Smart Connected Bikes Newsletter
September 2021, no. 1

Welcome to this first newsletter from the Smart Connected Bikes team! In this edition:
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A new project and newsletter

A digital revolution is happening and the influx of new technologies and materials will change the appearance, function, and role of bicycles and E-bikes. E-bikes with integrated sensors and intelligence could give rise to many new opportunities, increased user experience, safety and better quality. Given this background, Accell Group started a five year collaboration on *Smart Connected Bikes* with the University of Twente (UT) at the end of 2019. The collaboration resulted in two full-time four-year PhD positions. Additional grants, including one from the Dutch Research Council (NWO) allowed us expand the programme with four more full-time PhD positions. Martin Schmitter, Lead Business Developer Innovation & Technologies, coordinates the collaboration between the *Smart Connected Bikes* team and Accell Group.

In this first newsletter we will introduce the project and its team members to you. More newsletters will follow in the coming years. More information on the Smart Connected Bike programme can be found here: https://www.smartconnectedbikes.nl/

The Smart Connected Bike programme

The Smart Connected Bikes programme aims to develop and test a novel connected vehicles ecosystem which combines the capabilities of sensing, wireless technology and data science to make bicycle transportation more safe, reliable, and comfortable.

The Smart Connected Bikes programme has different steps which are closely linked (see figure 1). The six PhD projects start with a review and scoping phase (step 1), in which also detailed research proposals are written. Step 2 is the design and development of several innovative parts of the Smart Connected Bike programme. This involves the development of a multi-party data sharing platform (considering privacy and data sovereignty), embedded intelligence, vehicle to infrastructure communications and digital twins. Furthermore, the user experience and traffic safety impacts of smart connected bikes will be examined. Testing of Smart Connected Bike prototypes with end users will be conducted in field trials in different Dutch cities (step 3). All components of the Smart Connected Bike platform will be thoroughly evaluated (step 4). The results from all steps will be shared and discussed in project meetings, stakeholder meetings, workshops and conferences (step 5).
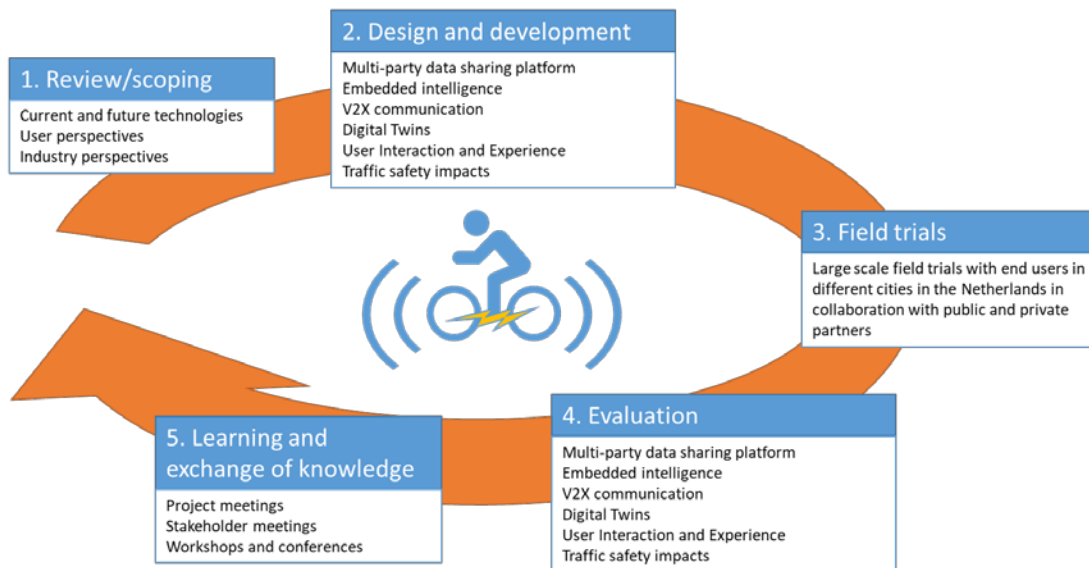
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Figure 1: The Smart Connected Bike approach

