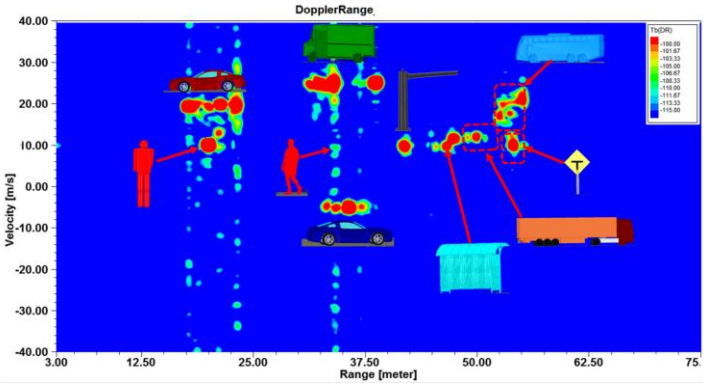
Design and simulation of a multi-static RADAR receiver with radio cooperation and machine learning



Source (License: CC): U. Chipengo et al.: “Full Physics Simulation Study of Guardrail Radar-Returns for 77 GHz Automotive Radar Systems”, IEEE Access (Vol: 6), Nov. 2018, https://doi.org/10.1109/ACCESS.2018.2881101

With RADAR systems, objects can be efficiently detected and their movement tracked. In the civil sector, these are widespread in driver assistance systems. It is to be increasingly used in other applications with localization requirements, e.g. in the intra-logistics of manufacturing companies (Industry 4.0), but also at traffic intersections in order to avoid possible accidents through early detection or to optimize the flow of traffic. As 5G/6G mobile communications continue to evolve, localization using RADAR signal processing is becoming more common.

You will work in the 5G-trAAffic research project, which aims to make traffic intersections safer and optimize the flow of traffic with 5G mobile communications and RADAR, among other things.

The aim of your work is to design a digital signal processing chain that generates a RADAR image in which several RADAR systems cooperate with each other (so-called multi-static RADAR), e.g. by coordinating who is sending out a RADAR signal and when not to bother; or by transmitting these readings to create a joint RADAR image with better resolution (data fusion).
Your task is to design the signal processing chain for the data fusion and to analyze it extensively in a self-created simulation. On the other hand, you should design, implement and test the cooperation procedure and protocol based on existing algorithms. It will then be examined to what extent machine learning algorithms can be used to reduce the amount of data to be exchanged between individual RADAR systems.
The implementation should take place either in MATLAB, Python/SciPy, Julia or C++.

Contact person (first supervisor): Prof. Dr.-Ing. Stephan Ludwig

E-Mail: Stephan.Ludwig@hs-aalen.de

Telephone: +49 7361 576-5625