# Master Thesis
Development of a real-time multipath propagation simulation model for FMCW radar sensors

Motivation and Objective

In past years, FMCW radar sensors gained high popularity among different research fields such as robotics or autonomous driving. Especially in robotics, state-of-the-art control algorithms rely on machine learning techniques which require massive amount of training data. With the aid of simulation, training and implementation of such algorithms could further be enhanced. Hence, realistic sensor models in simulation are needed to account for such problems. Reflection of radar waves from objects heavily depends on the object's material and shape. Often, radar waves are reflected in a multipath fashion and the received signal is a mixture of all multipath components which leads to destructive and constructive interference. Including a multipath propagation model into a real-time simulation environment is crucial to enhance the realism of sensor models and closing the sim-to-real gap. Based on an existing radar simulation implemented in Unity3D, the goal is to develop and implement a multipath propagation model which takes reflections from multiple objects into account. The proposed model should then be validated using a real-world radar sensor embedded in a robotic scenario.
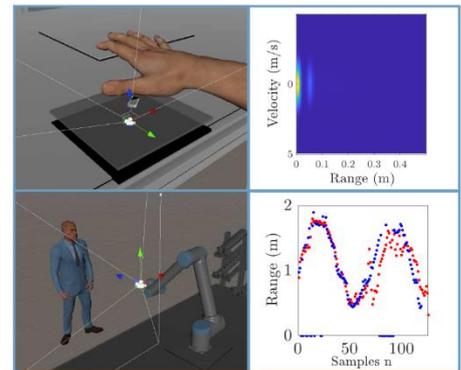
Milestones/Tasks

M1: Get familiar with radar sensors and the in-house radar simulation
M2: Literature study of state-of-the-art multipath propagation models
M3: Concept development of a multipath propagation simulation model for FMCW radars
M4: Implementation and integration of the multipath model into the current framework
M5: Validation with a real-world radar for a given use case scenario

Requirements

- Knowledge in mathematics and physics
- Knowledge in game engine development
- Knowledge in programming (shaders, C#, C++)
- Self-driven motivation to learn new topics

Skills

Theory   [◆◆◆
Simulation   [◆◆◆◆
Practical   [◆

Period and Contacts

Time period: 6 months, beginning as soon as possible
Contact: Christian Schöffmann (christian.stetco@aau.at)

We offer funding and publication possibilities!