AOE 5244
Optimization Techniques

21 August 2000

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Texts:
Practical Methods of Optimization, Gill, Murray and Wright
Applied Optimal Control, Bryson and Ho

Description:
The students will study practical methods of optimization used for shaping of optimal aerospace trajectories. While trajectory-shaping problems provide the prime motivation, many of the ideas and algorithms have more general application. Study will begin with the basic finite-dimensional optimization problems; a survey of necessary conditions and gradient-based methods. The goal is an understanding of the ideas supporting the Sequential Quadratic Programming (SQP) algorithms that form the algorithmic engines in many aerospace applications. A second phase will describe techniques used to transcribe describe a class of (infinite-dimensional) trajectory-shaping problems to finite-dimensional approximation. A variety of applications including atmospheric and space flight will be studied.

The final phase of the course will develop optimality conditions for a simple class of (infinite-dimensional) trajectory shaping problems. Optimality conditions (Pontryagin's Maximum Principle) for a more general class of problems will be described and computational implementation will be studied.

Grading:
The student will construct a diary of the simple problems used to illustrate various elemental ideas in the SQP formulation. This will include codes (FORTRAN / MATLAB) for solving a class of QP problems. The main work of the course will be recorded in several computer projects wherein the techniques are applied. Each project will require a report describing the formulation of the problem, its numerical implementation and a discussion of the results. Exams will include a mid-term and final.

Mid-Term	25 %
Final	25 %
Assignments	50 %