



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
CAMPUS DI FORLÌ

Learning by doing projects: Hydrone

Friday, September 22nd 2023

School of Engineering- Forlì Campus

Department of Industrial Engineering

Via Montaspro, 97 Forlì

Hydrone: Objectives



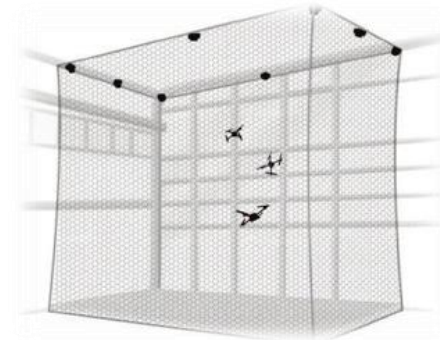
The project intersects different research interests, and takes form in two main tasks:

- Creating an unmanned vehicle student team, with the first objective of participating to the ICUAS UAV competition
- Improve unmanned (air and land) performance by using hydrogen Fuel Cell propulsion systems



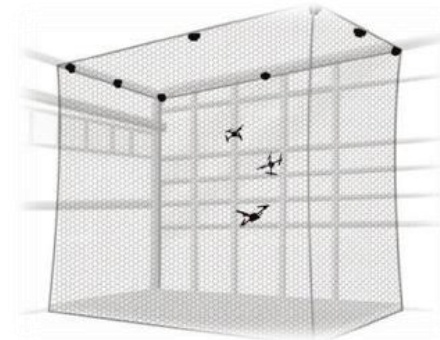
Hydrone: ICUAS UAV competition

- The Competition is student-focused, offering unique opportunities for students to test and compare their skills with those of their peers, worldwide.
- The competition is open to any full-time BSc, MSc and PhD students (a proof of student status will be required later). There is no fee to participate.
- There are two phases:
 - **Simulation:** ICUAS provides ROS-Gazebo based simulation environment for students to test their code, starting from low level control, all the way towards path planning and mission execution.
 - **Trials:** during ICUAS there will be a motion capture arena where the (representatives of) the best teams from the simulation phase would be invited to compete and test their code in a laboratory setup environment



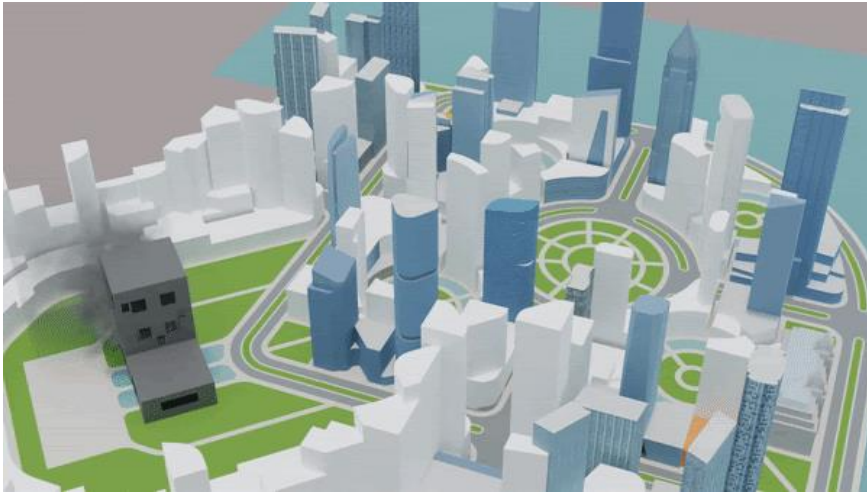
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Hydrone: ICUAS UAV competition

Example: ICUAS UAV competition, 2022



THE CHALLENGE

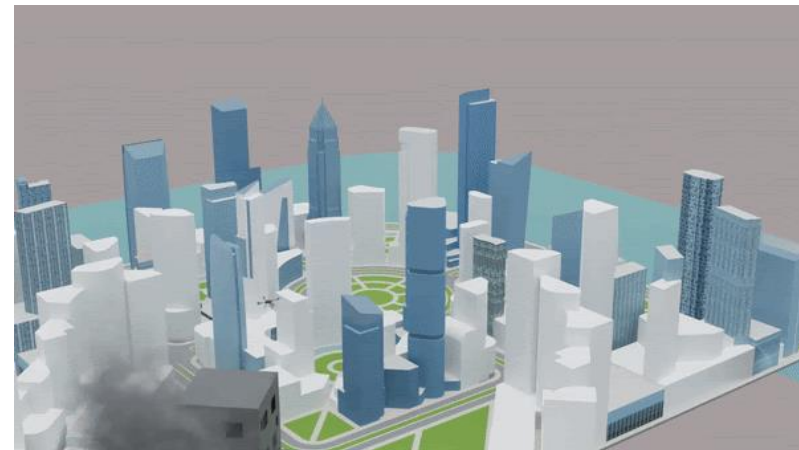
TASK 1: EXPLORATION

Students were provided with a map of the environment and a rough estimate of the target. Students task was to navigate towards the target through the provided map.

