 ~ 11/25 Link everything.

11/26 ~ 11/30 Fix possible bugs in the code. Refine the features. Take a break!

* Work distribution is subject to change.

World Map Updating

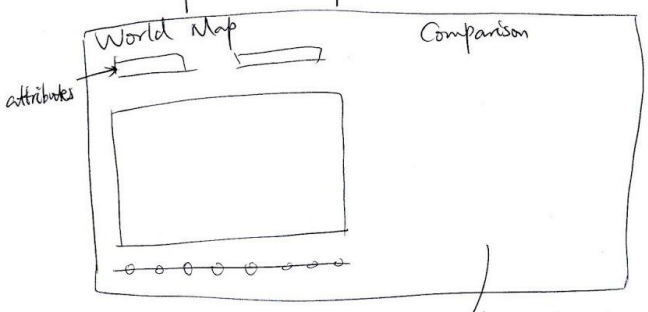


Mode Selecting Button :

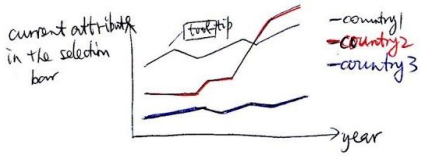
World | Nation : World Mode → Show World Map

World | Nation : Nation Mode → Show Nation Information.

World Map — Comparison

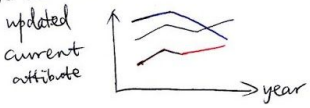


Selecting multiple countries by clicking them on the world map will trigger the comparison line chart generation.



By hovering over a line, a tool-tip will pop up. The name of the country corresponding to this line is shown in the tool-tip, as well as the year and the attribute value at this point.

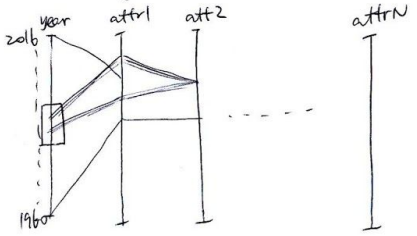
If we keep the selection of countries (highlighted) on the world map and change the attribute in the selection bar, another comparison chart will be added too.



But we don't want to accumulate too many line charts, we can click anywhere blank on the map to unselect countries, or remove the line charts in the comparison pannel that we are not interested any more by clicking the Remove button beside each line chart.

Parallel coordinates

For a fixed country, we can see changes in attributes in different years. Any trend of changes can be observed easily.



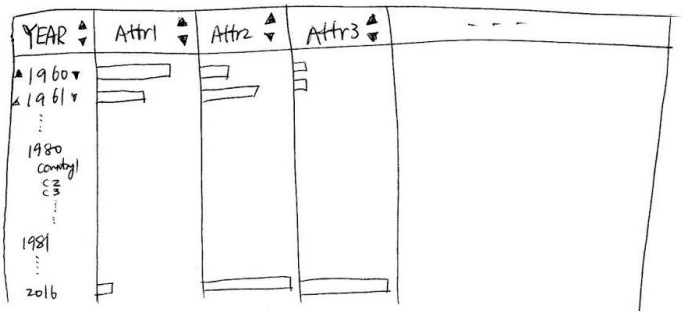
Features:

- Brush. Can use brush to select a segment of one coordinate. The paths going through the selected segment will be highlighted. Similarly, if multiple segments of coordinates are selected, only paths going through all segments will be highlighted.
- Sorting. Each coordinate can be sorted in decreasing/increasing order.
- Reordering. Coordinates can be moved around to be reordered so that specific attributes users are interested in can be adjacent and their correlation can be visualized effectively.

Similarly, we can make parallel coordinates for a particular year one would like to study. In this case, we can simply replace the year coordinate in the above chart by the country coordinate.

Table

YEAR COUNTRY ← can switch the group attribute in the first column between year and country.



