TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Electrical and Computer Engineering Vodafone Chair Mobile Communications Systems

Channel Estimation for Hybrid Beamforming

Bachelor/Master/Diploma Thesis
Studienarbeit/Diplomarbeit

Problem Statement

Future Wireless communications systems are foreseen to utilize the large available bandwidths in the mmWave regime. The high path loss at these frequencies can be compensated by employing large antenna arrays. Nevertheless, conventional fully digital beamforming (DBF) may become prohibitively expensive in terms of power consumption and estimation complexity. A promising solution is hybrid beamforming (HBF), a low-dimensional digitally weighted combination of a few analog beams. The task of the thesis would be to develop and implement channel estimation approaches for HBF and to compare their performance with comparable channel estimation algorithms for DBF.

Tasks

- Familiarization with array signal processing and channel estimation
- Implementation of channel estimation algorithms for DBF
- Development and implementation of channel estimation algorithms for HBF
- Performance evaluation of the implemented algorithms

Expected Skills

- Interest in (array) signal processing and estimation theory
- Preferably experience in MATLAB/ Python programming

Contact Person

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Please include a recent transcript of records when contacting.

Recommended References

- S. M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*. Prentice Hall, 1997.
- Don H. Johnson, and Dan E. Dudgeon. *Array signal processing: concepts and techniques*. Prentice Hall., 1993.
- Van Trees, Harry L. *Optimum array processing: Part IV of detection, estimation, and modulation theory*. John Wiley & Sons, 2002.
- A. Sayeed and J. Brady, "Beamspace MIMO for high-dimensional multiuser communication at millimeter-wave frequencies," in *2013 IEEE Global Commun. Conf. (GLOBECOM)*, Atlanta, USA, Dec. 2013, pp. 3679–3684.
- M. Khalili Marandi, W. Rave and G. Fettweis, "Beam Selection Based on Sequential Competition," in *IEEE Signal Processing Letters (SPLet)*, vol. 26, Mar 2019.