



Evaluation of Sophisticated RF Models for IEEE 802.11 based Communications

Description:

Communication over IEEE 802.11 based Wireless LAN plays an important role for the design and development of embedded systems. Due to a constantly increasing communication capacity of devices and simultaneously shorter time to market of such systems, the use of model-based virtual prototypes of the developed systems becomes indispensable. Most simulation solutions for Wireless LAN based communication use very simple simulation models with their associated shortcomings.

There are several projects and approaches for precise models of radio based communications. The QuaDRiGa project (<http://quadriga-channel-model.de>) developed a multi-purpose statistical framework for “generating realistic radio channel impulse responses for system-level simulations of mobile radio networks”. PyLayers (<http://pylayers.github.io/pylayers/index.html>) is another simulation framework with similar aims, including features like ray tracing simulation. With the growing computational power of general-purpose computing systems, it becomes an eligible scenario to use such a simulation framework for the development of a virtual prototyping platform.

In this thesis, at least one of such frameworks should be compared to other solutions and evaluated as a channel simulation of WLAN communications according to the IEEE 802.11 standard. The practical part of this thesis should include the implementation of an experiment with WLAN nodes, which can be integrated in a model-based virtual prototyping solution developed with C/C++ at the institute.

The following tasks have to be conducted:

- Learn about state-of-the-art radio communication modeling frameworks
- Design and implementation of a channel simulation of WLAN nodes
- Test and evaluation of the developed approach
- Discussion and documentation of the results

Highly recommended skills for working on this topic:

- Advanced C/C++ coding and knowledge of Matlab/Python
- Advanced knowledge in radio communications (OFDM, QAM, MIMO, Fading, DFT/IDFT, ...)

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