Project Team & Partners

In total 15 researchers are currently involved in the Smart Connected Bikes programme. The University of Twente is leading the programme, with professor Paul Havinga (professor in the Computer Science department), and Director Science at TNO - ICT) and professor Karst Geurs (professor in the Civil Engineering Department) as coordinators. Delft University of Technology and Saxion University of Applied Science join the consortium as academic partners. TNO (Unit ICT) supports the research within the data sharing work package. The Province of Utrecht and the Dutch Institute for Road Safety (SWOV) are involved as public partners, and the ambition is to involve more public partners interesting in facilitating the field trials. For all members of the consortium, please see https://www.smartconnectedbikes.nl/About%20us/

Phd researchers in the spotlight

Mario Boot joined the Department of Civil Engineering at the University of Twente in March 2021. Mario explains his interests as follows: my focus is on the experience of emerging bike technology. I am fascinated by human-computer integration: collaboration between the bike, the cyclist, and other nearby actors. I will look at design, implementation and evaluations of things like interfaces and applications which are crucial elements to safety and comfort in the cycling experience.

Deepak Yeleshetty joined the Pervasive Systems Group, department of Computer Science at the University of Twente in January 2021. My research focuses on collaborative intelligence with secure data sharing in a smart connected-bike ecosystem. I will investigate how cycling safety can be improved by learning from a network of smart-bikes, road infrastructure, other vehicles and external parties. Federated Learning and secure multi-party data sharing methods are explored to maintain data privacy.

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Wo Meijer joined the at the Department of Industrial Design Engineering, Technical University Delft in April 2021.. The focus of my research is to look at Digital Twins as a material for the (co)design of new bikes and bike services systems. Digital Twins are a virtual representation that's in sync with the physical "twin" of riders and their bikes. Digital Twins can capture and explore the interactions and context of a bike journey in a way that's easy to understand and share with other stakeholders.

Georgios Kapousizis joined the Department of Civil Engineering at the University of Twente in September 2020. The main aim on my PhD research is to evaluate the impacts of smart connected bikes prototypes on traffic safety and user's acceptance level. Georgios will examine the market potential of smart connected e-bikes and the user satisfaction, journey experience of cyclist assistance/control systems.

Akhil Reddy Pallamreddy joined the Pervasive Systems Group, department of Computer Science at the University of Twente in May 2021. My research explores learning various parameters by the connected intelligent bike through advanced digital technologies to improve road safety, reduce pollution, and developing sophisticated rider assistance systems. I will use Artificial Intelligence methodologies to make the bikes intelligent.

Khalil Ben Fredj will join the Pervasive Systems Group on August 2021 at the University of Twente. Khalil was graduated from the University of Paris Saclay where he worked on an internet of things project, reducing energy consumption of connected devices by using the most suitable wireless communications protocols. His research will focus on investigating a reliable, robust and low cost communication mechanism that connects Bikes, pedestrians, cars and infrastructure.

Share your ideas!

We are exploring success stories and new ideas on the intersection of cycling, mobility, transport, active travel, and digital innovation. Think about new ways of thinking and doing, something that fascinated you, a memorable experience, or valuable impact from a solution – either to yourself, an innovation from Accell Group or other companies.

What are your ideas to make smart and connected bikes attractive, fun, safe and comfortable? What in your opinion are successful examples of smart and connected bikes?

Please share your inputs and ideas on https://www.smartconnectedbikes.nl/ideas/. We will treat all ideas and suggestions anonymously.

Contact

If you have any questions, please contact Martin Schmitter, Lead Business Developer Innovation & Technologies at Accell Group (martin.schmitter@accell-group.com) or Karst Geurs, professor of transport planning, University of Twente (k.t.geurs@utwente.nl).

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