

Offer: Master Thesis/Project for ???

Movable Antennas for Near-Field Codebook Design

Movable antennas (MAs) are antennas capable of dynamically changing their position and orientation through the use of micro-electromechanical systems (MEMS). Compared to traditional fixed antenna systems (FAS), MAs introduce additional degrees of freedom that can be exploited to enhance overall system performance.

For FAS, the near-field region has recently become an active area of research, particularly as the development of large-scale antenna arrays extends the near-field distance. However, the increased antenna size also makes beam design more complex and less feasible for real-time applications. One possible solution involves the use of a pre-designed codebook that comprises a set of codewords, each representing specific position, orientation, and phase-shift configurations for all antennas.

Previous work at the IDC has examined the far-field behavior of MA systems. In this work, we aim to extend the analysis to the near-field region, comparing the two and highlighting their differences. The resulting insights can then be leveraged to inform new codebook design paradigms and improve our understanding of MA-based systems.

Guidelines for the project:

- Literature survey on MA in the near-field
- Review of previous work
- Formulating a system model and investigating possible optimization goals and constraints
- Solving the position and orientation optimization problem

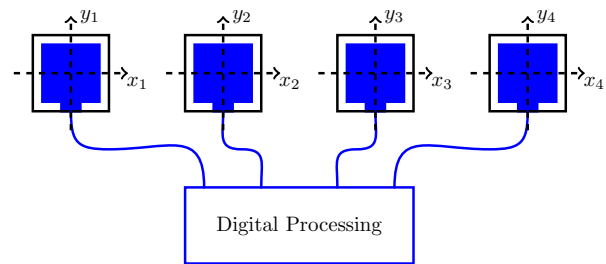


Figure 1: Movable Antenna with 4 elements.

PREREQUISITES

Scientific skills	- Advanced programming skills (mandatory for Master Thesis), - Good knowledge of digital and mobile communication systems (e.g. gained in the courses “Digital Communications”, “Mobile Communications” and “MIMO Communication Systems”).
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Start date: ASAP

End date: