



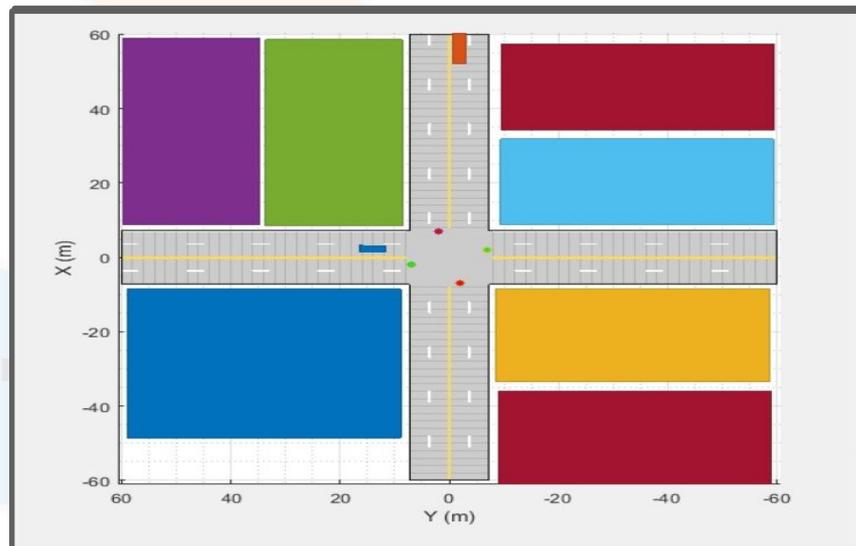
Name: Kothencz Kornél, MSc student, second year

Project type: thesis project

Topic: Implementing 5G-based vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2x) communication in a virtual environment

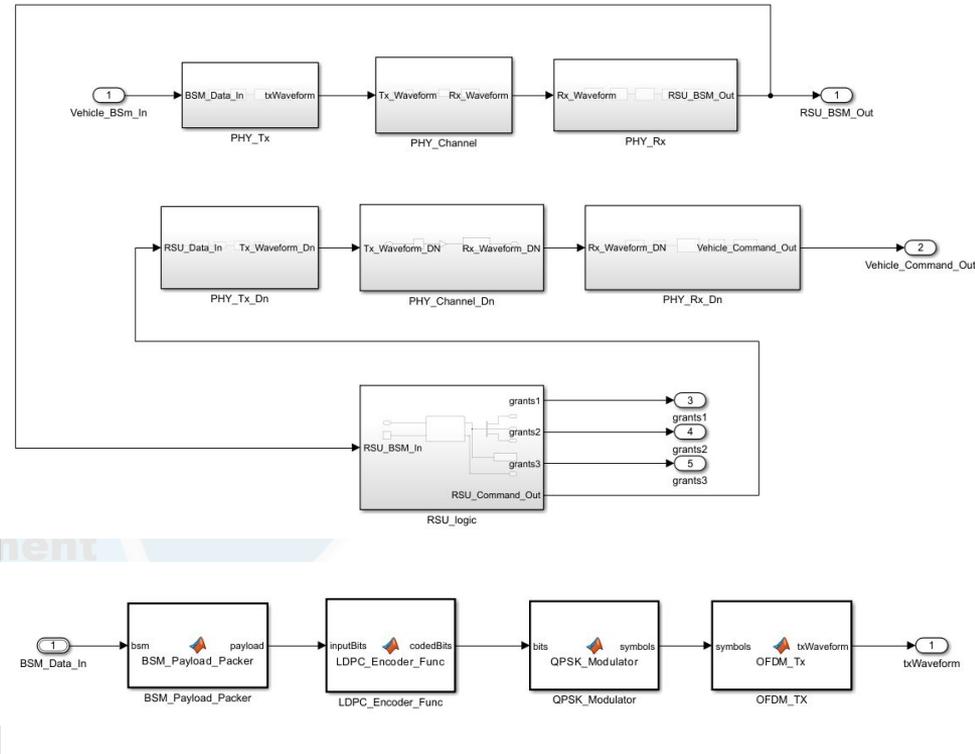
Supervisors: Dr. Pletl Szilveszter

- Modern vehicles can now connect to telecommunications networks, such as the mandatory emergency call system, and have the necessary SIM card
- These vehicles could even be able to initiate emergency calls over 5G networks, and various systems could be updated online
- This opens up the possibility that vehicles can communicate via a 5G network, and in the future autonomous vehicles may also be able to communicate with each other and with the infrastructure



Experiments

- This project presents a traffic light coordination system that leverages 5G-enhanced vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. The system models real-world intersections using MATLAB and Simulink, simulating efficient and safe navigation under dynamic traffic conditions.
- The project started by building a vehicle model traveling at urban speeds using the Automated Driving Toolbox
- The animations for the simulation were created using Simulink 3D Animation
- The 5G Toolbox and Vehicle Network Toolbox were used for V2V and V2I 5G communication
- The parts required for 5G communication were created in Matlab scripts
- Vehicles send their speed and steering angle to other vehicles and traffic lights via the 5G network
- Based on this, the traffic light selects the MIO vehicle and this vehicle will receive a green signal at the intersection, while the other vehicles will receive a red signal



Results & future work

- The vehicles visibly send the necessary data to each other and the infrastructure
- Accordingly, the traffic light selects the MIO vehicle, giving it a green signal and a red signal to the other
- The red signal the receiving vehicle starts to slow down accordingly and stops before the intersection
- In addition, it shows how large the range of the 5G network is in an urban environment, where it provides secure communication between vehicles and infrastructure despite buildings
- Investigating what differences there may be between the use of 5G and 6G
- testing the system not only in urban areas, but also on routes outside populated areas, whether communication between vehicles remains secure
- The possibility of machine learning in 5G communication collision detection

