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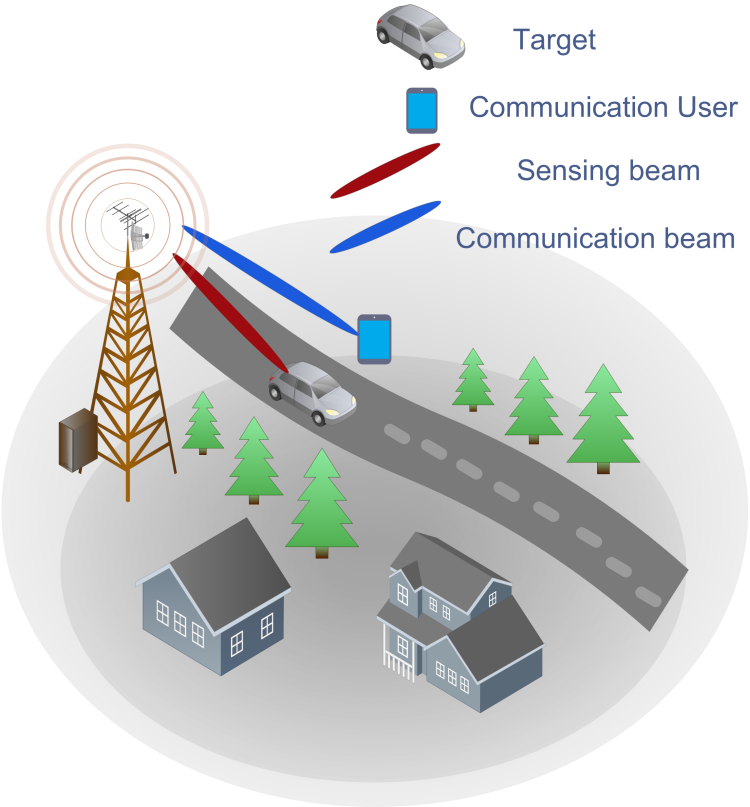
Master's Thesis

Mobile Target Detection via Integrated Sensing and Communication

Abstract

Vehicular-to-everything (V2X) communication will play an important role in the autonomous vehicles which are required to support low-latency information transmission in high-mobility environments. Besides, in the future V2X-based networks, because of the dynamicity of the network topology and the surrounding environments, sensing technologies are proposed as a promising candidates for detecting and tracking cars and obstacles in a real-time manner. To this end, proposing a solution for estimating and predicting beam tracking based on the feedback protocol is needed. Previously, radar and communication systems adopted separate spectrum resources. However, this approach leads to allocating more spectral resources. Recently, integrated sensing and communication (ISAC) has been proposed as a promising solution to perform both sensing and communication in a shared infrastructure which reduces the hardware cost and network resources while enhancing the overall system throughput. In this thesis, we aim to provide a solution for target tracking of mobile targets while supporting communication users in an effective frame of ISAC.



Guidelines for the project

1- Conducting a literature survey on target tracking based on the sensing signal: The main goal is to obtain the MSE in target tracking while using a matched filter for delay-doppler estimation from the received echo.

2- Developing a framework for ISAC

3- Simulation of the proposed algorithm in MATLAB

* If successful, this work may lead to a journal and/or a conference paper

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Requirements

* Interest in communications and signal processing

* Basic knowledge of digital and mobile communication systems and estimation theory (e.g. background in courses like Digital Communications, Fundamentals of Mobile Communications, and MIMO Communications).

* Basic knowledge of ISAC will be considered as a superiority.

* Experience in MATLAB.