November 30, 2015
13:00-15:30

Seminar title: **Outage Probability Analyses of HARQ on Correlated Packets with Network Coded Helper Transmission: from the correlated source coding theorem viewpoint**

(Expected Length: 150 minutes including Q&A)
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Abstract

First of all, this talk introduces "Links-on-the-fly Technology for Robust, Efficient and Smart Communication in Unpredictable Environments (RESCUE) a EU FP7 ICT-2013 project, of which concept was motivated by the technological bases of correlated multiple source coding. The results of the project are expected to be applicable to machine-to-machine and vehicle-to-vehicle communications as well as communication for internet-of-things since they should also require the robustness against the network topology change, and have to be highly energy-efficient.

Then, this talk shifts the focus point on to recent results of our research on Hybrid Automatic Request (HARQ) with a helper. Analytical results of the outage probability of network coded helper transmission hybrid HARQ protocol is presented over Rayleigh fading channels in this paper, based on the theorem of multiple source coding with a helper. A parity is formed by bitwise exclusive-OR (XOR) of the previous M negatively acknowledged information packets, which is utilized as the helper, where $M=2, 3$. The major contribution is that the admissible rate region is derived for the HARQ protocol, where account is taken of the correlation among the packets. It leads to the outage probability analyses. The most significant finding of this paper is that M-th order diversity can be achieved by only one XOR helper packet transmission when transmitting M information packets, regardless of the correlation values among the information packets. Furthermore, when the helper has less transmit power than the information packet transmission, the packet correlation highly influences the outage performance of $M = 2$ XOR network coded helper transmission, compared to that with $M = 3$, especially at high average signal-to-noise power ratio (SNR) region. On the contrary, with both $M = 2$ and $M = 3$, increasing the transmit power of the helper influences the outage performance at low average SNR region only.