

Comparison of overtaking behaviour between cyclists, and between motorised road users and cyclists

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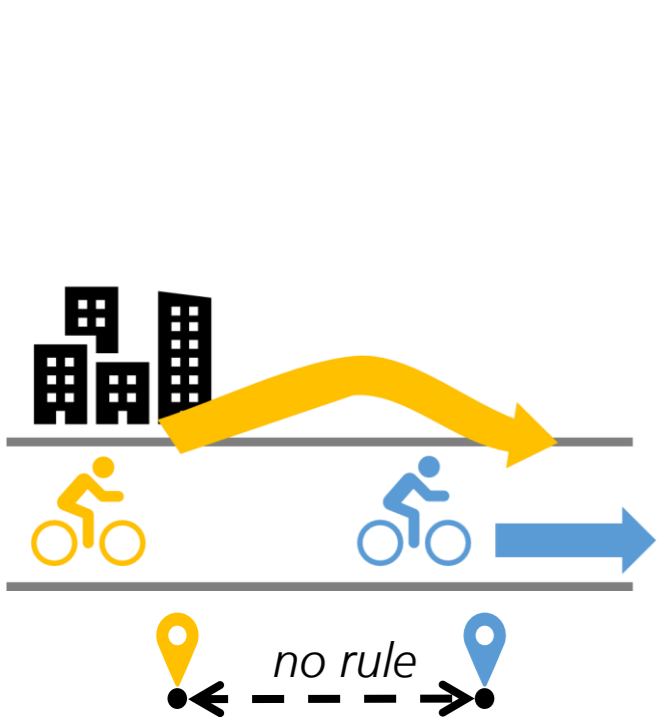
INTRODUCTION

- By law, a distance of **1.5 m in urban areas** and **2 m outside urban areas** must be respected when a bicycle is overtaken by a car in Germany.
- **Between cyclists**, there are **no distance rules** that must be kept, when overtaking.
- A university in Germany analysed 8,000 overtaking manoeuvres. In 50% of all overtaking manoeuvres in urban areas, the minimum distance was not respected. Outside urban areas, the minimum distance was not respected in $\approx 80\%$ of cases between car and bicycle. [1]
- In Germany in 2021, there were more than 1,400 cases of personal injury caused by cyclists misbehaving when overtaking [2].
- Drivers base their perceived safety on the crash risk of a collision with the oncoming vehicle. Cyclists based their perceived safety on the lateral clearance and speed of the overtaking vehicle. [3]

METHOD AND AIM

- Camera-based traffic observation in Germany in
 - an **urban area (bicycle path)** in Braunschweig in February and October 2022 and May 2023 at the Application Platform for Intelligent Mobility (AIM) [4].
 - an **urban area (roadway)** in Berlin in September 2021.
 - a **rural area (roadway)** in Brandenburg in July and October 2023 with a mobile measurement station [5].
- Data contains information about GNSS-based timestamp, location (UTM), velocity, acceleration, road user type (e.g. pedestrian, bicycle, car) and size of each detected road user. The centre position of the object is used for distance analysis.
 - There are rules about distance between vehicles and bicycles, but how are they respected in urban and rural area? There are no rules about distances between cyclists. What conflicts might this cause?
 - The aim is to show similarities and differences in overtaking behaviour in urban and rural areas having an impact on traffic safety.

RESULTS



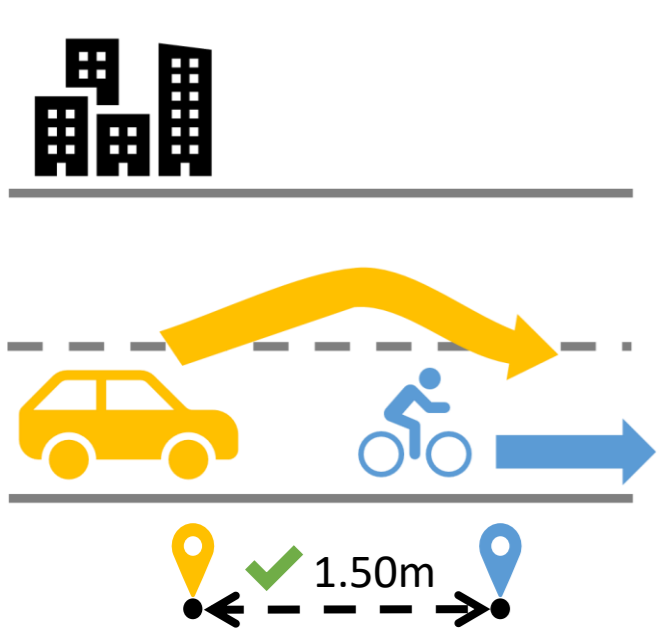
Sample video images of overtaking in an urban area between cyclists.

URBAN AREA / bicycle path (256 h)

- ⊗ Analysed overtaking manoeuvres: $n = 12$
- ⊗ Average lateral distance: $d_{mean} = 1.7 \pm 0.3m$
- ⊗ Average minimum lateral distance: $d_{mean_min} = 1.4m$
- ⊗ In 75% of cases, cyclists overtake legally from the left, with the cyclist being overtaken usually moving onto the pedestrian path.



