Cycling through intersections: Patterns affecting safety

Mandy Dotzauer, Marek Junghans, Gina Schnücker

Background: Cycling trends
- Cycling is environmentally friendly, healthy, and sustainable.
- Popularity has increased in urban areas.
- Growth of bicycle use occurred over the past decades.

XCYCLE - Advanced measures to reduce cyclists' fatalities and increase comfort in the interaction with motorised vehicles

Background: Cooperation
- Joint action: Two or more parties work or act together for a common benefit.
- Cooperation affects outcomes and decisions: Prisoner's dilemma.
- Cooperation in real-world interactions requires trust and willingness to compromise.

Research goal and question
- Project goal: Investigating and developing new technical means (focusing on detection and networking technologies) in order to prevent crashes between vulnerable road users and motorized traffic in urban areas.
- Research goal: Online situation and risk assessment (predicting critical situations).

Method: Dataset
- Video recordings and trajectory data from August 22nd to September 18th (4 weeks).
- Video data from over 35 minutes of observation.
- Dataset includes over 1800 interactions of cyclists and motorists.

Method: Variables and analysis
- Independent variable: Type of interaction
- Dependent variables: Mean speed (v in m/s)
- Distance (m)

Analysis:
- ANOVA with repeated measures (Greenhouse-Geisser correction)
- Post hoc tests (one-sample independent t-test; α = 0.004)
- Repeated contrast analysis for significant interaction effects
**Results: Mean speed**

- Diagram showing trend lines for different categories.

**Results: Distance in speed (DiS)**

- Diagram showing trend lines for different categories.

**Discussion/Conclusion**

- Discussion:
  - Analyzing speed patterns as a first step to finding a method to quantify cooperation.
  - Calculating "distance in speed" was done independent of:
    - Relative position to each other
    - Distance between interaction partners
  - Differences in time crossing a section
  - What we know:
    - Interaction patterns partly vary across a section at the same time

**Revisiting research questions**

1. How do encounters and critical situations differ for drivers and cyclists?
   - Cyclists in critical situations approach the intersection with higher speeds.
   - Drivers in critical situations do not show differences in speed during the last 15 seconds before the crossing point.

2. Where and when do conflicts emerge? Do they emerge abruptly or build up over time?
   - Last 10 meters before the crossing point, mean speed of cars drops from 6.5 to 4.5 m/s, cyclists from 5.5 to 3.5 m/s.
   - Critical situations: 10 m before crossing point, mean speed of cars drops from 4.6 to 3.3 m/s, cyclists from 5.9 to 5.2 m/s.

3. Is it possible to detect conflicts before they escalate?
   - Results indicate differences between encounters and critical situations before they occur.

4. Is it possible to quantify behavioral patterns (interaction/cooperation)?
   - Variable distance in speed may be promising for quantitative interactions less coherent than critical interactions.
Thank you for your attention!

Dr. Mandy Dotzauer  
Mandy.dotzauer@dlr.de  

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