Learning outcomes @ IPSA's Summer School 2018

Knowledge achievements

The IPSA's summer school (I2S) is meant to provide the basics on micro aerial vehicle (MAVs) design & development. The summer school not only provides a "friendly" theoretical background on aerial autonomous vehicles, as dynamic/aerodynamic modeling and nonlinear control, but also it details experimental aspects regarding the airframe design and implementation of such techniques on both: (i) a two-rotor educative IPSA-made's benchmark (Educopter) and, (ii) a customized drone developed by I2S's students. The former corresponds to ongoing research projects on vision-based navigation, while the latter corresponds to experimental drone development within the I2S's framework.

Students Profile

The summer school is intended for international students interested on improving their background on aerial robotics. A prior basic background on robotics, control systems and/or mechatronics is recommended.

Syllabus

1) Design and Modeling of MAVs
    - Drones configurations
    - MAV Basic Aerodynamics
        - Aerodynamic model
        - CFD Simulation Tutorial
    - MAV Dynamic Modeling
        - Newton-Euler vs Euler-Lagrange
        - Matlab-Simulink simulation Tutorial

2) Control Techniques for MAVs
    - Basic linear control
    - Attitude Controller
    - Basic Underactuated System
        - Educopter Position Control (In Simulation)

3) Flight Control Embedded Architecture
    - Microcontroller MAV Programming
    - Inertial Sensors and Visual Servoing Description
        - Educopter Attitude/Position Experimental Control

4) MAV Development @ I2S
    - Airframe design
        - CAD Tutorial (MAV's airframe)
        - 3D printer basics
        - Drone Assembling/Experimental Tests Session(s)

Facilities

- Flight Arena
- 2 - 3D Printers
- ROS-controlled off-the-shelf Parrot drones
- Operational Homemade Drones