SCAN ME (for videos)



Sample video images of overtaking manoeuvres in an urban area.

Left: Overtaking between cyclists.

Right: Overtaking between vehicle and cyclist.

URBAN AREA / roadway (9 h)

Motorised vehicle vs bicycle

- ⊗ Analysed overtaking manoeuvres: $n = 103$
- ⊗ Average lateral distance: $d_{mean} = 2.4 \pm 0.5m$
- ⊗ In 57 % of the cases was the distance $d \leq 1.5m$
 - in 56 % of these cases there was no oncoming traffic

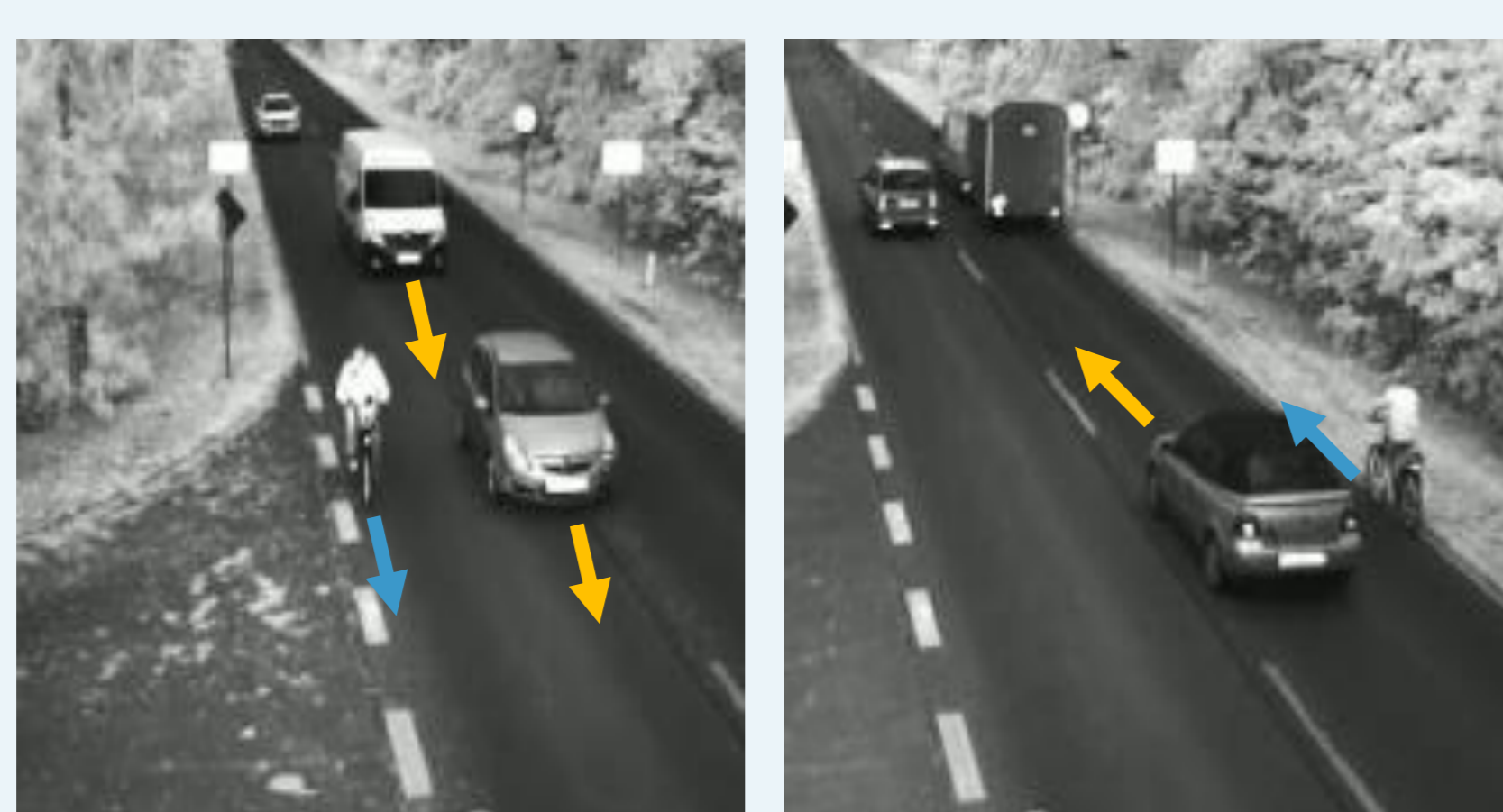
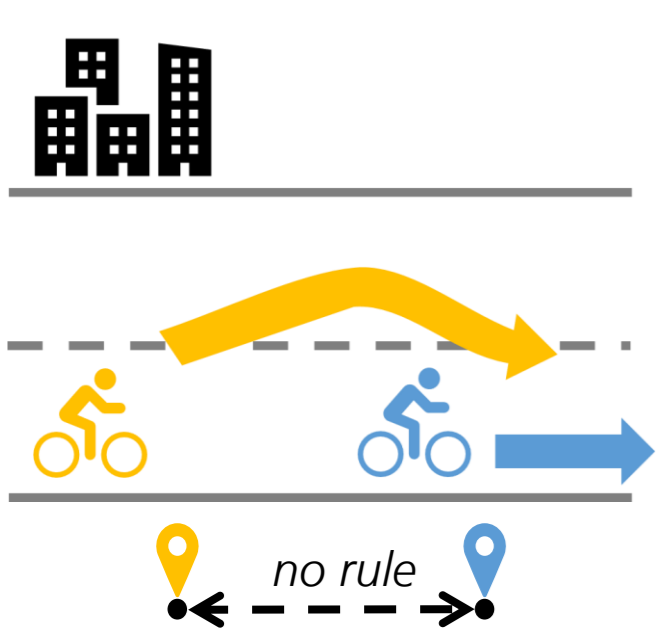
Bicycle vs bicycle

