INF8808 – Visualisation de données

Lab 3

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Winter 2020

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1 Objectives

The goal of this lab is to realize a bubble chart using open data from a CSV file. It will be possible for the user to modify the displayed data as well as search for specific elements in the graphic. Before starting the lab, it is recommended to read Chapters 8 and 9 of Scott Murray's book [1].

2 Introduction

A bubble chart is a type of graphic that is used to visualize data possessing many parameters and where each point is represented by a circle. It's a combination of a scatter plot and a proportional area chart. With this type of graphic, we can encode a maximum of four dimensions: the position in x, position in y, color and area of the circles.

In this lab, you will create a bubble chart using data about the average life expectancy and revenue per inhabitant, provided by the open data portal of the World Bank. You will have access to data from 156 countries from years 2000 to 2014. The data is split into two CSV files, in the folder `"data"`. Each line has the following information :

- The name of the country (`"name"`);
- The zone of the country (`"zone"`);
- The average revenue per inhabitant in American dollars (`"income"`);
- The life expectancy in years of the inhabitants, (`"lifeExpectancy"`);
- The population of the country (`"population"`).

3 What to do

For this lab, you have to complete the necessary JavaScript code to display a bubble chart which uses data from the World Bank. Also, you will have to add a transition to update the displayed data (which can switch between 2000 and 2014). Also, you will have to complete the logic allowing you to select a particular element to make it stand out. Finally, you will have to display the information about a given country when the circle associated to a country is hovered.

The following subsections present the different parts that will need to be completed for this lab. It should be noted that it is necessary to complete the first two parts of this work

(the data preprocessing and the creation of the bubble graph) before carrying out the last three parts, which are independent of one another. Make sure to complete the various "`TODO`" sections found in the files located in the folder "`assets/scripts`".

3.1 Data preprocessing

For this first part, you need to complete a light preprocessing of the data provided by the World Bank. Indeed, the numbers from the CSV files will have to be converted into type *number* using the functions `parseInt` (for whole numbers) or `parseFloat` (for decimal numbers). After, the different scales that will be used by the graph will have to be defined. To do this, you will need to complete the file "**`1-preproc.js`**" located in the folder "`assets/scripts`". More specifically, you will have to complete the following:

- Initialize the data by converting the numbers in the CSV files to type *number* (function "`initializeData`");
- Specify the domain of the axes x and y (functions "`domainX`" and "`domainY`");
- Specify the domain of the color scale (function "`domainColor`");
- Specify the range of the radius of the circles (function "`domainRadius`").

3.2 Bubble chart

For this second part, you will have to draw the circles and axes used by the graph. Each of the circles in the graph represents a separate country, where the area of the circle corresponds to the population of that country and where the color is associated with the region of the world of that same country. The position in x of the circle corresponds to the average life expectancy of the inhabitants of this country while that in y illustrates the average income per capita in American dollars. For the sake of clarity, Figure 1 illustrates what the graph obtained should look like once this part is completed.

For the creation of axes, you can use the classes "`axis x`" and "`axis y`" with the groups responsible for drawing the axes x and y respectively.

- Draw the axes x and y associated with the graph (function "`createAxes`");
- Draw the circles of the graph (function "`createBubbleChart`").

