GIScience 2021 POZnan ADAM MICKIEWICZ UNIVERSITY IN POZNAN

Cognitive Workload and Bicyclists' spatial behavior

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Bicycles and Intelligent Transport Systems (BITS)

Urban Development and Smart Cities

Smart Cycling
Technologies
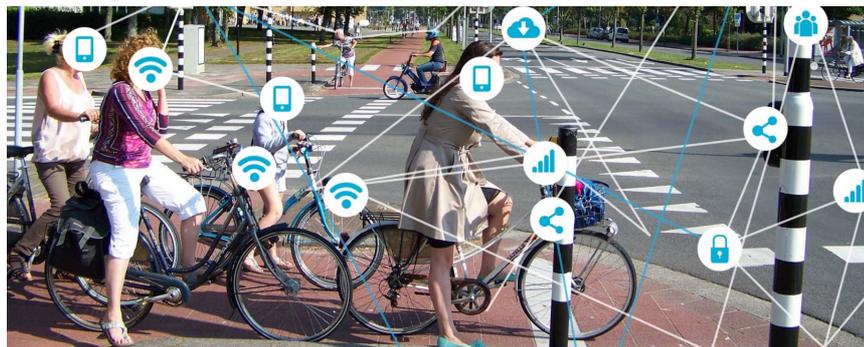
Source: https://northsearegion.eu

Smart and Sustainable Mobility

Different Cycling Apps

- **Pre-trip**
  - Route and navigation
  - Bike share and reservation
- **On-trip**
  - Tracking bicycle trips
  - Availability of cycle parking
  - Monitoring health impact
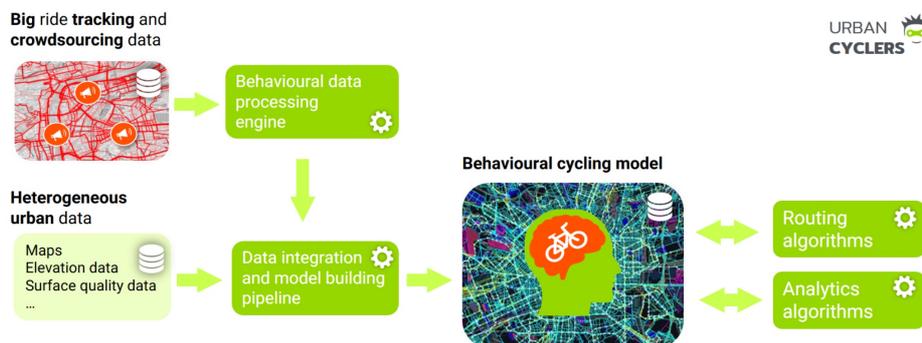- **Post-trip**
  - Cycle theft prevention

Source: https://northsearegion.eu

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Cognitive Control of Human Behavior

Smarter Cycling – Big Data and Artificial Intelligence

Source: https://ecf.com/

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Smart and Sustainable Mobility

Visualization Solutions

Gather and translate data into valuable
information to give advice to the user
how to best select riding path

Source: https://northsearegion.eu

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Cognitive Control of Human Behavior

General Framework

The general framework is a model of human control of behavior in terms of a hierarchical
structure. The model distinguishes between three levels of cognitive control:

- Skill-based behaviour
- Rule-based behaviour
- Knowledge-based behaviour

However, it does not address cognitive workload or distraction of bicyclists.
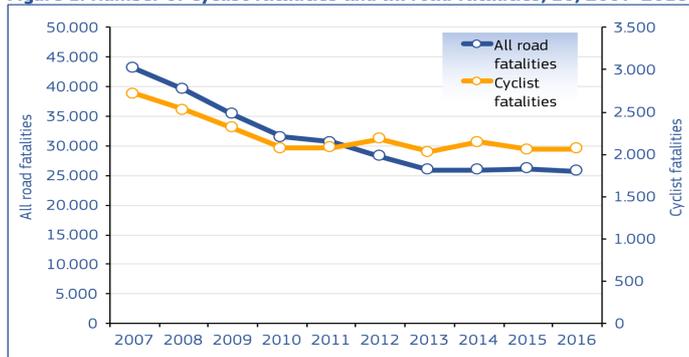
Source: Rassmusen (1980; 1987)

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Smart and Sustainable Mobility

European Commission Report

Figure 1: Number of cyclist fatalities and all road fatalities, EU, 2007-2016

Source: CARE database, data available in May 2018

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Smart and Sustainable Mobility

Cognitive Workload

- One of the influential factors on bicycle fatalities is the spatial behaviour of cyclists influenced by the cognitive workload.

- It affects peoples' physical and mental ability to react on the surrounding environment and make decisions in a complicated situation that is critical in traffic safety.

- The performance of complex dynamic-decision making tasks depends on an individual's cognitive abilities, however, individual's experience and skills have an important role to play in the effective performance of the tasks.
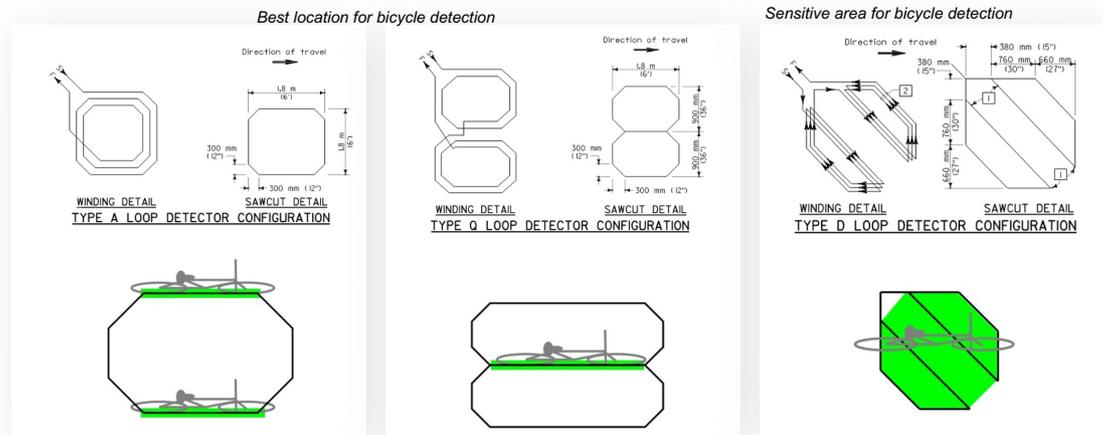
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Bicycles and Intelligent Transport Systems (BITS)

Improved infrastructure - Loop sensors for smart cities

Best location for bicycle detection

Sensitive area for bicycle detection

Source: http://www.bikewalknc.org/bicycle-detection-at-traffic-signals/

Cognitive Control of Human Behavior

How Can AI Help?

- **How to understand / measure the impact of the cognitive workload on spatial behaviour of bicyclists using AI?**

- **How to extract information on cognitive workload from the data gathered through various tracking and recording devices using AI? Can bicyclists' route choices for cycling from a cognitive perspective be helpful?**

- **How can AI help in designing the suitable routing algorithm from physical and cognitive overload perspective for cyclist, and how can this algorithm be utilized for a different criteria and places?**

Thank you!