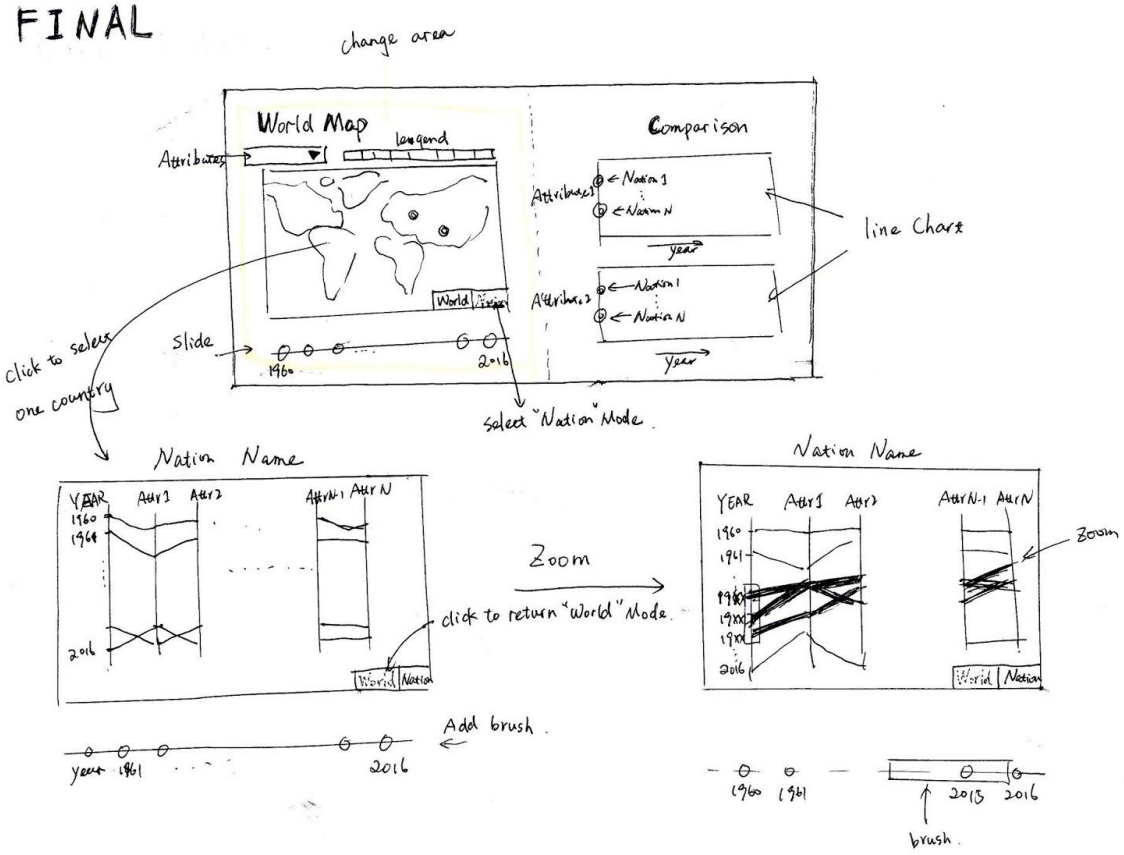
Features:

- sorting. Each column can be sorted
- Grouping/Ungrouping. By clicking ▼ on a year, all countries show up below this year and all attribute values in other columns are populated. Note that attribute values in the year row are median or mean values of those from all countries. By clicking ▲, the details of countries will disappear. Keep clicking ▲, 5 or 10 years can be grouped into one group and the aggregate values of attributes are populated.

Similarly, when the first column of the table is COUNTRY, we can group/ungroup years.

This table can be combined with line charts for comparing selected countries.

FINAL


change area
World Map
legend
Attributes
Comparison
Attribute1
Nation 1
Nation N
year
line Chart
Attribute2
Nation 1
Nation N
year
World
Nation
click to select one country
Slide
1960
2016
select "Nation" Mode
Nation Name
YEAR
Attr1
Attr2
AttrN-1
AttrN
1960
1961
2016
World
Nation
Zoom
click to return "World" Mode
Add brush
year
1961
2016
Nation Name
YEAR
Attr1
Attr2
AttrN-1
AttrN
1960
1961
1980
19XX
19XX
2016
Zoom
World
Nation
1960
1961
2013
2016
brush