



Implementation and Evaluation of IEEE 802.11n Receive/Transmission Chain in GNU Radio for Simulations

Description:

Communication over IEEE 802.11 based Wireless LAN (WLAN) 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.

For the development of a simulation of WLAN transmission, there exist several tool suites like MATLAB, which allow the modeling of a complete transmission chain from transmitter to receiver. However, especially MATLAB simulations are hard to integrate into other simulation solutions and introduce dependencies to proprietary software.

On the contrary, the open source GNU Radio project (<https://www.gnuradio.org/>), offers a variety of signal processing modules for the development of software based radio systems. Although GNU radio is focused to software defined radio applications, it allows also the usage in simulations.

Within this thesis, GNU Radio should be used to develop the reception and transmission chain of IEEE 802.11 frames communicated over a simulated channel model. The resulting module should be able to encode and decode streams of multiple antennas (MIMO) with the modulation and coding schemes introduced by IEEE 802.11n. The final module is intended to be integrated into an existing C++ based simulation and possible solutions for this should be discussed. The implementation should be evaluated with suitable experiments and tests.

The following tasks have to be conducted:

- Learn about the GNU radio framework
- Design and implementation of a transmit/receive chain for 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, ...)

Supervisors:

- M.Sc. Benjamin Beichler, M.Sc. Hannes Raddatz, Prof. Dr.-Ing. Christian Haubelt