THE CHALLENGE

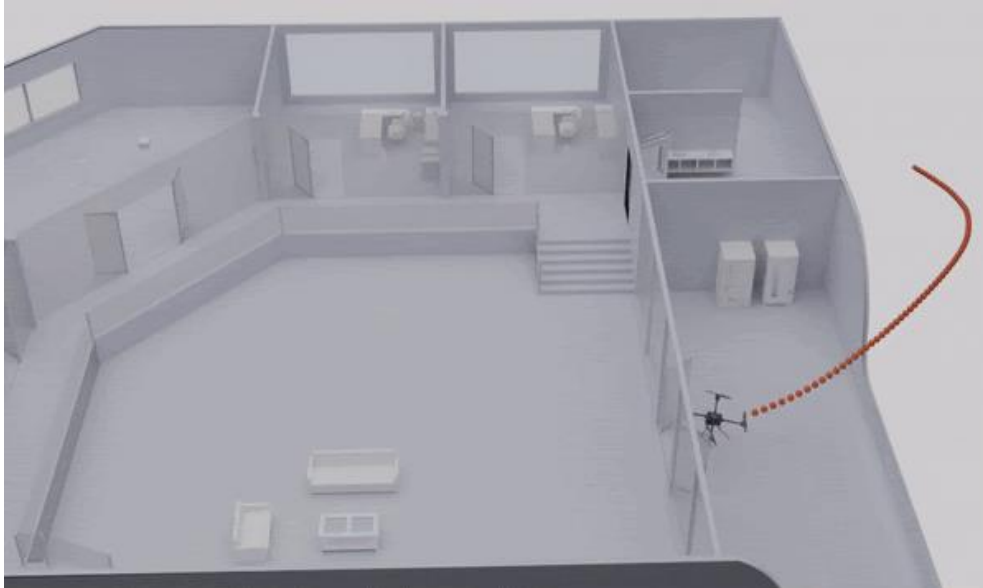
TASK 2: TARGET DETECTION

Once the target was reached the team had to find the precise location of the drop point in order to successfully deliver the payload. Execution time and precise localization were important.



Hydrone: ICUAS UAV competition

Example: ICUAS UAV competition, 2022



THE CHALLENGE

TASK 3: PRECISION DELIVERY

The final challenge tested the agility of trajectory planning. Teams had to plan a trajectory that was capable of delivering the payload without harming the drone.



Hydrone: ICUAS UAV competition

Example: ICUAS UAV competition, 2022

THE LIVE TRIALS PLATFORM

- ROS capable Intel NUC computer run students algorithms onboard.
- Pixhawk flight controller set including orange cube featuring triple redundancy IMU system connected to the computer via MAVLINK interface.
- The Intel® RealSense™ D435 offered the widest field of view of all cameras, along with a global shutter on the depth sensor that was ideal for fast moving applications.
 - Arduino nano board preprogrammed to deploy the payload at teams command.



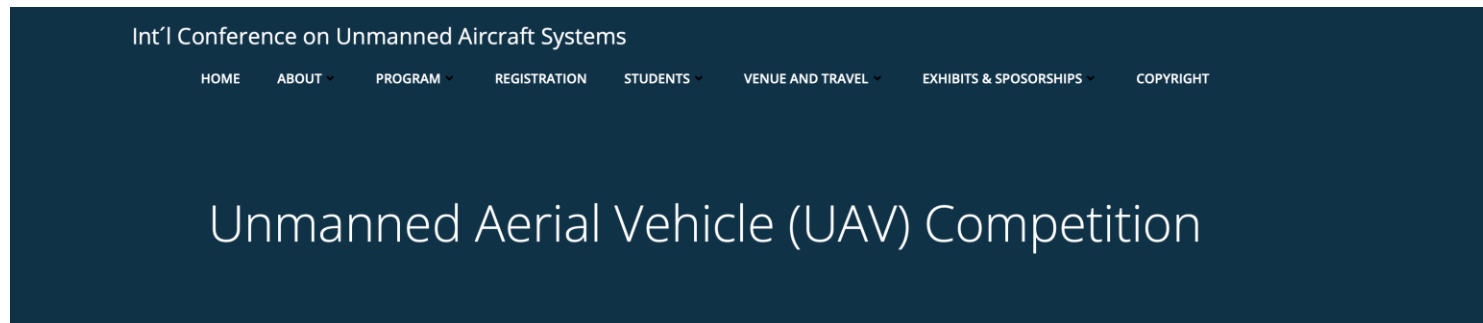
Hydrone: ICUAS UAV competition

MORE INFO:

- Past competitions:

- https://uasconferences.com/2023_icuas/unmanned-aerial-vehicle-uav-competition/
- https://www.uasconferences.com/2022_icuas/uav-competition/

- Next Competition



Following the successful launch of the ICUAS UAV Competition at ICUAS 2022 in Dubrovnik, and the return of the second edition at ICUAS 2023, the ICUAS Competition will be back in 2024!

