

ED STIC - Proposition de Sujets de Thèse pour la campagne d'Allocation de thèses 2011

Titre du sujet :

Mention de thèse :

HDR Directeur de thèse inscrit à l'ED STIC :

Co-encadrant de thèse éventuel :

Nom :

Prénom :

Email :

Téléphone :

Email de contact pour ce sujet :

Laboratoire d'accueil :

Description du sujet :

Cooperative communications, along with cross-layer approaches in wireless networks, is one of the most active research areas since near 10 years. In particular, the use of distributed space-time-frequency codes has led to major breakthroughs; enabling single antenna operated devices to team up together and provide large diversity gains, hence enhancing the network's performance dramatically.

Two key issues w.r.t. cooperative communications are, on the physical layer, the ability to provide efficient precoding (in multiantenna cooperative wireless communications) as well as receiver structures (e.g. joint channel/symbol estimation/detection); and on the networking aspects, the joint design between

the physical layer and higher layers.

The PhD proposal is :

1. To develop new models and mathematical tools for tensor processing of signals, with applications in space-time-frequency precoding for cooperative wireless communications (with multiple antennas thanks to the presence of multiple devices) [1,2]. This part will concentrate on the signal processing approaches and enable to estimate channels in two-way relaying systems, possibly in presence of multiple hops.
2. To study the applicability of the models to the MAC layer (for example the CCMA protocol [4]).

Following the approaches in [1,2], and with the help of the networking experts in the SIGNET team, the

candidate will consider the following problems :

- 1) Investigate transmit space/time/frequency pre-processing techniques by resorting to generalized tensor models (for example the CONFAC and PARATUCK2 models).
- 2) Generalize the tensor modeling approach to cover a wider range of cooperative networks with different cooperation protocols.

[1] C. A. R. Fernandes, A. L. F. de Almeida, D. B. da Costa, "Blind receiver for amplify-and-forward cooperative diversity scheme", accepted for IEEE SPAWC 2011.

[2] F. Roemer and M. Haardt, "Tensor-based channel estimation and iterative refinements for two-way relaying with multiple antennas and spatial reuse," IEEE Trans. Signal Process., vol. 58, no. 11, pp. 5720-5735, Nov. 2010.

[3] Ray Liu, Ahmed Sadek, Weifeng Su and Andres Kwazinski, "Cooperative Communications and Networking", Cambridge University Press, 2008, 642 pp.

[4] A. K. Sadek, K. J. R. Liu, and A. Ephremides, "Cognitive multiple-access via cooperation: Protocol design and performance analysis," IEEE Transactions on Information Theory, 2007

English version:

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