Call for application for research scholarships

for post-graduate international candidates

RESEARCH PROJECT N. 51

Title

Cloud-based Framework for Risk-aware Intelligent Navigation in Urban Environments

Scientific responsible (name, surname, role)

Alessandro Rizzo, PhD, Associate Professor – Department of Electronics and Telecommunications (alessandro.rizzo@polito.it)

Short description of the research activity (max 250 words)

Remotely Piloted Aircraft Systems (RPAS) are being widely studied and developed due to their mission flexibility, reconfigurable architecture and low cost. The research activity aims at developing a novel Cloud-based framework for intelligent navigation of RPAS in urban environments, toward achieving fully-autonomous missions without compromising safety. The advantages of the envisaged approach reside in the flexibility in the design and implementation of complex systems and algorithms with partial independence from the specific flying and control hardware. Thanks to the real-time use of Cloud-based algorithms, advanced control ability and risk-aware navigation and planning can be implemented, without increasing the flying payload. The envisaged framework is structured in stacked logical layers, distributed between the Cloud and the RPAS, implementing the tasks of autonomous flying, processing information and decision-making. The architecture comprises five layers, including map and risk-aware path planning generation, and control layers. Important novelty elements are: (i) the definition of a dynamical risk-map, and (ii) an On-board Control System able to perform emergency maneuvers, if communication with the Cloud is poor or missing.

During this multidisciplinary project, the applicant will have the opportunity to work in a team with multi-faceted skills and strengthen her/his knowledge in RPAS navigation, control, and regulations, in preparation for a PhD program. The research team is involved in research projects on similar topics, in collaboration with major academic and industrial partners (e.g., TIM, Italy; LAAS-CNRS, France; MIT, USA). Sound preliminary results have already been obtained and will constitute the basis for the applicant's research.

Specific requirements (experiences, skills)

Good knowledge of dynamical systems theory and nonlinear control is required, as well as skills in coding and visualization. A specific knowledge on modeling of aeronautics systems and on the Robotic Operating System (ROS) will surely constitute a strong plus.

Website of the research group (if any)

staff.polito.it/alessandro.rizzo

Keywords (min 3, max 6)

Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Vehicles (UAV), Navigation, Risk assessment, robotics

Research Area (max 1)

Electronics, Control and Telecommunication Engineering

The present form should be filled in English and sent to scudo@polito.it by 2nd October 2017