[O09] Low-Complexity Adaptive Beamforming Algorithms Based on Low-Rank Decompositions and Set-Membership Filtering

The goal of this project is to develop novel low-complexity beamforming algorithms based on low-rank decompositions and the set-membership filtering (SMF) framework in order to design adaptive beamformers with complexity one order of magnitude lower than existing techniques. The proposed low-rank decompositions will be based on iterative switching and pattern matching and approximation of basis functions, and do not require complex eigen-decompositions or expensive operations. These techniques can be significantly simpler than full-rank filtering algorithms by reducing the dimensionality of the input data vector. The SMF concept will then be used to design low-complexity adaptive algorithms for the updates of the transformation matrix that performs dimensionality reduction and the low-rank filter. We will formulate the LCMV beamforming problem with the low-rank decompositions using linear algebra, develop SMF-based adaptive algorithms and build simulation tools to design, test and analyse the proposed techniques. The outcomes will be better, simpler and practical beamforming algorithms, and high-quality publications.

Project Supervisor

Dr. Rodrigo C. de Lamare

Rodrigo C. de Lamare was born in Rio de Janeiro, Brazil, in 1975. He received his Diploma in Electronic Engineering from the School of Engineering of the Federal University of Rio de Janeiro (UFRJ) in 1998 and the MSc and PhD degrees in Electrical Engineering from the Pontifical Catholic University of Rio de Janeiro (PUC-RIO) in 2001 and 2004, respectively. He then worked as a Postdoctoral Fellow from January to June 2005 at the Centre for Telecommunications Studies (CETUC), PUC-RIO and from July 2005 to January 2006 at the Signal Processing Laboratory, UFRJ. In 2006, he has been a visiting Professor at the University of Oslo, Norway. Since January 2006, he has been with the Communications Group, Department of Electronics, University of York, where he is currently Lecturer in Communications Engineering. His research interests lie in communications and signal processing, areas in which he has published over 150 papers in international journals and conferences.

Project Summary

Project Type: Accepted Status: Open Call