Keynote: Navigating the Urban Space - Challenges and Innovations in Distributed UAS Position Control -

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Keynote Abstract

Unmanned Aircraft Systems (UASs)[1] have rapidly evolved, finding applications across various domains in both urban and rural areas. Despite their widespread use—ranging from logistics, such as on-demand delivery of food and parcels, to surveillance of people and traffic, and environmental monitoring—their deployment in urban settings remains constrained due to concerns of authorities and the general public about the safety and reliability of such large-scale deployments. One reason for this is, that the capability to monitor and manage large amounts of UASs safely and efficiently using Unmanned Aerial Traffic Management (UTM) systems is still lacking. Such systems would provide for many services to UAS operators like requesting flight permission, deconflicting and remote piloting. But most importantly, UTM systems must provide a mechanism for airspace monitoring in which the positions of UASs are reliably known at any time. Although concepts for UTM systems exist all around the world, the communication technology to support such concepts to deploy among UAVs from different operators is still at an early stage.

In order to overcome this problem, drone-to-drone communication plays a key role. Hence, in the VEREDUS[2] project, a solution for direct drone-to-drone communication was developed including the design of hardware, antennas and software. Within the VEREDUS project, we identified requirements and challenges for a communication system supporting both current and future applications, complementing today's communication technology (such as C-V2X or IEEE 802.11bd) and enabling scalable solutions for the future. The performance of the network was assessed using a traffic and network simulator.

Our keynote outlines the key requirements and challenges identified in the project and presents a solution that supports both current UAS applications and future UAS networks. We also showcase the project's outcomes, including the design, implementation, and integration of solutions into commercially available UAVs, validated through simulations and real-world experiments.

[1]UAV refers to the drone itself, the flying component, while UAS includes the UAV plus all operational support elements (e.g., ground control, communication equipment). However, these terms are often used interchangeably in the literature.

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Keynote Speakers

Koojana Kuladinithi has been serving as the Deputy Head of the Institute of Communication Networks at Hamburg University of Technology, Germany (TUHH), since November 2016. Before that, she held a PostDoc position at the University of Bremen, Germany (2010–2015), where she also obtained her PhD in 2010. Her doctoral research focused on wireless multihop ad hoc networks, specifically enabling radio-disjoint multipath routing. Her research journey began in 2002 when she joined the ComNets group at the University of Bremen as a research scientist, specializing in enhancing mobility management protocols. She has made significant contributions to the scientific community through numerous publications, including patents, and actively participated in the IETF during her time at the University of Bremen.

Her primary focus areas include enhancing network and link layer protocols, optimizing and modeling wireless network protocols, and studying networks with opportunistic and intermittent communications. She is also actively involved in teaching and was awarded the City of Hamburg's Teaching Award in 2024.

She is a member of several program and organizing committees for conferences and workshops. She is also a member of the United Nations University and serves as the Deputy Coordinator for the international master's program in Information and Communication Technology at TUHH.

Konrad Fuger is a research fellow at the Institute of Communication Networks at Hamburg University of Technology, Germany (TUHH). He received his Bachelor of Science in Mechatronics at TUHH after which he enrolled in the international program of Information and Communication Systems and received his Master's degree in 2020.

After joining the Institute, he first conducted research on aeronautical communication, quickly migrating into the related field of UAV communication where he made significant contributions. Within the German government funded VEREDUS project he developed protocols and techniques to enable large-scale urban UAV networks. His methods cover a wide variety of simulation, stochastic modelling and machine learning. He currently is in the final stages of pursuing his Dr.-Ing. at TUHH on the topic of "Reliable Communication for UAVs in Urban Environments".