

Ph.D. in Information Technology: Theses Defenses

December 19th, 2018

Room Conferenze Emilio Gatti - 10.00 am

First Ph.D. presentation and discussion:

Atul KUMAR – XXXI Cycle

“Synchronization and Performance Evaluation of Future Wireless Cellular System Based on the Use of New Multi-Carrier Transmission Techniques”

Advisor: Prof. **Maurizio Magarini**

Abstract:

The impact of synchronization issues can be higher in future wireless cellular system, where the use of non-proportional subcarrier spacing are required to accommodate the necessary bandwidth. As its consequence, orthogonality is destroyed and inter-carrier interference (ICI) among the sub-carriers and inter-symbol interference (ISI) will arise. To this aim, I intend to apply the concept of Fractional Fourier Transform (FrFT) to improve tolerance to ICI and ISI and also analyze the impact of synchronization errors i.e., carrier-frequency offset (CFO) and symbol timing offset (STO) on the symbol error probability (SEP) performance of Orthogonal frequency division multiplexing (OFDM) system and perform Monte Carlo simulations to validate the analytical results. Moreover, as more practical aspects related to hardware co-simulation, I implemented the FPGA-in-the-loop (FIL) simulation of receiver with equalization of DFrFT-based OFDM system using MATLAB and Simulink Toolboxes and analyzed by capturing the real-time video and transmitted over both DFT and DFrFT-based OFDM system. Furthermore, OFDM are characterized by a high out of band (OOB) emission and cyclic prefix overhead, which limits spectral efficiency, and high latency, resulting into limitation of real-time applications. Based on this, the main motivations behind the study of new multicarrier waveforms, where I studied the generalized frequency division multiplexing (GFDM), and analyzed the effect of pulse shaping filters on SER performance of GFDM transmission over AWGN, flat and frequency selective Rayleigh fading channel and also derived the analytical expressions of SEP of GFDM system in presence of CFO with matched filter receiver in case of transmission over AWGN and different multipath Fading environments.

Second Ph.D. presentation and discussion:

Navuday SHARMA – XXXI Cycle

“Increasing Capacity of Wireless Networks Through Aerial Base Stations”

Advisor: Prof. **Maurizio Magarini**

Abstract:

Unmanned Aerial Vehicles (UAVs) have recently gained enormous attention recently in wireless communication sector. Therefore, it is imperative to develop innovative communication technologies not only for supporting reliable and secure UAV remote command and control, but also for enabling high-capacity mission-related information transmission, with potentially densely deployed UAVs. This thesis drives towards integrating UAVs into 5G and beyond with focus towards several aspects such as Air-to-Ground Channel Characterization, Cell Coverage, Capacity and Interference analysis at low altitudes. Further, an innovative idea of Ultra-Dense Cloud Drone Network is proposed to support high data rate requirements of 5G flash crowd users and reduce the total cost of operations for mobile operators. Also, implementation of different waveforms such as OFDM and GFDM with low latency LTE-Grid and "Better than Nyquist" pulse shaping filters into UAV channel has been done, with further enhancements on synchronization aspects through carrier frequency offset.

PhD Committee:

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