

Old and New Methods in Flight Trajectory Optimization

Guest Lecture

Prof. Joseph Z. Ben-Asher
Department of Aerospace Engineering
Technion – Israel Institute of Technology, Haifa, Israel



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17:30 – 18:30, MW 3618

Topics:

- Optimal Control Theory
- Overview of different methods
- Comparison of direct and indirect approach
- Introduction to hybrid gradient-in-function-space
- Demonstration: optimal rocket trajectories



Abstract:

Numerical techniques for solving optimal control problems fall into two general classes: indirect methods and direct methods. In an indirect method we rely on the Minimum Principle and other necessary conditions to obtain a two-point boundary-value problem (TPBVP), which is then numerically solved for optimal trajectories (usually by multiple shooting methods). In the direct methods the continuous optimal control problem is parametrized as a finite dimensional problem. Well-developed algorithms for constrained parameter optimization then solve the resulting optimization problem numerically.

Gradient in function space is a well-known method which may be characterized as a hybrid method, merging direct and indirect methods. On the one hand necessary conditions are met, whereas on the other hand the control function is directly sought by the method of gradients.

The seminar will provide a brief overview of the various methods and then will focus on the gradient-in-function-space method. It will be shown that it can obtain very fast, albeit less accurate, optimal flight trajectories. For demonstration optimal rocket trajectories (for which the computation time is important) will be used. The method can be used either by itself or as an accelerating method for more accurate techniques.

Further information:

<http://www.fsd.mw.tum.de/ben-asher-flight-trajectory-optimization>

Benedikt Grüter | 089 / 289 16579 | benedikt.grueter@tum.de