- ⊗ Analysed overtaking manoeuvres: $n = 105$
- ⊗ Average lateral distance: $d_{mean} = 1.6 \pm 0.5m$
- ⊗ Average minimum lateral distance: $d_{mean_min} = 0.8m$
- ⊗ 11 cases with high potential risk (wobble)



SCAN ME (for videos)

[6]



Sample video images of overtaking manoeuvres in a rural area.

Left: Direction town entrance.

Right: Direction out of town.

RURAL AREA / roadway (336 h)

Direction town entrance

- ⊗ Analysed overtaking manoeuvres: $n = 200$
- ⊗ Average lateral distance: $d_{mean} = 2.4 \pm 0.5m$
- ⊗ In 27% of the cases was the distance $d \leq 2m$

Direction out of town

- ⊗ Analysed overtaking manoeuvres: $n = 129$
- ⊗ Average lateral distance: $d_{mean} = 2.6 \pm 0.5m$
- ⊗ In 15% of the cases was the distance $d \leq 2m$
- ⊗ 60% of overtaking manoeuvres started inside town



SCAN ME (for videos)

[7]

CONCLUSION

- ⊗ When overtaking below the safe lateral distance, there is no difference in the distance between motorised road users and cyclists.
- ⊗ On urban roads, more than half of the cars overtaking bicycles do not keep the lateral distance.
- ⊗ Parked cars in combination with the absence of bicycle paths cause evasive manoeuvres of cyclists, which can lead to conflicts with other cars and cyclists.
- ⊗ The construction of bicycle paths in rural areas can promote the attractiveness of cycling, increase the perception of safety and increase the individual's safety perception.
- ⊗ Lateral distances are not always maintained when overtaking and this can lead to dangerous manoeuvres, especially in rural areas at speeds of up to 100 km/h (≈ 62 mph) but even in urban areas, situations are often confusing and there is little space for road users.
- ⊗ Narrow bicycle paths can encourage conflicts between cyclists. Swerving can lead to collisions with other road users or with obstacles.

[1] Hessischer Rundfunk. Verkehrssicherheit - Sensoren zeigen, wo Radfahrer zu nah überholt werden. <https://www.hessenschau.de/wirtschaft/verkehrssicherheit-sensoren-zeigen-wo-radfahrer-zu-nah-ueberholt-werden-v1,fahrrad-sensoren-abstand-auto-sicherheit-100.html>. last accessed on 14 May 2024

[2] Statistisches Bundesamt. VERKEHRSSUNFÄLLE: Kraftrad- und Fahrradunfälle im Straßenverkehr 2021. https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Verkehrsunfaelle/Publicationen/Downloads-Verkehrsunfaelle/unfaelle-zweirad-5462408217004.pdf?__blob=publicationFile. last accessed on 14 May 2024

[3] Rasch, A., Moll, S., López, G., García, A., & Dozza, M. (2022). Drivers' and cyclists' safety perceptions in overtaking maneuvers. *Transportation research part F: traffic psychology and behaviour*, 84, 165-176.

[4] German Aerospace Center (DLR). 'Research Intersection' - a hub for data collection in the field. <https://www.dlr.de/en/ts/research-transfer/research-infrastructure/test-areas/recording-technology/research-intersection-a-hub-for-data-collection-in-the-field>. last accessed on 14 May 2024

[5] German Aerospace Center (DLR). 'Mobile measurement stations'. <https://www.dlr.de/en/ts/research-transfer/research-infrastructure/test-areas/recording-technology/mobile-measurement-stations>. last accessed on 14 May 2024

[6] Joelle Piep (2023). Untersuchung von Überholverhalten nicht-motorisierter Verkehrsteilnehmer im urbanen Raum im Kontext der Verkehrssicherheit. Technical University Braunschweig, bachelor's thesis. <https://elib.dlr.de/201125/>

[7] Leschik, Claudia, Klitzke, Lars, Lütke, Richard and Gimm, Kay (2024). Investigation on Road Traffic Safety in Rural Areas Using Trajectory Data: Case Studies at Two Measurement Sites. preprint article. <http://dx.doi.org/10.2139/ssrn.4802927>