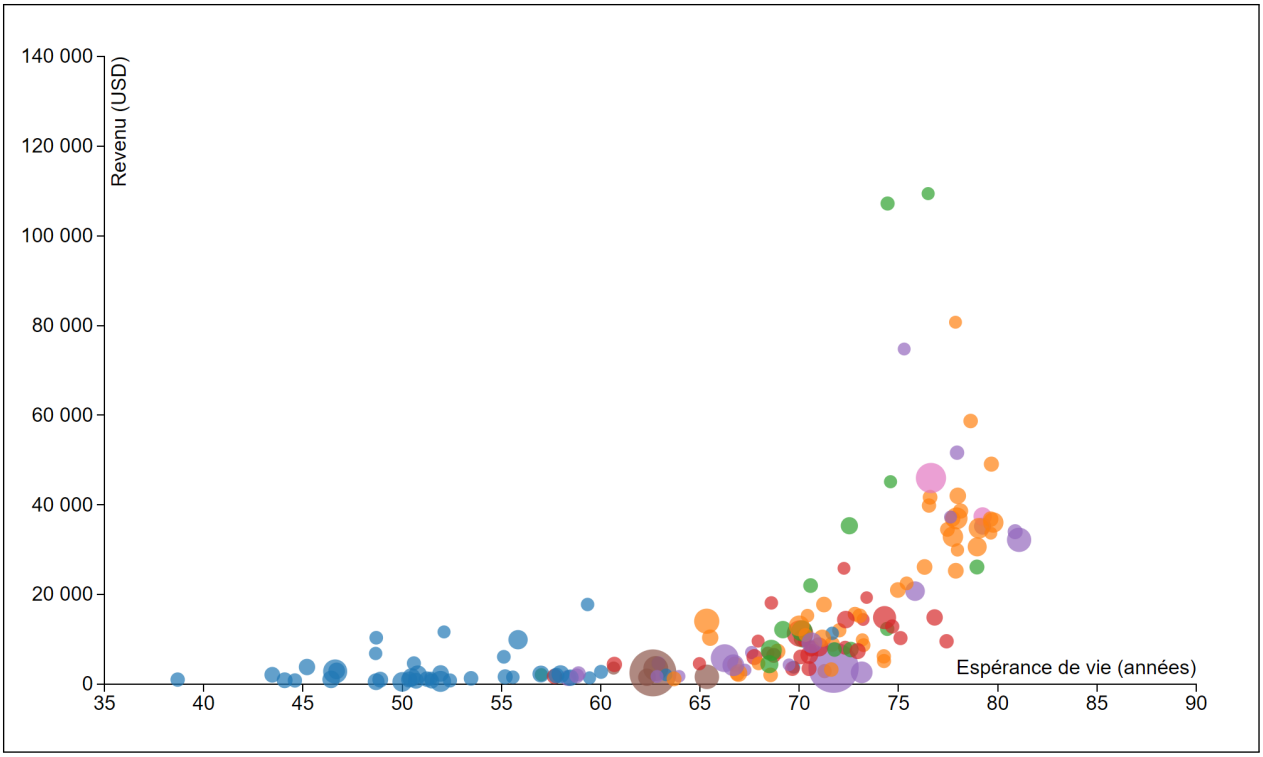


Figure 1: Bubble chart illustrating data for the year 2000

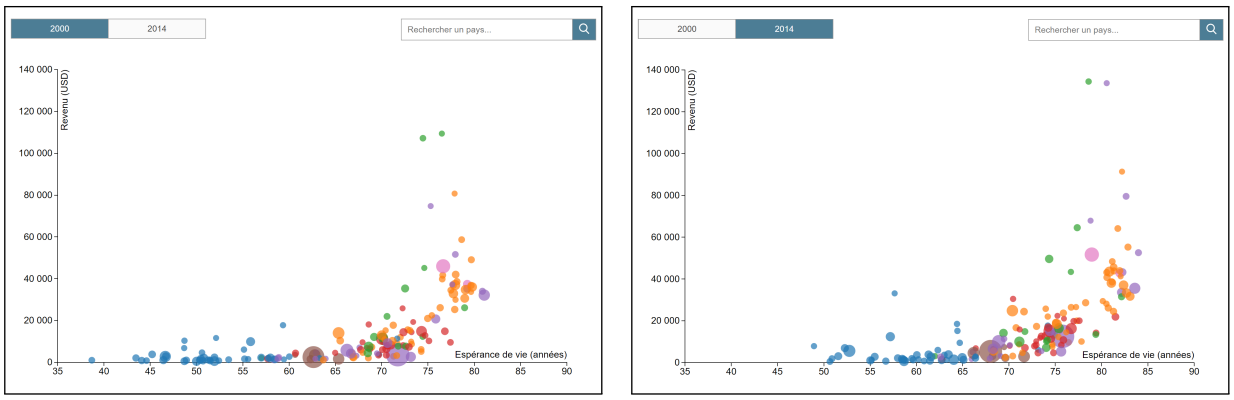
Be careful!

Make sure to indicate a title for your axes in a similar way to Figure 1 (e.g. "Life expectancy (years)" for the axis x and "Income (USD)" for the axis y). In addition, make sure that the orientation of the elements is as shown.

3.3 Transition

The third part of this work consists in carrying out a transition when the data used by the graph is modified. When the "2000" or "2014" buttons are clicked, the data used by the graph must be modified in order to use those associated with the year indicated on the button clicked. In this sense, a transition lasting one second must be made in order to update the position and size of the circles in the graph in order to illustrate the changes. Figure 2 also illustrates the display expected for the years 2000 (2a) and 2014 (2b).

