Multirotor Drone Sizing and Trajectory Optimization within Modelon Impact

Clément Coïc
clement.coic@modelon.com
Modelon, Germany

Marc Budinger
marc.budinger@insa-toulouse.fr
Institut Clément Ader (ICA)
Université de Toulouse
CNRS-INSA-ISAE-Mines Albi-UPS
Toulouse, France

Scott Delbecq
scott.delbecq@isae-supaero.fr
ISAE-SUPAERO,
Université de Toulouse,
France

The design of multirotor drones often relies on optimizing its performance in terms of maximum speed requirements and hover time. This is well suited to undefined tasks. In the case of repetitive tasks, the drone trajectory can be added as a third degree of freedom. This paper focuses on the use of Modelon Impact and its dynamic optimization capabilities to reach a multirotor drone design and 1-D trajectory optimization.

The model fidelity is not necessarily the highest but constrains on the numerical aspect of the code are highlighted – e.g. acausality, smoothness, etc. The models shall be "optimization-friendly". The propeller model is detailed to emphasize the level of details sufficient for such a purpose.

In comparison to other options investigated by the authors in a separate publication, Modelon Impact based optimization showed significant advantages in terms of easiness of implementation, speed and robustness.