Workshop on Smart Urban Micromobility

Tanja Schneeberger, Stefan Schaffer, Dimitra Tsovaltzi, Lara Chehayeb, Patrick Gebhard

firstname.lastname@dfki.de

German Research Center for Artificial Intelligence

Saarbücken, Berlin, Germany

ABSTRACT

Urban mobility is evolving towards sustainable transportation as awareness of the environmental impact of transportation increases. In addition, efforts to improve public health, are leading to a greater focus on micromobile means of urban transport, such as bicycles or scooters. Although the number of people using micromobile urban transport is increasing, technologies to improve rider safety have been researched mainly in the context of motorized vehicles. In this workshop, we will present research and discuss ideas for smart urban micromobility. Therefore, we invite scientists and practitioners from different backgrounds to contribute with their latest work. Our goal is to bring together micromobility and technology enthusiasts to discuss and identify opportunities to provide a smart and safer mode of transportation.

KEYWORDS

Micromobility, Assistance Technology, Cycling, Safety

1 MOTIVATION AND OBJECTIVES

Micromobility devices include bicycles, scooters, skateboards, segways and hover-boards, can be human-powered or electric and are either privately owned or shared [2]. People who use micromobility means of transportation often find themselves in a dilemma: On the one hand, micromobility is one of the healthiest and most ecological means of urban transport; on the other hand, its drivers belong to the group of vulnerable road users, are involved in many traffic accidents and are often seriously injured [4]. Moreover, drivers also feel subjectively unsafe [5, 12]. The aim of this workshop is to provide a platform for researchers from different fields working in the field of micromobility and technical support to overcome safety issues.

Although the market share of micromobility in urban areas is increasing [3], compared to motorized vehicles, research on intelligent driver assistance technologies is only slowly catching up [13]. In the area of micromobility, there is only little research, mostly on technological support for cyclists (e.g., [1, 6, 7, 9, 10]). Comparatively, car-2-x communication has been a major research topic in the scientific community for the last 20 years [14], and cars are equipped with more and more technology to improve driving comfort and safety [15].

Figure 1: Users of micromobility means of transportation

Therefore, new approaches are needed on how to support drivers to increase both the objective safety and the subjective feeling of safety by using smart technologies for micromobility. During the workshop, we will discuss research directions, find synergies, identify possible research collaborators, and define important future research questions.

We invite the submission of research and position papers that address (but are not limited to) the following areas

- (Wearable) Technology supporting drivers of micromobility modes of transport
- Risk and safety factors in micromobility for all types of drivers (e.g., children, elderly)
- Applications that can enhance safety of micromobile drivers
- Empirical studies on micromobility
- Micromobile-2-x communication
- New concepts for micromobility

The workshop's topics are closely related to the workshop on Intelligent Cyclist Support Systems and Applications at *Mensch und Computer 2021* [13] and other workshops on cycling at MobileHCI 2021 [8] and CHI 2021 [11]. The Smart Urban Mobility workshop extends the application area from cycling to micromobile means of transportation.

2 PARTICIPANTS AND ATTRACTION

We attract participants from diverse research and application fields. The workshop is advertised with a dedicated web page (micro-move.dfki.de, hosted by DFKI) with all important information for authors and participants.

We publicize the workshop through mailing lists related to conferences and interest groups such as HCI Cycling Slack Group, websites, social media, and personal invitations. To have a productive group size, we limit the number of participants to about 20 (including organizers).

Based on the discussion and outcomes, we envision the foundation of an interdisciplinary special interest group for pursuing future research. Accepted workshop papers will be published in the *Mensch und Computer* conference proceedings.

Submissions and Review Process

We invite submissions of research papers and position papers from authors with diverse backgrounds (e.g., researchers and practitioners). Authors can submit papers up to 6 pages, also position papers up to 2 pages are welcomed (excluding references). All submissions will be reviewed double-blind by two independent reviewers. We follow the proposed days and deadlines by *Mensch und Computer 2023* for short papers, all deadlines are AoE.

