Efficient Localization and Energy Management for Resilient Aerial Networks

by

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All interested are cordially invited.

ABSTRACT:

Resiliency in communication networks is the maintainability of the communication functionality at acceptable levels against possible errors, environmental problems, network outage due to technological causes or malicious attacks. However, it is tremendously time-consuming to redesign the network in a versatile disaster situation considering today's static and conservative communication network infrastructures. In disaster management; assessing the situation, taking immediate and effective precautions and proposing solutions for the optimization is only possible with a robust communication network infrastructure. Additionally, in case of base station failures, there is no infrastructure to manage the mobile traffic in today's mobile network provider systems. In order to solve this problem, mobile data traffic should be managed adaptively. To this end, novel applications are also needed in order to solve the network management problems in case of an unanticipated failure. Today, with the increasing use of Unmanned Aerial Vehicles (UAV), many new applications are emerging in the communication sector. According to the AUVSI report (2013), direct economic impact from the UAV industry in US is about $3.6 Billions in 2018 and is expected to exceed $5 Billions by 2025.

UAVs are proposed to support the communication infrastructure as an aerial base station via a central controller to solve the problems for existing network infrastructures. Thus, it is aimed to design a resilient network management mechanism conceptually at system level. In order to increase resiliency in aerial networks, a proper positioning management and a flight planning mechanism are both needed considering the relationship between drone flight characteristics and energy consumption. In this context, with the proposed original network management platform, a three-dimensional spatial and temporal flight planning is proposed, which locates the aerial base stations according to user density and traffic flow, taking into account the energy consumption of the entire topology, it is aimed to virtualize dynamic mobile network topology and create a scalable structure to manage possible handover procedure between aerial base stations. Thus, a solution is presented in a flexible and centralized structure, which analyses the resiliency of the network in real time and is sensitive to increased mobile data traffic and dynamic topology changes.

BIOGRAPHY:

Berk Canberk received his PhD degree in Computer Engineering from Istanbul Technical University (ITU), Turkey, in 2011 and his MSc degree in Communications Engineering from Chalmers University of Technology, Sweden, in 2005. He was a Postdoctoral Researcher in Broadband Wireless Networking Laboratory in Georgia Institute of Technology, Atlanta, USA, between 2011 – 2013. Currently, he is an Adjunct Associate Professor with the Department of Electrical and Computer Engineering at Northeastern University. He is also an Associate Professor at the Department of Computer Engineering in ITU. He serves as an Editor in IEEE Transactions in Vehicular Technology, IEEE Communications Letters, Elsevier Computer Networks, Elsevier Computer Communications and Wiley International Journal of Communication Systems. He is a Senior Member of IEEE, Member of ACM and IET. He has been involved in several international conferences as technical program co-chair, symposium chair, regional chair, publicity chair, tutorial chair, and TPC member. He is the recipient of the IEEE Turkey 2018 Research Incentive Award. He also holds several other recognitions including IEEE INFOCOM Best Paper Award (2018), The British Council (UK) Researcher Link Award (2017), IEEE CAMAD Best Paper Award (2016), Royal Academy of Engineering (UK) NEWTON Research Collaboration Award (2015), IEEE INFOCOM Best Poster Paper Award (2015). Dr. Canberk's current research areas include Aerial Networks, Software-Defined Networking (SDN) and Network Function Virtualization (NFV) in 5G Systems.