To achieve the requested functionality, you will have to complete the function "`transition`" of the file "**`3-transition.js`**".



(a) Data for 2000 (b) Data for 2014

Figure 2: Bubble chart with varying data

3.4 Search

For this fourth part, you will have to implement the search for any element on the graph. As you may have noticed, it can be difficult to spot a certain country on the diagram due to the large amount of data. To facilitate this operation, a search bar with autocompletion has been provided so that you are able to find a particular country.

When a valid country is entered in the search bar and a search is launched, the circle of the graph associated with this country must become black and its opacity must be 100%. In addition, all the other circles of the graph which are associated with other countries must modify their opacity to 15%. For clarity, Figure 3 illustrates what the search result should look like. In this case, the country sought was "Canada".

When an invalid value is entered in the search bar, the graph should return to its initial state, as illustrated in Figure 1. Specifically, the circles in the graph should return to their opacity and their original color.

To carry out this part, you will have to complete the file "**`4-search.js`**". More specifically, you will need to complete the following:

- Highlight the country that is sought by modifying the display of the graph (function "search");
- Reset the display of the graph to the default (function "`reset`").

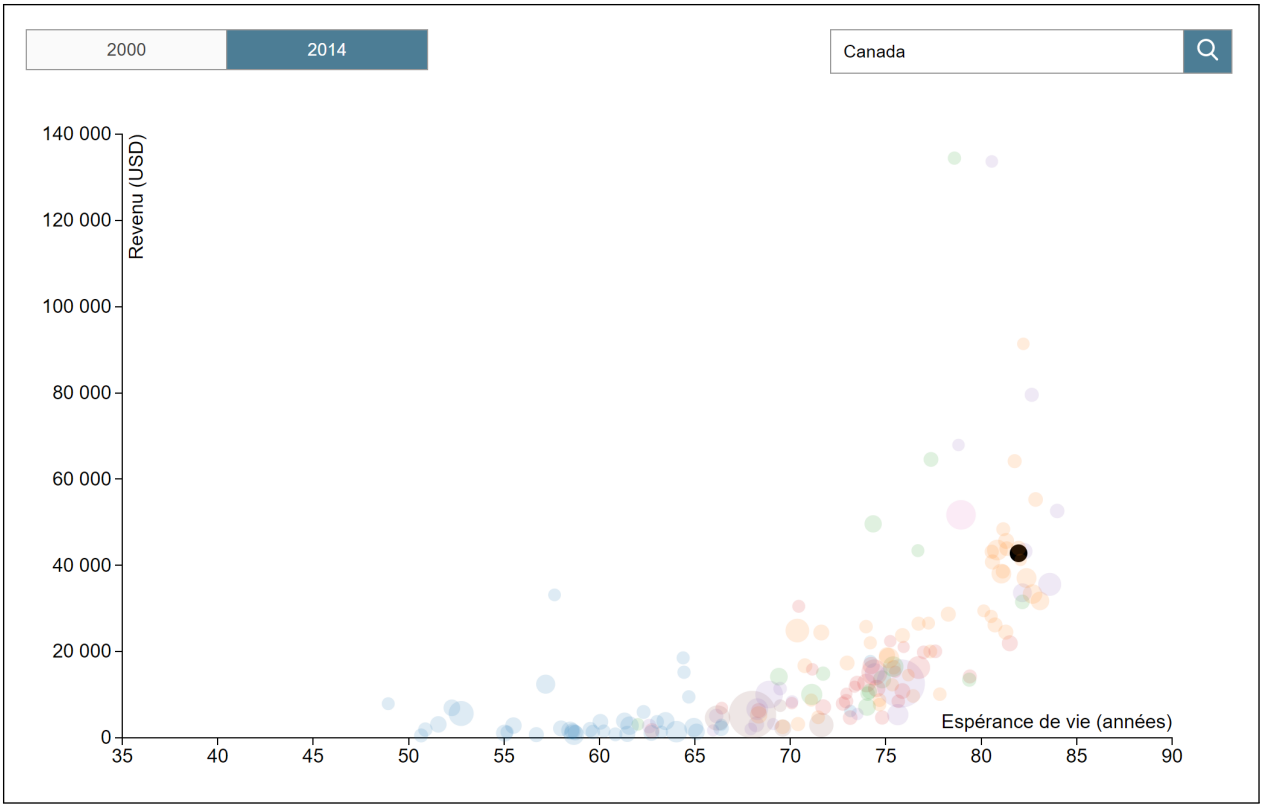


Figure 3: Bubble chart using the data for the year 2014 where the country "Canada" was searched

Be careful!