Table 1: Submission and review schedule.

Publication of Call for Papers:	March 31, 2023
Workshop paper submission deadline:	June 12, 2023
Notifications:	July 3, 2023
Deadline for Camera ready version:	July 20, 2023
Workshop:	September 3, 2023

3 FORMAT

Our one-day in person workshop consists of three main activities:

(1) Invited talk(s) including a question answering session.
(2) Oral presentations and discussions for approximately three hours in total. Each author will be encouraged to present their work in a 10-minute presentation. The workshop organizers will then encourage a 15-minute discussion. There will be a 5-minute break between presentations. Both the total time and the length of the presentations will depend on the number of accepted papers. Presentations will be grouped around related topics. Discussions will be guided to identify promising future research approaches, application areas, and empirical study designs.
(3) Panel discussion in the afternoon for approximately one hour. We will identify topics based on the accepted papers and the expertise of the workshop participants.

Table 2: Tentative workshop schedule.

9:00-9:20	Welcome and Onboarding
9:20-10:15	Invited Talk 1
10:15-10:30	Coffee Break
10:30-12:00	Paper Presentation
12:00-13:00	Lunch Break
13:00-13:55	Invited Talk 2
13:55-14:00	Break
14:00-15:30	Paper Presentation and Discussion
15:30-16:00	Coffee Break
16:00-17:00	Panel Discussions on Research Challenges, Emerging Trends and Future Directions

To increase accessibility, equity, and visibility, we are open to organizing online participation, although we strongly encourage live participation.

Keynote Speaker(s) and Discussant(s)

We will have several speakers and discussants setting the tone, engaging the audience, and providing insightful and inspiring content. One keynote will be given by *Andrii Matviienko*. He is an assistant professor in computer science with a specialization in human-computer interaction at KTH Royal Institute of Technology, Sweden. His research focuses on assistive technology in urban environments. He designs, constructs, and evaluates multimodal and mixed reality interfaces for vulnerable road users. In particular, he investigates how to make evaluation environments for micromobility safe and realistic, and what future micromobility, such as self-driving bicycles, might look like. In addition, he focuses on how adult and child cyclists interact with assistance systems designed for collision prevention, navigation, and traffic behavior recommendations.

PROGRAM COMMITTEE

The Program Committee reflects the interdisciplinary aspects that are addressed in the Workshop on Smart Urban Micromobility. There are 7 confirmed Program Committee members who will review submissions and support the organization of the workshop:

Elisabeth André, Augsburg University, Augsburg, Germany

Paul Lukowicz, German Research Center for Artificial Intelligence, Kaiserlautern, Germany

Linglong Meng, German Research Center for Artificial Intelligence, Berlin, Germany

Alain Pagani, German Research Center for Artificial Intelligence, Kaiserslautern, Germany

Christian Rudolph, Technical University of Applied Sciences Wildau, Wildau, Germany

Tamara von Sawitzky, Technische Hochschule Ingolstadt, Ingolstadt, Germany

Esther Zahn, German Research Center for Artificial Intelligence, Berlin, Germany

4 ORGANIZERS

With their long-term experience, the organizers cover the areas Intelligent User Interfaces, Mobile Human-Computer-Interaction, and Affective Computing. They have published work on related topics at major scientific conferences (e.g., AutomotiveUI, ISC2, ISLS, IUI, NordiCHI, MuC, MobileHCI).

Lara Chehayeb is a researcher in the Affective Computing Group at the German Research Center for Artificial Intelligence. She conducts research on the significance of socio-emotional and cognitive factors in various contexts, including learning and collaborative environments. Currently, she is involved in designing technologies aimed at enhancing awareness in human-computer interaction. She was involved in the organization of Workshop on Functions of

Emotions for Socially Interactive Agents (ACII 2021).
German Research Center for Artificial Intelligence (DFKI), Campus D3 2, D-66123 Saarbrücken, Germany
https://affective.dfki.de/team/, `lara.chehayeb@dfki.de`

