

# ELECTRICAL, ELECTRONICS AND COMMUNICATIONS ENGINEERING

## PNRR - Modeling and control strategies for unmanned aerial vehicles operating in urban environments

<b>Funded By</b>	DET - Progetti - Progetti ricerca MIUR ed altri ministeri MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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<b>Context of the research activity</b>	<p>The research focuses at the development of novel modeling and control strategies to operate autonomous aerial vehicles in urban environments. Many challenges are posed by this endeavor, especially when applications must be deployed. Control algorithms, both for single vehicles and for fleet coordination, are essential to safely operate the vehicles. Thorough simulation studies are expected to evolve in full experimentations, both indoor and outdoor.</p> <p>Progetto Finanziato nell'ambito del PNRR - Project funded in the PNRR initiative PNRR M4C2, Investimento 1.4 - Avviso n. 3138 del 16/12/2021 - CN00000023 Sustainable Mobility Center (Centro Nazionale per la Mobilità Sostenibile) – CNMS - CUP E13C22000980001</p>
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	<p>The research is conducted as part of the MOST - National Center for Sustainable Mobility, an initiative under the PNRR (Next Generation EU). The researcher is involved in Workpackage 1, specifically in Task 1.3, which focuses on sustainable design and social acceptance of urban air mobility with a demonstrator. The objective is to develop efficient models and control strategies for unmanned aerial vehicles (both single vehicles and fleets) operating in urban environments.</p> <p>This PhD fellowship will explore various control techniques, ranging from classical model-based approaches to cutting-edge applications of artificial intelligence. Emphasis will be placed on incorporating interpretability features to enhance social acceptability. The research will involve the development of guidance, navigation, and control strategies to ensure efficient and safe</p>
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<b>Objectives</b>	<p>operations in urban settings.</p> <p>To validate the proposed techniques, extensive testing will be conducted using high-fidelity simulators, hardware-in-the-loop and software-in-the-loop systems. The PhD candidate will actively contribute to the creation of dedicated indoor and outdoor facilities for testing purposes.</p> <p>The ultimate goal of this research is to contribute to the realization of a demonstrator for operations in urban environments. The research findings will inform the development of innovative control strategies and models, paving the way for sustainable and socially accepted urban air mobility solutions.</p> <p>Overall, this PhD fellowship offers an exciting opportunity to be part of a dynamic research project that aims to advance the field of unmanned aerial vehicle control in urban environments. The candidate will actively contribute to the development of novel models, control strategies, and testing facilities, making significant strides towards sustainable and socially accepted urban air mobility.</p>
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<b>Skills and competencies for the development of the activity</b>	<p>The ideal candidate has gained an experience in modeling and controlling unmanned aerial vehicles, and in the use of simulation systems.</p> <p>Particularly appreciated skills are:</p> <ul style="list-style-type: none"><li>- knowledge of modeling and control principles of mobile and aerial robotics</li><li>- Matlab/Simulink for robot simulations</li><li>- ROS/Gazebo or another high-fidelity simulator</li></ul> <p>Willingness to realize a hardware prototype is indispensable to the success of the endeavor.</p>
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