CONSTRAINED OPTIMIZATION MODELS BASED ON UAV NETWORKS WITH 5G TECHNOLOGIES

GABRIELLA COLAJANNI

In recent years, the impact of 5G technology (the fifth-generation mobile network) is revolutionizing all social and economic sectors since, compared to previous networks, 5G has superior and better performance in terms of speed, latency, error, reliability, efficiency and so on and because 5G enables a new type of network designed to virtually connect everyone and everything together, including machines, objects and devices. Therefore, the purpose of this talk is to propose an optimization of a fleet of Unmanned Aerial Vehicles (UAVs), organized as a Flying Ad hoc Network (FANET) aimed at providing 5G network slices or on-demand services to users and devices on the ground. Moreover, the FANET, which is emerging as an alternative access technology for regions that do not have fixed infrastructures or are difficult to reach (perhaps after a disastrous event), is represented by a set of UAVs that communicate with each other even in rural or post-disaster areas, often not even covered by the electricity grid or in marine environments. The determined three-level Networks are able to represent all the fundamental elements of different structures of 5G network and slice architectures. The proposed nonlinear network-based multilevel optimization models for the provision of 5G services are very useful for problem solving and to determine the optimal distributions flows. The associated Variational inequality formulations are proposed, and some numerical examples are presented to validate the effectiveness of the models.

References

[1] G. Colajanni, D. Sciacca, *An Optimization model for service requests management in a 5G network architecture*, A. Masone et al. (eds.), Optimization and Data Science: Trends and Applications, AIRO Springer Series 6, 2021, 81-98.

[2] L. Galluccio, C., Grasso, M., Grasso, R., Raftopoulos, G., Schembra, *Measuring QoS and QoE for a Softwarized Video Surveillance System in a 5G Network.* In: 2019 IEEE International Symposium on Measurements & Networking (M&N), pp. 1–6. IEEE (2019).

[3] C. Grasso, G., Schembra, *A fleet of MEC UAVs to extend a 5G network slice for video monitoring with low-latency constraints.* J. Sens. Actuator Netw. 8(1), 3 (2019).

[4] R. F. Olimid and G. Nencioni, *5G Network Slicing: A Security Overview*, in IEEE Access, vol. 8, pp. 99999-100009, 2020.

Department of Mathematics and Computer Science, University of Catania, Viale A. Doria 6, 95125, Catania, Italy

Email address: colajanni@dmi.unict.it