Too close? Investigating the distance between cars and bikes when overtaking with regards to the infrastructure using the OpenBikeSensor and information from OpenStreetMap

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1 INTRODUCTION

When a vehicle driver overtakes a cyclist, one aspect is very crucial: the distance between vehicle and the bike. The overtaking distance influence the perceived safety as well as the actual safety. Thus, the German traffic rules specify a minimum distance must be kept by 1.5 m between car and bike within the city limits, even two meters outside the city limits. In 2020 a total of 426 cyclists were killed in traffic [1]. The most common cause were right-bending trucks overlooking a cyclist. But close overtaking actions are perceived as one of the most threatening traffic maneuvers to cyclists. The perceived threat respectively the sense of unsafety hinders people even to use their bike for daily errands and commuting. This fact is a big challenge for city and transport planners since cycling is considered to be a very important item for the transition of our mobility system into a more sustainable, safe and city friendly transport system.

Cycling in Germany – and also in many countries in Europe and all over the world – has become more relevant in recent years especially due to the corona pandemic. People have been afraid using public transport and tend to use individual means of transport more intensive. Many cities across Europe supported cycling and pop-up cycle lanes were marked on streets with yellow lines in order to give cyclists more space for safe and comfortable riding. Cities like Brussels, Vienna or Berlin implemented these kinds of "unconventional" infrastructure in 2020 during the first Corona lockdowns [2]. Though, evaluations have shown that the use of these pop-up lanes led to increasing numbers of users on these tracks, these tracks were marked only on a marginal share of the streets in contrast to the whole cycling network of a city.

Other indicators depicting that cycling is advancing are the numbers of sales and the increased willingness to pay for a new bicycle. In Germany, the average price over all sold bicycles in 2021 was about €1,400 EUR [3]. Compared to 2019 (€929 per bike) this is an increase of about 50%. This increase of sales numbers of e-bikes explains this increase. In 2021 about two million e-bikes were sold in Germany in contrast to 2.7 million conventional bikes. The overall market value of sold bikes in Germany was 6.56 billion euros which is an increase by 60% in comparison to 2011 [3].

Nevertheless, a recent Germany-wide survey with over 11,000 participants shows that 91% of the cyclists feel unsafe in German traffic [4]. 69% state that the keeping too little distance between other traffic participants is one of the reasons that people feel unsafe in traffic. The survey also reveals that the feeling of safety would increase by building more bicycle infrastructure (81%) and a clear separation between motorized and non-motorized traffic (62%).

2 INFLUENCE OF INFRASTUCTURE ONTO OVERTAKING DISTANCES

The paper wants to clarify if there are any interdependencies between the *actual overtaking distance* which is kept by drivers when overtaking cyclists and *the infrastructure*. The information is being recorded by using the OpenBikeSensor (OBS). The OBS is an open-source project with the objective to depict how the actual overtaking distances between cars and bikes are in reality [5]. Another open-source project which is not widely known outside Germany is the one meter plus (1m+) project [6]. First own evaluations confirm that the perceived little subjective sense of safety of cyclists when overtaken by a car or a truck is justified since legally prescribed overtaking distances are not observed. The insights are also confirmed by [7] and [8]. The community around the OBS project is steadily growing. Participants of the project want to build awareness for the crucial challenge that traffic rules are not obeyed by overtaking car drivers. Data is being uploaded constantly onto regional allocated (not coordinated) servers. First online visualization kits have been developed (figure 1 and 2).
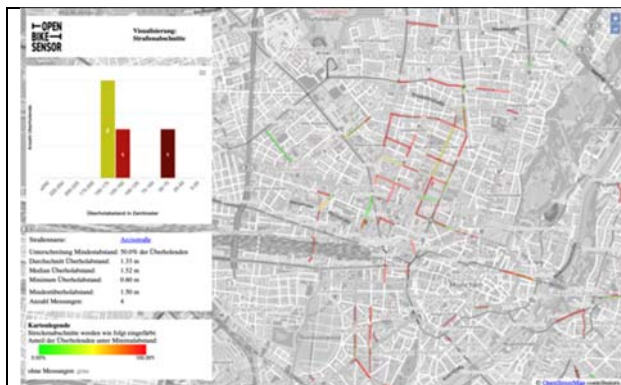

| Figure 1: Visualization tools for distance measuring[1]. | Figure 2: Different visualization[2]. |

3 RESEARCH DESIGN

The research figured in this paper wants to investigate if and which influence the build environment has on the overtaking distance between cars and bikes. Therefore, the authors are combining data from the OBS project. The research question can be prompted as: *'Are there systematic correlations between overtaking distances and network-side properties of the road space?'.*

The OpenStreetMap project supplies an excellent source of maps deploying roads with a lot of attributes: if there are cycleways on both sides, the road category, number of lanes, maximum speed allowance, name of the road, priority, side of sidewalk, description of smoothness, material of surface, traffic signs, and the width of the road. To answer the research question the authors concentrate on the four attributes road category, speed allowance, surface material, and widths.