Patrick Gebhard is a Principal Researcher and the the head of the Affective Computing Group. He is researching computational models of human affect and its components. He was involved in the organization of several international conferences and workshops, among others submission chair of the IVA 2019 conference, workshop co-chair of the Workshop on Conversational Interruptions in Human-Agent Interactions (WCIHAI 2017) and the Workshop on Functions of Emotions for Socially Interacitve Agents (ACII 2021), IUI 2010 workshop and conference co-chair, IUI 2009 workshop and demo co-chair.
German Research Center for Artificial Intelligence (DFKI), Campus D3 2, D-66123 Saarbrücken, Germany
https://www.dfki.de/~gebhard/, `patrick.gebhard@dfki.de`

Stefan Schaffer is a Senior Researcher and head of the Cognitive Assistants group in Berlin at the German Research Center for Artificial Intelligence. His research interests include smart sustainable mobility and multimodal human-computer interaction. In his projects, cutting-edge technologies for intelligent mobility and multimodal information processing drive demonstrators for future domain-specific user applications. Stefan was a member of the working groups "Mobility and Logistics" and "Sociotechnical Systems" of the standardization roadmap for AI of the German institute for standardization (DIN) and a program committee member of several international conferences. He was involved in the organisation of several workshops, including the workshop on "Future mobility service chains" at the BMBU barcamp Mobilwandel (2016) and the "Smart Bike" workshop at the KI Camp (2019).
German Research Center for Artificial Intelligence (DFKI), Alt-Moabit 91c, 10559 Berlin, Germany
https://www.dfki.de/web/ueber-uns/mitarbeiter/person/stsc10, `stefan.schaffer@dfki.de`

Tanja Schneeberger is a Senior Researcher in the Affective Computing group at the German Research Center for Artificial Intelligence. Her research focuses on affective reactions, such as stress, in human-computer interaction in the application areas of automated driving, health, and serious games. She has been involved in the organization of several workshops in the area of automotive research (e.g. AutomotiveUI 2015, industrial projects with BMW). She was also workshop co-chair of the workshop on Functions of Emotions for Socially Interactive Agents (ACII 2021).
German Research Center for Artificial Intelligence (DFKI), Alt-Moabit 91c, 10559 Berlin, Germany
http://www.dfki.de/~tasc02, `tanja.schneeberger@dfki.de`

Dimitra Tsovaltzi is a Principle Investigator in the Affective Computing Group at the German Research Center for Artificial Intelligence, and a habilitated member of Saarland University (empirical social sciences). In various projects, she investigates the interplay of implicit and explicit socio-emotional and cognitive processes and develops socio-technological interventions to support and leverage complex group interactions. She focuses on technologies to enhance self-/ group regulation processes for emotional outcomes and related behavioral change. She has been involved in the organization of several international conferences and workshops, among others social media co-chair (CSCL 2019), Interaction Tools and Demos co-chair (ISLS 2021-23) and various symposia organisation like Effects of explicit and implicit guidance on external and self-regulation through conflict awareness (Earli 2017), Group Formation in the Digital Age (CSLC 2019), and Functions of Emotions for Socially Interacitve Agents (ACII 2021).
German Research Center for Artificial Intelligence (DFKI), Campus D3 2, D-66123 Saarbrücken, Germany
http://www.dfki.de/~dits01, `dimitra.tsovaltzi@dfki.de`

ACKNOWLEDGMENTS

REFERENCES

[1] Abdelrahman Abdelrahman, Rafik Youssef, Mostafa ElHayani, and Hassan Soubra. 2021. B2X Communication System for Smart Autonomous Bikes. In *2021 16th International Conference on Computer Engineering and Systems (ICCES)*. IEEE, 1–6.

