GeoVisual Analytics for the Exploration of Complex Movement Patterns on Arterial Roads

Irma Kveladze and Niels Agerholm

UCGIS 2018 Symposium and CaGis

AutoCarto
In 2015, 5,435 pedestrians were killed in road accidents in the EU, which is 21% of all road fatalities.

### European Commission Report

The annual data of pedestrian fatalities in the EU

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The number of pedestrians who were killed in road accidents decreased by 36% from 2006 to 2015.
The percentage of pedestrian fatalities of all road fatalities differs widely across Europe.

### European Commission Report

#### Percentage of pedestrian fatalities of all road fatalities in the EU

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User interest

• To observe and understand the use of the arterial roads by vehicle drivers and pedestrians
  
  • Where, when and how often do Vulnerable Road Users (VRU) cross the streets by neglecting traffic rules on arterial roads.
  
  • Do vehicle drivers obey speed limit rules on the arterial roads.
### Use case studies

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<th>Length of the street segment (m)</th>
<th>Number of traffic controlling elements</th>
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### Data characteristics

**FCD was collected:**
- 3 years (2012, 2013, 2014)
- 425 cars

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<td><strong>Position X, Y</strong></td>
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<td><strong>Direction</strong></td>
<td>a 3-digit number, which describes the movement direction (360 degree) of the vehicle.</td>
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<td><strong>Speed</strong></td>
<td>measured in <strong>meters/second</strong> based on the GNSS registrations.</td>
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**Data limitation** – due to the **anonymisation** certain information is removed from the database.
Floating car dataset

Data processing – MapMatching

Mapillary’s freely available map-matching algorithm based on PostgreSQL, Postgis and pgRouting was adapted.
Visual Solution

Develop street profile graph to reveal high-low movement speed on arterial roads

Pixel Based Approach – Pixel Bar Charts

Stacking based approach – trajectory wall


Results

Sankt Peders Gade – movement distribution

Speed limit: 30 km/h
Length: 647.11 m
Speed controlling elements: 7
Results

Sankt Peders Gade – street profile

- Sankt Peders Gade – 647.11m, North-West
- Sankt Peders Gade – 647.11m, South-East

Speed limit – 30 km/h

- Zebra crossings
- Traffic signal & pedestrian crossings
- Speed bumps
Results

Kastetvej – street profile

Time

Kastetvej - 569,77m, North-West

Time

Kastetvej - 569,77m, South-East

Speed limit – 50 km/h

Zebra crossings

Traffic signal & pedestrian crossings

May 22 – 24 2018 | Madison, Wisconsin USA
Results

Gugvej – street profile

Speed limit – 60 km/h

Background

Study design

Results

May 22 – 24 2018 | Madison, Wisconsin USA
Conclusions

• The proposed visual solution space revealed detailed patterns of speed variations on arterial roads. The visual exploration allowed to answer the questions of the traffic engineers using a multiple visual representations.

• Using FCD to investigate speed-flow and congestion patterns on road network is a prevailing way in traffic and transportation domain, however it can be challenging. To make sense of FCD suitable visual representations and tools for the analysis are needed.

• The knowledge derived may help scientists in the traffic domain to gain an extensive understanding on movement patterns in traffic networks. Revealed movement patterns can be used by domain experts in better planning and design of road network.
Thank you!