Figure 3 exemplarily shows correlations between average speed of the cyclists against the surface material. Since the data collection of the ongoing citizen science project 'Zu nah? Mit Abstand mehr Sicherheit!' (engl.: 'Too close? More Distance, more Safety!') has not been finished at the moment of the creation of this abstract the data used in figure 3 is based on data taken from the Stadtradeln project [9].

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[1] https://www.adfc-muenchen.de/radverkehr/projekt-ueberholabstaende-mit-dem-openbikesensor-messen/
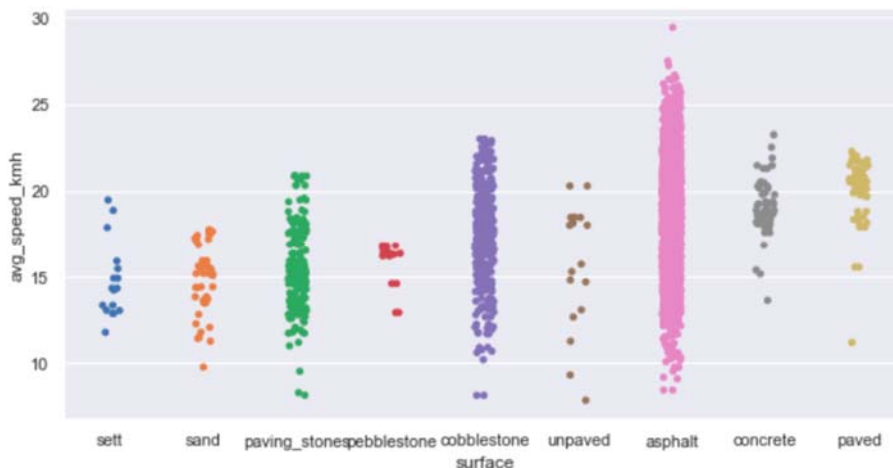[2] https://radentscheid-essen.de/openbikesensor/

Figure 3: correlation between average cycling speed and type surface. Source: own illustration

4 OUTLOOK

The paper investigates the link between road attributes and the overtaking gap between cars and cycles. By combining real data on realized overtaking actions recorded with the OBS with OSM information this research paper will exhibit the relationship between distances kept and attributes of the roads. Hence, the researchers will be enabled to draw conclusions for roads designers and city planners. The research will show on the one hand, where crucial overtaking maneuvers are conducted and derived from the knowledge recommendations can be formulated in order to increase safety at these very locations.

REFERENCES

[1] Statistisches Bundesamt. (7th July, 2021). Anzahl der getöteten Fahrradfahrer bei Straßenverkehrs-unfällen in Deutschland von 1980 bis 2020 [Graph]. Retrieved from: https://de.statista.com/statistik/daten/studie/1041872/umfrage/getoetete-fahrradfahrer-im-strassenverkehr-in-deutschland/ (accessed 1st of May, 2022).

[2] K. Götting & S. Becker (2020). Reaktionen auf die Pop-Up-Radwege in Berlin. Ergebnisse einer explorativen Umfrage zur temporären Radinfrastruktur im Kontext der Covid-19 Pandemie, 10.

[3] ZIV (16th March, 2022) Marktdaten Fahrräder und E-Bikes 2021. Presented on Pressekonferenz 16. März 2022 Berlin / digital: retrieved from: https://www.ziv-zweirad.de/fileadmin/redakteure/Downloads/Marktdaten/ZIV_Marktdatenpraesentation_2022_fuer_Geschaeftsjahr_2021.pdf (accessed 1st of May, 2022).

[4] Motor Presse Stuttgart (2022). Umfrage zur Verkehrssicherheit 2022. Retrieved from: https://www.auto-motor-und-sport.de/verkehr/umfrage-verkehrssicherheit-viele-fuehlen-sich-in-der-stadt-nicht-sicher/#:~:text=Auch%2067%25%20der%20Brummifahrer%20beklagen,beklagen%20mangelnde%20Aufmerksamkeit%20im%20Verkehr (accessed 1st of May, 2022).

[5] OpenBikeSensor (2022). Website of the OpenBikeSensor project: https://www.openbikesensor.org/

[6] A. Henao, P. Apparicio & D. Maignan (2021). One metre plus (1M+): a multifunctional open-source sensor for bicycles based on Raspberry Pi. Sensors, 21(17), 5812.

[7] P. Zeile, T. Obst, F. Dembski, J. Drescher, Ö. Cinar & U. Woessner (2021, September). Radfahren auf realen und virtuellen Flächen–Das NRVP-Projekt Cape Reviso. In CITIES 20.50–Creating Habitats for the 3rd Millennium: Smart–Sustainable–Climate Neutral. *Proceedings of REAL CORP 2021, 26th International Conference on Urban Development, Regional Planning and Information Society* (pp. 613-622). CORP–Competence Center of Urban and Regional Planning.

[8] Karakaya, A. S., Ritter, T., Biessmann, F., & Bermbach, D. (2022). CycleSense: Detecting Near Miss Incidents in Bicycle Traffic from Mobile Motion Sensors. arXiv preprint arXiv:2204.10416.

[9] Klimabündnis (2022). Kampagne Stadtradeln. Retrieved from: https://www.klimabuendnis.org/aktivitaeten/kampagnen/stadtradeln.html (accessed: 1st of May, 2022)