Chair of Intelligent Control Systems | RWTH AACHEN UNIVERSITY

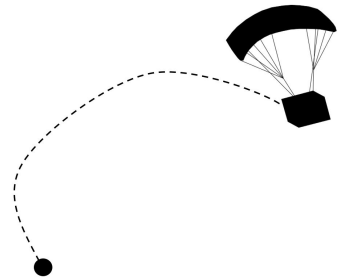
Open Master Thesis Project

Convex Relaxations for Trajectory Planning

DESCRIPTION

Optimization-based generation of trajectories is one of the most important, if not the most important, tool for planning trajectories for dynamical systems. It is, for example, a common part of Guidance Navigation and Control of aerial vehicles, and we will study it in this thesis using the example of a parafoil with payload. This is a challenging application, because on the one hand, we are dealing with an aerospace dynamical system where there are high safety requirements on the trajectory generation. On the other hand, the dynamics of these systems are nonlinear and solvers for nonlinear optimization problems do not provide guarantees on the run time or even convergence. The necessary guarantees on convergence and running time would exist in convex optimization. However, as already emphasized, most trajectory optimization problems are not convex. For this reason, work has been published in the last two decades showing that some trajectory optimization problems can be convexified by reformulations and transformations. It is such convexifications that this work is intended to deal with.

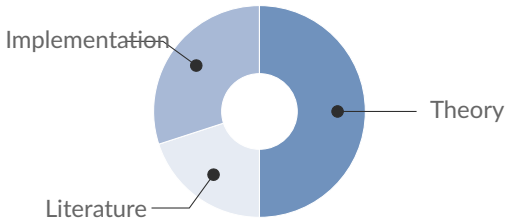
A motorized parafoil
Source: https://pixabay.com/



Generate optimized trajectories

In this thesis, you will start from an elementary trajectory optimization problem for parafoils, which is of general interest in optimal control. Most sources available in the literature on convexification of trajectory optimization problems attempt to reformulate a non-convex problem as a convex second order cone program. Here we will take an alternative approach to convexification. Applicants for this thesis will get an insight into convex optimization on a high scientific level.

PROPERTIES



AREA

- Convex Optimization
- Guidance Navigation & Control
- Function approximation

PREREQUISITES

Convex Optimization	●●●●●
Control Theory	●●●●○
Numerical Mathematics	●●●○○

BEGINNING

any time

CONTACT

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