

Ph.D. in Information Technology: Theses Defenses

February 18th, 2019

Room Seminari – 10.00 am

Hamid Reza BARZEGAR– XXX Cycle

“Wireless Partial-Duplex Communications”

Advisor: Prof. **Luca Reggiani**

Abstract:

This research activity has been focused on the analysis and design of new schemes for wireless communication based on the reuse of the same channel for both communication directions (full-duplex) in order to increase link performance in terms of transmission range or capacity. Therefore, in order to overcome these issues, this research introduced a new scheme, named as Partial-Duplex (PD) approach. This solution consists of a communication link with the capability of supporting the connection in both directions at the same time in a portion of the bandwidth and with a frequency division for up-link and down-link in the rest of the band.

The second part of this study has been focused on the channel encoding for Partial-Duplex. We have identified that, in PD communication, the receiver faces a mixture of high and low bit (symbol) SNR in the same codeword, condition associated with a scheme in which part of the bits/sub-carriers is subject to FD interference (partial-duplex scheme). LDPC codes have shown, also w.r.t. turbo and polar codes, the best performance for PD, and we have studied how to optimize further their performance in this specific context.

Dario TAGLIAFERRI – XXXI Cycle

“Visible Light Communications for Next Generation In-Flight Systems”

Advisor: Prof. **Carlo Capsoni**

Abstract:

The amount of flights and of the number of passengers complaining for the lack of Internet connectivity has rapidly increased in recent years. Although some airline companies currently provide an Internet service based on both satellite communications to ensure the aircrafts' coverage and on on-board cognitive Wi-Fi systems to interface with the users' terminals, the capacity is insufficient, for the large geographical area covered by satellites and the limitations on the spurious RF interference needed to not impair the avionic instrumentation. The thesis aims at investigating the possibility of providing the passengers with a RF-free Internet access through optical wireless communications, in particular by using the visible light emitted by the LED reading lamps as a carrier for the downlink and a custom IR solution for the uplink. The wireless

optical channel is characterized in terms of channel impulse response and signal-to-interference-plus-noise ratio, and some optimized digital transmission techniques are tested to best suit with on-board scenarios. An innovative high-capacity backbone network is proposed to interconnect the LED reading lamps one to each other, reducing as much as possible the extra weight and limiting the energy consumption. Finally, the development of a visible light optical transceiver with its relative preliminary tests is reported.

PhD Committee:

Prof. **Umberto Spagnolini**, DEIB

Prof. **Roberto Garello**, Politecnico di Torino

Prof. **Pin-Han Ho**, University of Waterloo