Unmanned Aerial Vehicles in Communications and Sensing

Date: Tuesday, October 19, 2021

Time: 01: 10 PM – 02: 00 PM
Location: Bldg. 59-2015 and
ONLINE at : Meeting ID: ID 711 610 8767 Passcode: 103923

Speakers:

Detection of unmanned aerial vehicles (UAVs)	**Dr. Ali Muqaibel** (10 min)
Statistical channel models for UAV-based communication systems	**Dr. Suhail Al-Dharrab** (10 min)
Optimizing resource allocation in UAV-enabled communication	**Dr. Ali Nasir** (10 min)
Future UAV Communication and Sensing Research Directions	**Audience** (15 min)

Abstract:

One of the *grand challenges* addressed by the IRC for Communication Systems and Sensing is to develop holistic designs that span multiple disciplines of signal processing, communications, sensing, machine learning, and big data addressing public safety and national security needs. UAV finds a lot of applications in communications and sensing. Drones/ UAVs are used in many applications to save cost, time, and, more importantly, human lives. Such advanced technology could also be abused. We address different related research directions with multi-speakers' seminar.

Part I: Detection of UAVs

Due to the vast use of UAVs/drones and their increased popularity, as well as what the subject has in terms of potential development and research. This part focuses on UAVs detection, specifically domestic drone types. Drones can be detected using acoustic, visual, RF and Radar means. There are pros and cons for every technology. We also examine the hybrid systems and their potential in applications like receiving payload drones' packages. We highlight the basic experimental efforts done in the IRC-CSS and the way to go forwards. We also highlight the use of machine learning techniques in the detection process.

Part II: Statistical channel models for UAV-based communication systems

In this part of the talk, I will give a brief overview on common statistical channel models for UAV-based communication systems. Channels in UAV-to-ground coverage are characterized by mobility and dynamic propagation conditions, which lead to a composite multipath/shadowing fading and double scattering propagation. Due to local scattering regions around both transmitter and receiver(s), and their large separation, the keyhole effect exists. These models are corroborated empirically by measurement campaigns to justify their goodness-of-fit in urban environment.

Part III: Future UAV Communication and Sensing Applications & QA Discussion

Unmanned aerial vehicles (UAVs) can assist normal communication networks by acting as flying base stations (UAV-BSs) and taking care of traffic demand in exceptional situations, e.g., sports events, concerts, disaster position, military situations, traffic congestion, etc. Thus, UAV-enabled communication can be efficient in increasing the coverage and throughput of wireless communications. However, this can be only achieved by optimizing various resource parameters, e.g., power allocation, bandwidth allocation, location of UAV or its trajectory etc. Moreover, the broadcast nature of wireless channel and the availability of line-of-sight link makes the UAV-enabled communication more susceptible to be overheard by the eavesdroppers, which brings an extra challenge to the resource allocation design. This part will present a brief overview of some resource allocation strategies to maximize the benefit of deploying UAV in wireless communication systems.