Stay tuned for updates regarding registration, competition timeline, and general information.



Hydrone: ICUAS UAV competition

MORE INFO:

- Next Competition

IMPORTANT DATES

February 4, 2024: Full Papers / Invited Sessions / Tutorial Proposals Due

February 15, 2024: UAV Competition, Simulation-Based Scenario

April 5, 2024: Acceptance / Rejection Notification

April 5 – April 20, 2024: Early Registration

April 20, 2024: Upload Final, Camera Ready Papers

TUTORIAL AND WORKSHOP CHAIRS

Ann-kathrin Koschlik, DLR

UAV COMPETITION

Lefteris Doitsidis, Technical University of Crete
Frano Petric, University of Zagreb

and Automation Society, and the Mediterranean Control Association.

ICUAS '24 includes the student-focused and student-centered UAV Competition, which offers unique opportunities for students to test and compare their skills with those of their peers worldwide. The competition is organized in two stages: simulation qualifiers and in-person finals during the conference. Details on how to participate in the UAV Competition are available on the conference web.

- https://uasconferences.com/2024_icuas/unmanned-aerial-vehicle-uav-competition/

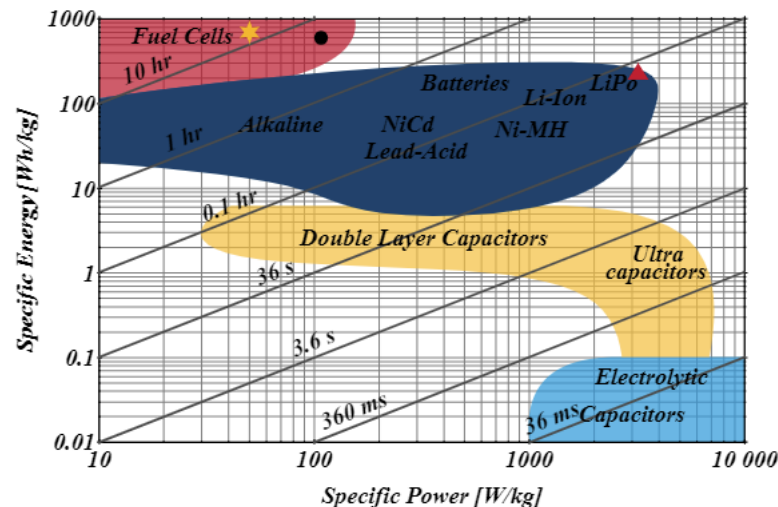
Check for UAV competition info!!



Hydrone: FC power generator



- Foster hydrogen technologies among the students
- Prepare students for a scaled-up project
- Benefit of the hydrogen infrastructure that will be available in the labs
- Create an Aero+Mech project for a heterogeneous teamwork
- Why Fuel Cell on drones? To improve rangeability...



Hydrone: FC power generator

Fuel Cell Power Generator KIT specifications

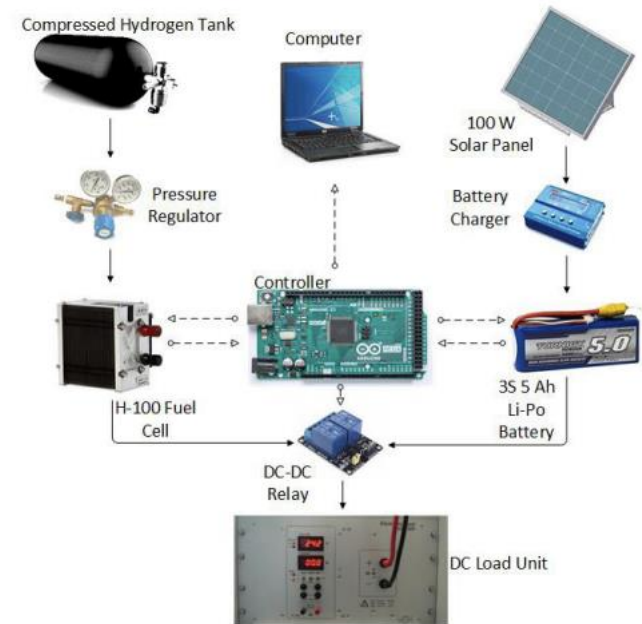
- 800 W@24/48 V Fuel Cell Module (210x105x105 mm)
- Control Box (195x90x40mm), including DC-DC converter
- Total weight: 1.5 kg
- Hydrogen regulator (350-0.9 bar), 0.315 kg
- 3.0 l hydrogen cylinder (4kg)



Hydrone: FC power generator

On-board installation tasks

- Power generation components integration and test (test bench, electric power measurement)
- Mechanical/electronic integration within a land rover
- Test on the vehicle
- Study/optimization/application to other unmanned vehicles (drones)



Would you like to join the team?



Contacts

Unmanned vehicles

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