DRONE

Flight model free control architecture of a convertible UAV

Combining long endurance flights with hovering flight, the model of convertible UAV namely "tilt body[1]" can effectively respond to the new challenges of UAV mobility: land and take off in restricted areas, travel long distances, deliver and/or manipulate suspended charges.

Faced with these new challenges, UAVs have to perform continuous and smooth transitions, from hovering to forward flight, despite the windy conditions. However, no technology at present offers a control algorithm without identification of the UAV dynamics or the UAV actuator characterisation that are expensive and time consuming.

DESCRIPTION*

- Software solution allowing **model-free control** of a convertible UAV, from hovering to forward flight
- Ability to maintain **stable and smooth transition flight** at a given angle even in the presence of external disturbances
- No identification of aerodynamic coefficients neither actuator models of the drone
- **One simple control law to implement** to stabilize the entire flight envelope
- **Effective disturbance rejection, such as wind, during critical flight phases:** vertical take-off, landing and transitioning flight

[1]*Figure : Entire flight envelope of the drone "tilt body"*
Source: ENAC

TECHNICAL SPECIFICATIONS

Control architecture	- Model-Free Control (MFC) - Cascaded control architecture (Position, velocity and angles) - Real time dynamic identification and stabilization with a single control law
Robust to variations in the internal parameters	Variation of < 50% masse, inertia, chord, wingspan and actuator parameters
Control performance	In the presence of wind: - Transition angle error <3 ° - Forward speed error <2 m/s - Tracking position error during transitioning flight <1 meter

*Technology under license.

TOULOUSE TECH TRANSFER

COMPETITIVE ADVANTAGES

- Adaptable to a convertible drone class without re-tuning the algorithm
- Low computational costs and easy implementation on any autopilot system
- Time saving to adjust the algorithm coefficients without any model
- Maintain robust, stable and continuous transition flight at a given angle even in the presence of external disturbances

APPLICATIONS

- Transport/Shipping
- Cartography
- Inspection
- Surveillance/Meteorology
- Agriculture
- Military

INTELLECTUAL PROPERTY

- Patent application filed
- Software deposited APP

DEVELOPMENT STAGE

- Experimental proof of concept

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LABORATORIES

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