[2] Rusul L. Abduljabbar, Sohani Liyanage, and Hussein Dia. 2021. The role of micro-mobility in shaping sustainable cities: A systematic literature review. *Transportation Research Part D: Transport and Environment* 92 (2021), 102734. https://doi.org/10.1016/j.trd.2021.102734

[3] Alexandra Bretones and Oriol Marquet. 2022. Sociopsychological factors associated with the adoption and usage of electric micromobility. A literature review. *Transport Policy* 127 (2022), 230–249. https://doi.org/10.1016/j.tranpol.2022.09.008

[4] Destatis Statistisches Bundesamt. 2021. *Verkehrsunfälle.* https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Verkehrsunfaelle/_inhalt.html#_xzq5vo1kl

[5] Allgemeinen Deutschen Fahrrad-Club. 2021. *ADFC-Fahrradklima-Test 2020.* https://fahrradklima-test.adfc.de/fileadmin/BV/FKT/Download-Material/Ergebnisse_2020/ADFC-Fahrradklima-Test_2020_Ergebnistabelle_Druck_Gesamt_A3.pdf

[6] Andrii Matviienko, Swamy Ananthanarayan, Shadan Sadeghian Borojeni, Yannick Feld, Wilko Heuten, and Susanne Boll. 2018. Augmenting Bicycles and Helmets with Multimodal Warnings for Children. In *Proceedings of the 20th International Conference on Human-Computer Interaction with Mobile Devices and Services* (Barcelona, Spain) *(MobileHCI '18).* Association for Computing Machinery, New York, NY, USA, Article 15. https://doi.org/10.1145/3229434.3229479

[7] Andrii Matviienko, Swamy Ananthanarayan, Abdallah El Ali, Wilko Heuten, and Susanne Boll. 2019. NaviBike: Comparing Unimodal Navigation Cues for Child Cyclists. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19).* Association for Computing Machinery, New York, NY, USA, 1–12. https://doi.org/10.1145/3290605.3300850

[8] Andrii Matviienko, Wilko Heuten, Alan Dix, and Susanne CJ Boll. 2021. Interactive Technology for Cycling—ideate, make–remote, together. In *Adjunct Publication of the 23rd International Conference on Mobile Human-Computer Interaction.* 1–4.

[9] Linglong Meng, Stefan Schaffer, and Vincent Wappenschmitt. 2022. A Connected Swarm Cycling System. In *2022 IEEE International Smart Cities Conference (ISC2).* IEEE, 1–5.

[10] G. Norman and N. Kesha. 2015. Using smartphones for cycle planning. In *IPENZ Transportation Group Conference.* 22–24.

[11] Gian-Luca Savino, Tamara von Sawitzky, Andrii Matviienko, Miriam Sturdee, Paweł W Woźniak, Markus Löchtefeld, Andrew L Kun, Andreas Riener, and Jonna Häkkilä. 2021. Cycling@ CHI: Towards a research agenda for HCI in the bike lane. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems.* 1–5.

[12] Motor Presse Stuttgart. 2022. *Umfrage: Die meisten Radler, Motorrad- und Lkw-Fahrer fühlen sich in der Stadt nicht sicher.* https://www.motorpresse.de/presse/news/umfrage-die-meisten-radler-motorrad-und-lkw-fahrer-fuehlen-sich-in-der-stadt-nicht-sicher/

[13] Tamara von Sawitzky, Philipp Wintersberger, Andrii Matviienko, Andreas Löcken, Andreas Riener, and Florian Michahelles. 2021. Workshop on Intelligent Cyclist Support Systems and Applications. In *Mensch und Computer 2021 - Workshopband*, Carolin Wienrich, Philipp Wintersberger, and Benjamin Weyers (Eds.). Gesellschaft für Informatik e.V., Bonn. https://doi.org/10.18420/muc2021-mci-ws12-122

[14] Lars Wischhof and André Ebner. 2012. 10 Years of Car-2-X Communication – a Success Story? *Frequenz* 66, 5-6 (2012), 149–157. https://doi.org/10.1515/freq-2012-0033

[15] Ekim Yurtsever, Jacob Lambert, Alexander Carballo, and Kazuya Takeda. 2020. A Survey of Autonomous Driving: Common Practices and Emerging Technologies. *IEEE Access* 8 (2020), 58443–58469. https://doi.org/10.1109/ACCESS.2020.2983149