The use of 5G networks to control UAVs

Matheus C. da Silva Gomes[1], Leandro D. de Jesus[1], Antônio J. Dantas Filho[1], Maurício A. de Almeida[1], Alexandre C. B. Ramos[1], Félix Mora-Camino[2], Georges Mykoniatis[3]

[1] Federal University of Itajubá, Minas Gerais, Brazil
{matheus_carloss,d2019102840,antoniodantas,d2021101420,ramos}@unifei.edu.br
[2] Federal University of Fluminense, Brazil
moracamino@hotmail.fr
[3] Université Fédérale de Toulouse / ENAC, France
georges.mykoniatis@enac.fr

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1 Introduction

Autonomous unmanned aerial vehicles, also known as UAVs, have been increasingly used in the most diverse segments such as entertainment, construction, surveillance in military areas, search and rescue in critical environments, and with COVID-19 pandemic another area that has shown promise is the transport of medicines. Currently what prevents them to be used even more are their limited energy capacity, their low data transmission rates and the necessity of expensive components for onboard processing and video streaming. To try to mitigate these problems, research related with the use of 5G networks to connect with UAVs has been performed recently. Therefore, this work aims to present an overview of the studies that have been developed with regard to UAVs with 5G technology.

2 Related Works

Develop a scenario in which it is possible to connect UAVs in a 5G network is the proposal of the work developed by Carlos Eduardo [7]. This work presents a positive view in which, through a simulated environment it is possible to get a glimpse of how connections between 5G and UAVs might occur in the future. Quick and easy to use for future investigations targeting 5G.

In the work developed by Sunil Jacob [4] the bidirectional multi-tier cognitive swarm drone network (BMCSDN) is proposed, which consists in the use of a UAV as a dynamic node for point-to-point communication in a 5G network. In the end, the work managed to develop, using the concept of cognitive swarm drone (CSD), the bidirectional multi-tier cognitive swarm drone network architecture (BMCSDN), which proved to be efficient in terms of sharing resources between drones within networks. It was also possible to observe the great power that a 5G network can offer in swarms of drones which gives a high outlook for future works.

In the work conducted by Raheeb Muzaffar [6], practical experiments are developed using a commercial 5G base, with a drone performing flights at different heights using a mobile android tool [1] for recording measurements. As general results, it is possible to observe that communication using 5G cannot be maintained during the entire flight time and oscillation for the 4G network [2] are frequent as there is an increase in altitude. This paper presented a study aimed at practical experiments involving 5G and UAVs, which generated very good results and which should certainly be taken into account in any study aimed at both technologies.

In [3] the potential gain of UAV-aided data collection in IoT scenarios is presented, a multi-antenna UAV is used to communicate with a group of single-IoT antennas in order to form the MIMO connection. In [8], the role of edge computing is presented with regard to autonomous browsing, the work highlights the importance of strong uplinks in cellular networks as provided for 5G for applications involving UAVs, showing that in some points of the edge it is possible to obtain high resolution image transfer. In [5] UAVs are presented as devices that carry small 5G base stations to remote areas. Furthermore, this work considers energy efficiency as a key factor for the evolution of UAVs and how the use of 5G can help to mitigate such an optimization problem.

3 Conclusion

With a detailed look at the current technology scenario involving 5G and UAV applications provided in this paper, it is possible to observe that many works point to the union of these two technologies as something beneficial that tends to develop a new generation of smart autonomous UAVs. Much of the work indicates benefits such as high data transmission rate, and better resource management on the aircraft. In addition, with the use of 5G, the processing power that previously had largely been contained onboard in UAVs can now be shared with the servers making more complex tasks such as traffic control, trajectory optimization and drone swarm coordination activities simpler to implement. It is evident that many studies are still needed since we are just transitioning from 4G to 5G, however, as this evolution progresses, applications involving these two technologies tend to increase and so the possibilities.

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