Interactive visualisation in time and space of flights in the United States

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1 Introduction

Air traffic data is dense, multidimensional, and constantly evolving. They are hard to understand using only tables. Data visualisation techniques can play a key role in understanding the main trends in the data.

In the United States (US), there are primary airports, and over 9 million flights were recorded in 2015 [**?**]. While we had a personal preference for analysing French air traffic data, and in particular departures/arrivals at Lyon Saint-Exupéry, open access data on flights is remarkably hard to obtain. We speculate this is for mainly commercial and security reasons. We thus concentrate on the best data we found, which is from the US.

Our main objective in this project is uncovering through data visualisation interactions between the spatial and temporal dimensions of air traffic in the US. We focus in particular on exploring the links between air traffic volume/direction and time/seasonality. We can then look to answer questions such as: are flights directed towards more sunny regions during summer and towards more mountainous regions in winter? When in the week, and in the calendar year, do flight numbers peak? From which airports, and by which airlines?

The importance of building effective visualisations is clear in this context, as these questions require representing complex data in intuitive ways to produce understanding. The visualisations will be built using the D3 JavaScript library and presented on our GitHub web page.

We will highlight the evolution of flights : in space (according to countries, continents), in time (depending on the season or school holidays)and according to the company.

2 Related Work

2.1

This part will describe the state of the art of flight visualizations in space, time and companies.

3 Conception guidelines

3.1 Main visualisation

We will start with a geographical map showing the main American airports and the traffic between them, with a color or symbol encoding for amount of flights. We then wish to implement user interactivity allowing for some of the following:

1. Selecting a relevant timeframe, measured either in month of the year or day of the week, in which to restrict the data.

2. Superimposing traffic from different seasons: for instance, winter vs summer.

3. A 'summary wheel' giving the main directions of flights; this could help seeing what the differences are in time, and possibly why.

A search bar for airports and airline companies would be useful to implement for the user to get an understanding of the connectivity of the network. In addition, the possibility of selecting the top x most busy airports can give the main trends in the data.

We have two additional visual representations we are looking to implement. We consider building them because they are quite simple so not time-consuming, and because they could provide useful informational added-value.

3.2 Supporting visualisations

The first supporting visualisation is a calendar year heatmap. An example of one is provided in the Related works section **??**. It is an efficient representation of the main periods of air traffic intensity. It would also make it easy to contrast week-ends and weekdays, and also pinpoint holidays and how they affect air traffic.

The other supporting visualisation is the streamgraph. It will represent the volume of total air traffic contributed by the different airlines and/or airports. This information cannot easily be represented using a geographical map. Here as well, a temporal dimension can be added by selecting timeframes.

Naturally, realising these supporting visualisations is subject to time constraints and represent an initial work plan only.

References

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