TALK: Agent based modeling and simulation to analyze and measure the Cooperative-Intelligent Transport Systems KPIs

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ABSTRACT:
Cooperative-Intelligent Transport Systems (C-ITS) aims to facilitate cooperative, connected and automated mobility. C-ITS is currently demonstrated by projects such as C-MobILE, which is a large-scale demonstration project spanning from 2017-2020 that is currently advancing C-ITS by aiming for a fully safe and efficient road transport without casualties and serious injuries on European roads.
C-MobILE adopts an evidence-based approach to measure its expected impacts. To support this, Key Performance Indicators (KPIs) are used to evaluate and assess the impact gained by C-ITS developments. Out of many KPIs set out in the project context, we focus mainly on improvement of traffic efficiency, safety, and sustainability. The concrete KPIs we have studied are number of collisions and near collisions, severity of hard braking, and waiting time.
We picked such an unsignalized intersection, Neckerspoel Eindhoven, where cyclists and buses share a common space, which compromises on safety and efficiency. Assessing the KPIs is challenging, because of the limited infrastructure (no camera, no traffic lights), no empirical data and unpredictable behavior of road users such as cyclists and bus drivers.
We adopted an agent-based modelling and simulation (ABMS) technique, which is an efficient method to simulate real-life situations and has lower cost compared to empirical and field experiments. Since Neckerspoel junction lacks traffic control infrastructure, we have modelled the intersection including various Intelligent Transport System (ITS) agents: roadside units, cameras, on-board units. This model allows us to measure the impact on cyclists and bus driver behaviors. The intersection and road users are modelled in the traffic simulation tool SUMO. The cooperative behavior between the ITS agents and the stochastic behavior of the road users is implemented using the agent programming language SARL. This model allows comparing the KPIs of different scenarios. In particular, we have studied the intersection with and without ITS agents. The results of the simulation served as a recommendation for the Municipality of Eindhoven to improve the situation at Neckerspoel junction.

SHORT BIO OF THE PRESENTER:
Priyanka Karkhanis is born in India and has received in 2011 a Master degree in Information Science from Manipal Academy of Higher Education (Manipal University). She then passed an internship at Intel at Bangalore (India) and further continued working for 3 years as a design engineer mainly on validation of memory (RAM,ROM, 2R2W etc.) required for Intel chips and processors. She, then worked at Oracle at Bangalore (India) mainly on SaaS, PaaS, IAS cloud domain as a senior application developer for 2 years.
Currently she is a PhD candidate at Mathematics and Computer Science department in Eindhoven University of Technology (TU/e) Netherlands since 2017. Her research is tied with one of European Commission's project name C-MobILE. She is mainly involved for architecting and modeling the large scale demonstration C-MobILE project. Her current interest focus on measuring and evaluating various key performance indicators (KPIs) required for C-MobILE. Multiagent systems (MAS), Holonic Multiagent Agent (HMAS), agent based simulation (ABMS) are some of the topics being explored by her.
Apart from being a researcher, she is involved in executing intelligent transport systems (ITS) projects with Bachelors/Master/PDEng students, performing the role of client and a supervisor. She also an instructor for a Java programming course for a bachelor program at TU/e. Also, she is involved in the Institute for Programming research and Algorithmics (IPA), playing the role of a council chairwoman.