Research Topic for the ParisTech/CSC PhD Program

Field: Information and Communication Sciences and Technologies, Mathematics and their applications

Title: NOMA based transmission optimization with low latency

ParisTech School: Telecom ParisTech

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Short description of possible research topics for a PhD:

Demands in high data rate, reliable and low latency communications are increasing due to the huge development of new wireless applications (gaming, virtual reality, etc). In order to fulfill these new requirements, we cannot resort to traditional schemes waiting for an acknowledgment feedback with delay. We need to force the transmitter to send information enough on time. The idea is to do superposition coding between several bit streams by mimicking the Non-Orthogonal Multiple Access (NOMA), which is a candidate for 5G multiple access but also has rich perspectives in the longer term..

The topic is of equally-large interest to academia as to industry. However, before the idea of combininig retransmission scheme with superposition coding and successive interference canceler could be implemented into real systems, the following questions have to be addressed:

- What is the performance of such a new scheme (either with theoretical capacity-achieving coding or practical coding)? More precisely, what are the performance improvements in terms of throughput, delay?
- What is the benchmark performance? Assuming feedback delay and successive interference canceler, what is the best throughput?
- Which practical scheme has to be selected?
- Once this system has been optimized, how to manage multi-user interference and related resource allocation?

The goal of this PhD thesis is to find answers to these questions. We expect that information theory and signal processing will be relevant tools to find appropriate solutions.

Required background of the student: Digital Communications, Wireless networks, Signal Processing, Statistics, Information Theory

A list of 5(max.) representative publications of the group: (Related to the research topic)
[1] A. Khreis, **P. Ciblat**, F. Bassi, and P. Duhamel : *Multi-Packet HARQ with delayed feedback*, IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Bologna (Italy), September 2018.
[2] A. Khreis, **P. Ciblat**, F. Bassi, and P. Duhamel : *Throughput-efficient Relay assisted HARQ*, International Symposium on Wireless Communication Systems (ISWCS), Lisbon (Portugal), August 2018.