SUBSTANTIATE: Simulation-based impact assessment of cooperative intelligent transport systems based on large-scale traffic networks.

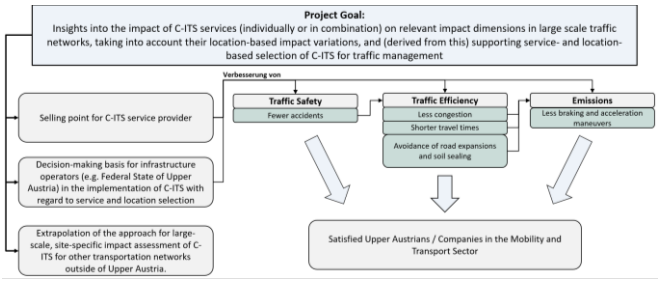
The dissertation project SUBSTANTIATE deals with simulation-based impact assessment studies regarding safety, efficiency, and sustainability in the traffic sector. The aim of the project is to gain knowledge about the effects of C-ITS services on relevant impact dimensions in large scale traffic networks under consideration of location related impact variations. The results will be used to support the service- and location-related selection and implementation of C-ITS for traffic management.

Similar to the generally increasing development of interconnecting everyday objects (Internet of Things – IoT), the interconnection of individual road users and vehicles is also increasing in the traffic sector. The wide-ranging equipment of vehicles and infrastructure with information and communication technology (ICT) as well as sensor systems offers the possibility of exchanging relevant traffic information (potentially detected by vehicles) between individual road users (V2V communication) as well as road users and infrastructure (V2I communication). The resulting collaborative and thus enhanced perception of events in the traffic area as well as the mutual exchange of information between vehicles can generate benefits for all road users such as increased efficiency, safety, or sustainability in the traffic sector. Due to the cooperative nature of these services, they are also referred to as "Cooperative Intelligent Transport Systems" (C-ITS).

The vehicle and infrastructure technology required for C-ITS and the necessary communication standards are already available today. A central aspect in this area, in addition to the development, implementation and improvement of such services, is the evaluation of their effects on traffic. The topic of "impact assessment" is therefore essential in the context of C-ITS. The current state-of-the-art in this area is limited to both traffic simulations and field tests in spatially limited road networks. However, what remains unconsidered, especially due to this spatial limitation, is that C-ITS services at certain nodes in a traffic network can also have significant effects beyond the actual road section under investigation. Thus, a change in traffic efficiency at a particular point in the network can also result in major changes at upstream or downstream road sections. In order to measure the true impact of the application of C-ITS services, it is therefore necessary to consider and evaluate their effects on a large scale based on real traffic data.

Accordingly, a simulation-based approach to evaluate C-ITS impact in large-scale traffic networks based on real-world traffic data from the national project EVIS.AT offers a reasonable alternative.

The aim of the dissertation project is to resolve the limitations of the current state-of-the-art (lack of an approach for large-scale impact assessment of C-ITS; lack of site-specific investigation of potential impact variation) and to provide support for the selection of C-ITS services and their deployment location. In addition to increasing traffic efficiency and safety, the project also aims to reduce traffic-related emissions. Furthermore, the methodology and approach used in the project to identify C-ITS impact should also be able to be extrapolated for other transport networks outside the test network Upper Austria.



Key project data:

Duration:	10/2022 – 09/2025
Budget:	€ 119.533,-
Funding program:	Dissertation program of the University of Applied Sciences Upper Austria
Supervising University:	Technical University Vienna
Funding source:	State of Upper Austria
Administered by:	FFG

PhD Student: Manuel Walch, MSc
Email: manuel.walch@fh-steyr.at
FH-Supervisor: Dr. Matthias Neubauer, MBA
Email: matthias.neubauer@fh-steyr.at