Attitude control of a UAV in presence of motor asymmetry

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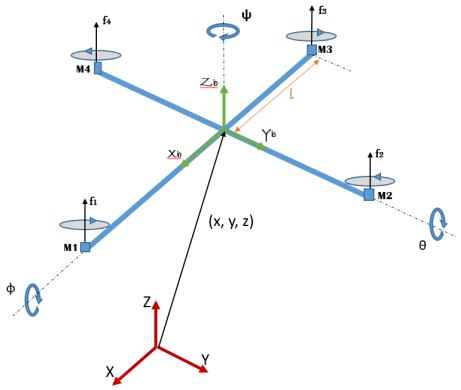

Figure 1: Quadcopter coordinate system.

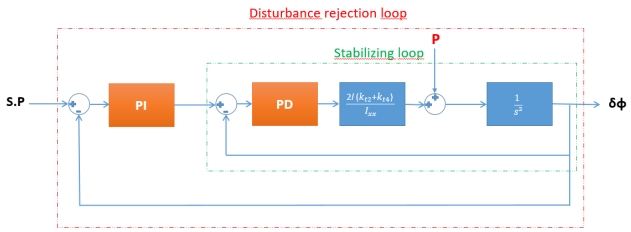

Figure 2: Cascade control.

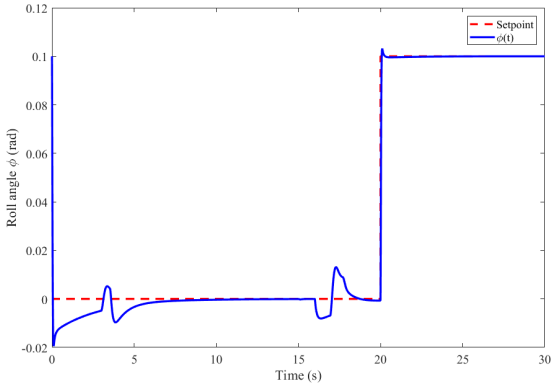

Figure 3: Roll angle : disturbances rejection (10% discrepancy and coupling effects of the Yaw angle).

1 Abstract

Quadcopter (Fig. 1), is one of the most used UAVs in both military and commercial in and out-door applications. The stabilisation and the guidance of the quadcopter have been widely study by researchers as they represent a complex problem because of the non linearity of the model and the four control inputs used to control the 6 degrees of freedom of the copter.

In this study, a cascade control strategy with PD and PI loop is presented (Fig. 2) to achieve a multirotor stabilization when the electrical actuators have discrepancies in their characteristics. The external disturbance created by the actuator asymmetry is compensated by the PI loop, while the PD loop ensures closed-loop stabilization. The robustness of the control strategy is tested in simulation (Fig. 3) as well as in real-life experiments.

References

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