Consiglio Nazionale delle Ricerche
Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni

Thesis proposal on
Development of an experimental framework for validating GNC algorithms for Quadrotors in Multi-Scenario Applications

The adoption of Unmanned Aerial Vehicles (UAVs) in several scenarios can aspire to become a reality if the validation of their effectiveness is sustained by the contemporary and shared improvement of all those technological gaps identified by current research projects. In particular, a crucial point is still linked to the autonomy of drones related to the concept of guidance, navigation and control (GNC).

Fig. 1 - Possible quadrotor applications.

This thesis is aimed to the development of an experimental framework where different guidance, navigation and control advanced and customized algorithms, once developed and validated in a simulation environment, can be embedded onboard the selected platform for performing Hardware-In-the-Loop and flight tests. The activity aims to train new professionals in the areas of autonomous systems with application to different sectors ranging from precision farming to Industry 4.0.

The candidate will be in charge of implementing and testing via HIL simulation different GNC strategies (pre-developed in a MATLAB/Simulink environment), to be embedded on the onboard SDK (OSDK) platform, equipped on a DJI Matrice 300RTK or 600 (see Fig. 2). In particular, the candidate will build a Linux or ROS standalone application based on OSDK, which will allow to extend the flight and control capabilities of the selected platform.

Fig. 1 – DJI Matrice 300 RTK (left) and DJI Matrice 600 (right).

Skills:

- Excellent knowledge of computer science and programming
- Excellent coding skills in MATLAB/Simulink
- Excellent coding skills in Linux or ROS
- Excellent knowledge of spoken/written English

Starting Date: September/October 2022.

Advisors and Stage: The thesis will be carried out under the supervision of the staff of the System and Modeling Control Group at the Institute of Electronics, Computer and Telecommunication Engineering of National Research Council of Italy (IEIIT-CNR). Possible collaborations with the research group of Prof. Paolo Gay from the Department of Agricultural, Forest and Food Sciences of Università degli Studi di Torino.

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If interested, please send your CV with a complete lists of exams and votes.