VIA VELOX

Visualizing GPS-tracked bike rides to better understand cycling behaviour

Motivation

Mobility behaviour of cyclists much more depends on individual characteristics and preference in comparison to users of public transit or motorized private transport. The main goal of our project was to gather and visualise trajectory data in order to support a better understanding of bicycle mobility patterns and trends.

The interactive prototype provides two coordinated views: A map with trajectories and a frequency matrix with a calendar heatmap and histograms.

Users can select areas within the map to filter bike trips which started or ended in that region. Such spatial filtering is mirrored in the frequency matrix, with all matching trips being displayed over time.



Spatial filter



The user can navigate by zooming and panning in the map. Blue trajectories represent the total number of recorded trips without any filters applied.

An area is selected by clicking in the map. Routes that are covered by the spatial filter are displayed in a yellow hue. The user can combine multiple selections and choose to filter either for departures or arrivals.

The radius of the selection can be resized to suit varying search interests.





Two histograms on either sides show aggregated frequency of trips for each weekday, as well as for each week (resp. each hour). By summarization, these histograms allow a more direct comparison of trends over the different temporal levels. Users can select time spans via the calendar by clicking on single cells, or by dragging the mouse over the matrix. Each selected cell is highlighted in yellow, with a matching gradient colour schema representing the same amounts of rides per unit.

Here, Saturday and Sunday were selected to analyse cycling behaviour on the weekend. After selecting specific time ranges, the histograms on each side get updated to highlight the sub-selection, as well. In this way, the highlighted parts of the histogram bars enable comparing the frequency of trips in a selected time range with the overall distribution of all bike trips.

Insights



Seasonal Patterns

Environmental factors such as weather conditions can strongly influence the behavior and decisions of cyclists. These general patterns become visible in the histogram, showing larger amounts of trajectories in spring and summer months.

Circadian Patterns

Similar temporal patterns can also be found at a smaller scale. Typically, more bike rides happen at daytime than at night, which is reflected in the recorded trajectories. Comparing different days of the week can help revealing interesting insights about varying usage scenarios.

Combined Patterns: Recreational

An intensified usage, predominantly in the morning hours on weekdays, without significant seasonal fluctuations and destinations in areas dominated by workplaces or transportation hubs, could indicate commuting movements. Also, commuters could probably be more prone to use the fastest route possible to save time in their daily routines.

Feedback



User feedback

Monnem Bike was a large bicycle festival in Mannheim to celebrate the 200th anniversary of the invention of the bike (10th June 2017). Here, we presented Via Velox publicly for the first time.

Conclusion

The attractive visualizations and simple but powerful interactions make bicycling data accessible and comprehensible. We learnt that *Via Velox* enables gathering a variety of insights, ranging from seeing which routes are used more frequently, to understanding daily patterns.

With this, we hope that our system helps to improve safety on the way to work, school or university, and contributes to a sustainable urban mobility planning.

hochschule mannheim

Deniz KayaPascal PerleMartin SchröderBüsra KelesPhilip PreglerUgur TunaliDimitry NagornyLisa Rudolf

Till Nagel (t.nagel@hs-mannheim.de)