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## Experimental Validation on Using Drones for the Take-off and Landing Phases of an AWE System

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Recent research results are gradually assessing and eliminating feasibility risks and improving the understanding of Airborne Wind Energy systems (AWE). One direction is to reduce their costs required for each generation unit compared to traditional wind turbines. AWE systems have also to cope with partially unpredictable wind to remain airborne and need to land when wind conditions are poor. Landing and take-off are hard to automate and they increase risk of catastrophic failure.

In the present work, the former theoretical solution based on drones for the take-off and landing phases of an on-ground power generation AWE System [1] is extended and validated experimentally on a benchmark of Gipsa-lab. This benchmark is composed of wing attached to a drone and linked with a tether to an on-ground winch. A motion capture system tracks the drone position and sends it to an on-ground computer that controls the winch and the drone.

The novelties of this work can be summed up in the following three points:

- A 3D space control law is proposed to steer the AWE system.
- · All the subsystems involved in the global control loops

are introduced and a discussion on their tuning parameters is presented.

• Several experiments are performed to show the efficiency of the proposed control method.



Global architecture of the benchmark.

## References:

[1] Audrey Schanen, Jonathan Dumon, Nacim Meslem, and Ahmad Hably. "Take-off and landing of an AWE system using a multicopter". In: 2020 American Control Conference (ACC). IEEE. 2020, pp. 3846–3851..