

Visualising the Streets: Representing the Spatial, Temporal and Social Patterns of Vélo’v Users

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1. INTRODUCTION

Vélo’v is a bike-sharing system in the city of Lyon. Launched in 2005, it was one of the first bike sharing systems implemented in France [1]. It started with 2,000 bikes and 200 stations and has increased to 4,000 bikes spread over 348 stations dispatched in Lyon and Villeurbanne [2]. Since 2013, JCDecaux, operator of Vélo’v, in partnership with the Greater Lyon, has released static data on the locations of Vélo’v stations and the number of bike stands, historical data that are seven days old. It also provides access to real-time data on bike and stands availability through an API [3].

For this project, we will use a data set on cycling trips in 2011 made available by JCDecaux and Lyon authorities as part of the research project ANR ‘VEL’INNOV’[4]. The project was carried out by an interdisciplinary research team in Lyon studying the use of bike-sharing services and following discussions with Professor Luc Merchez, we were able to secure access to the set for learning purposes on the condition that the visualisation is not publicly accessible since we did not obtain permission from JCDecaux to use the data set. The set includes information on cycling trips between Vélo’v stations in addition to data on users such as gender, age, place of residence and type of membership (yearly subscription plan). To cross the information on demographics with bike usage, our visualisation will focus specifically on trips by registered users which equals over 4 million trips out of the 7 million carried out in 2011.

The main advantage is the ability to visualise bike use through a socio-demographic perspective which would not have been possible with the data set available to the public. A second advantage comes from having a data set ready-for-use which will allow us to focus on the analysis and the visualisation. There are also limits related to using this data set. The first one concerns the freshness of the data. Our data set is over five years old which may limit the insights we could have contributed to discussions on smart cities and bike-sharing systems. Secondly, the set only covers the year 2011 which prevents us from making comparisons from one year to another and visualising any evolution. This being said, there is sufficient data to create an original visualisation of users’ habits over the year, on hourly, daily, weekly, monthly, and seasonal bases. In addition, previous visualisations were static so we are hoping an interactive perspective of the same data will bring out new insights.

2. RELATED WORK

While searching for data sets on bike sharing, we came across various studies and articles that inspired us. Team datahub’s GitHub website recommended by the professors, demonstrated that an in-depth visualisation including socio-demographic data could

be an interesting idea if we could find a detailed dataset with data on users [5]. Our search for this information led us to an online article by Professor Luc Merchez on a static visualisation of usage statistics [6]. We set an appointment with Professor Merchez who then introduced us to the worked carried by former intern Dominique Pitt who had used the same data set to develop a geographical information system to analyse the original data set through queries [7].

In addition, we looked at visualisations of bike-sharing systems in other cities such as the following ones to find out what analysis could be done, visualisations that would be the most relevant and the related code to implement this:

- Berlin, London and New York City [8]
- Boston [9]
- Moscow [10]
- New York City [11]

3. DESIGN

At this phase of the project we explored some early leads for our interface. We made some sketches (hand-drawn & Balsamiq Mockups™) to help us shape our work.

We imagined a first interface to illustrate the relation between Vélo’v traffic and time (Figure 1). We would adopt a geographical map as the base layer, on which we mark the location of Vélo’v stations. Lines would be added over the map and the station locations to show the displacements effectuated by travellers. Hence, the denser the lines between two stations, the more frequent the traffic between them. A tab bar could be added to offer the possibility to switch between different time bases, namely, day, week, month, and season. A timeline slider could also be available for viewing the variation between corresponding time intervals. On the right-hand side, filters could enable users to further explore traffic patterns by varying available data on Vélo’v subscribers’ profiles, for instance, gender and age, and journey duration.

Taking the chord diagram as the base, we conceptualised a second interface which focuses on Vélo’v traffic between areas in Lyon and Villeurbanne (Figure 2). The stations would be grouped into *zones* (Lyon arrondissements and Villeurbanne) and laid along the perimeter to form a circular space, in which lines would show the traffic flux between stations across two *zones* or two stations. The thicker the line cluster becomes, the more often traffic between two neighbourhoods it indicates. We picture that further details of in-out traffic could be shown upon hovering over the name of a particular *Zone*, and/or over a line cluster. Filters could be made available for toggling data visualisation from a *zone* to another.

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Other filters about Vélo'v subscribers' profile could also be introduced for further exploration in journey pattern (Figure 3).

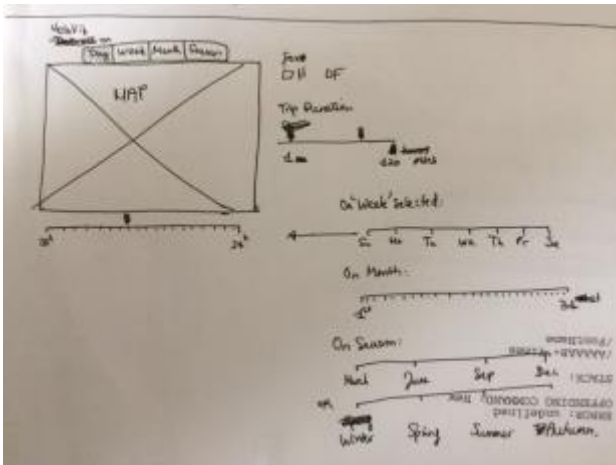


Figure 1: Sketch of map interface

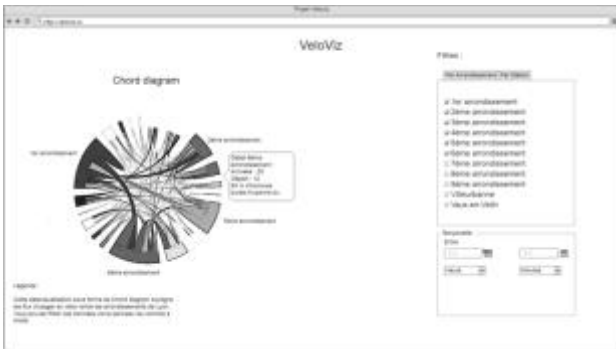


Figure 2: Mock-up of our suggested chord diagram

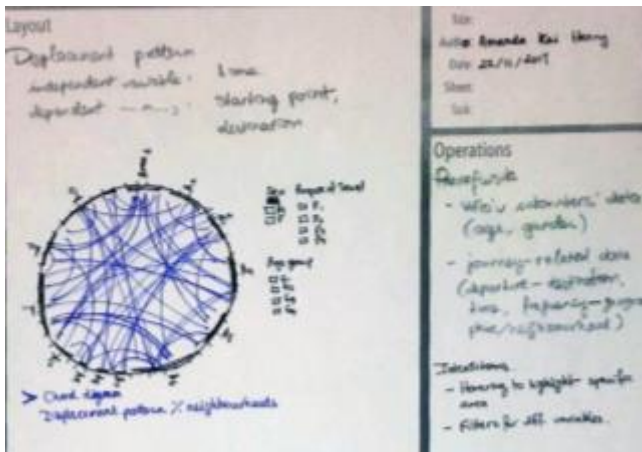


Figure 3: Initial sketch of our proposed chord chart

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