

Joint Communications and sensing (JCAS)

Bachelor / Master Thesis Work

Motivation

Joint Communications and sensing (JCAS) is considered to become a cornerstone of future mobile networks, enabling the seamless integration of sensing functions within communication systems, thus offering advantages such as reduced hardware costs, lower energy consumption, and enhanced spectrum efficiency. The combination of Vehicle-to-Everything (V2X) technology with JCAS advances road safety and the development of autonomous vehicles by allowing vehicles to communicate with infrastructure and each other, thereby improving real-time situational awareness. This integration could lead to more accurate obstacle detection, precise vehicle positioning, and better coordination among autonomous vehicles, contributing to safer and more efficient roadways.

Our project aims to design a complete radio system for coordinated multi-point (CoMP) transmission and reception in JCAS. We'll focus on a communication-centric approach with distributed architectures, which are common in advanced networks like 5G and beyond. This design will enable distributed multi-static sensing and illumination between stationary Radio Remote Units (RRUs) acting as Transmitter Points (TPs) and Receiver Points (RPs).

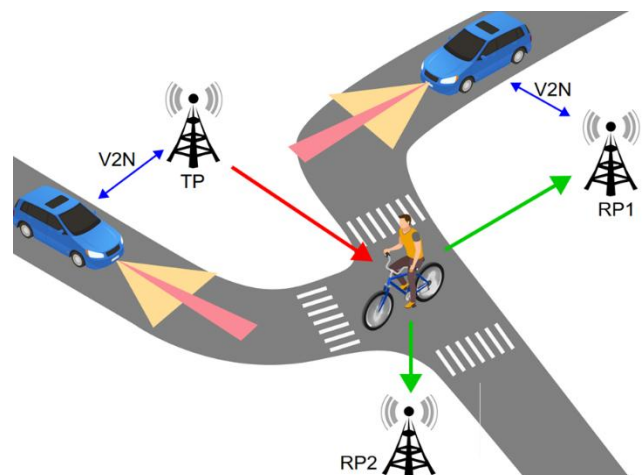
Tasks:

The aim of the proposed work is to develop, implement and test the JCAS techniques. This includes the following tasks:

- A literature review of JCAS techniques.
- Conducting a literature review on JCAS techniques.
- Implementing signal processing algorithms on software-defined radios, such as the USRP X310.
- Performing measurements and evaluations.

Requirements:

- Solid understanding of wireless communication and radar systems.
- Strong programming skills in MATLAB (experience with Python, C, or VHDL is a plus).
- Proficiency in reading and writing English.



Automotive scenario illustrating the motivation for using Multibistatic CoMP JCAS with V2N technology to enhance road safety.

If you are interested and need more information, feel free to contact me!