Make sure that the display of the search result is kept when you modify the data used by the graph (transition).

3.5 Tooltip

As for the last part to perform, you will have to complete the text which must be entered in the tooltip which will be displayed each time a circle is over. In this sense, the tooltip should display the information associated with the country which is currently overflown by the mouse. This information is as follows:

- The name of the country;
- The life expectancy;
- The average revenue;
- The population;

- The zone in the world.

The rendering of the tooltip should be similar to Figure 4. Note that important values must be in bold and that numbers must be formatted using the "`formatNumber`" function that is provided.

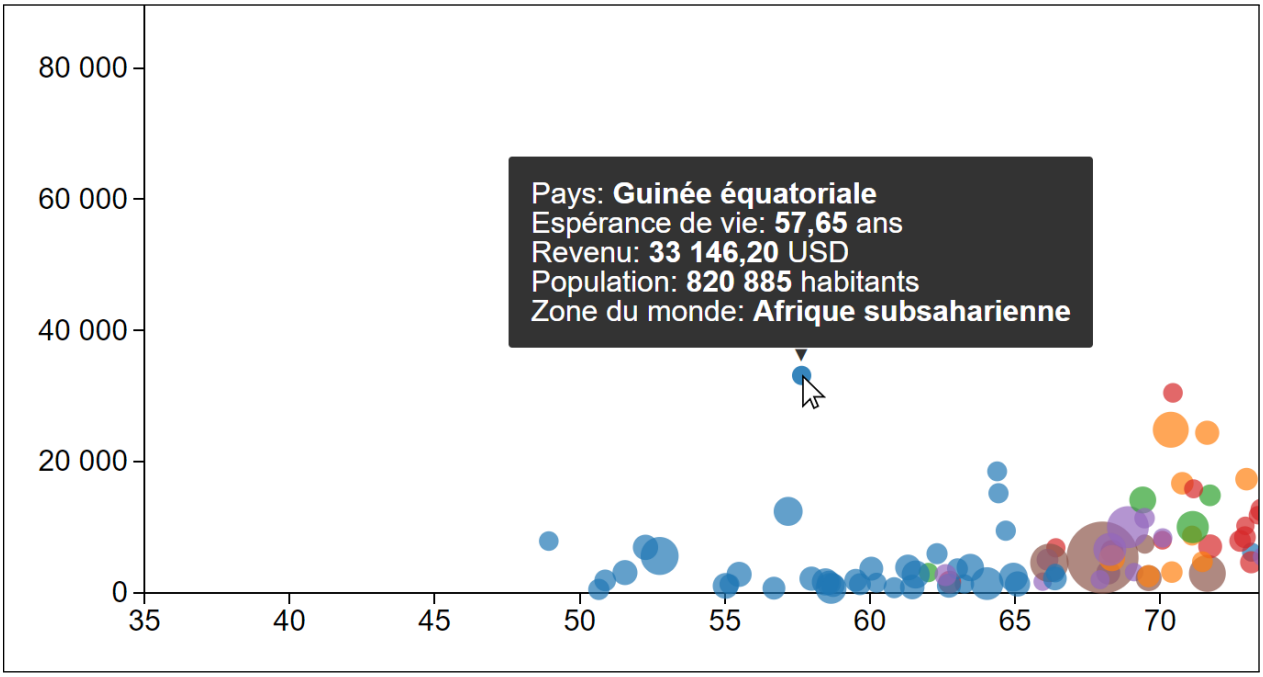


Figure 4: Tooltip displayed when a circle of the graph is hovered

To implement the requested functionality, you will have to complete the function "`getTool-TipText`" of the file "**`5-tooltip.js`**".

4 Submission

Here are the instructions for submitting this practical work:

1. You must place your project code in a compressed ZIP file named « `TP3_studentId1_-studentId2_studentId3.zip` ».
2. The lab must be submitted before **11:59PM**, **February 13 2020** on Moodle.

5 Grading

Overall, you will be assessed on the respect and proper functioning of the requirements. More specifically :

Requirement	Points
Data preprocessing	4
Bubble chart	6
Transition	3
Search	3
Tooltip	3
Code quality and clarity	1
Total	20

This lab is worth **5%** of the course grade.

References

[1] S. Murray, *Interactive Data Visualization for the Web: An Introduction to Designing with D3.* O'Reilly Media Inc., 2013.