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this chapter considers the problem of developing an integrated optimal control problem to predict the flight performance of a uav. the problem is then formulated as a finite-time optimal control problem. the chosen optimal control strategy is a bang-bang controller. a state space model for the uav is then developed using the developed optimal control problem to compensate the flight performance of the uav. this is followed by developing the guidance system to adjust the thrust and the control surface position to achieve a stable flight for the uav. the guidance system has two main components: the robust gradient-based controller and the state space model. a decentralized state-feedback control approach was developed to generate robust reference trajectories for a spacecraft that can track a desired time-varying path while maintaining stability and constraint satisfaction. the approach is based on singular perturbation analysis to derive a model with the same qualitative behavior as the spacecraft dynamics. the trajectories are generated through a continuous-time optimal control problem. the control strategy was implemented in a spacecraft simulator, and the results were validated through testing. a singular perturbation approach was developed to derive the relationship between the spacecraft gain and the amount of control effort required to maintain stability and satisfy constraints. this model was validated through flight testing, and the results were shown to predict the performance of a spacecraft with nominal dynamics for control efforts ranging from 1 to 10 percent of the spacecraft mass.

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the mechanics of flight are well understood. the challenge has been to develop accurate models that can be used for guidance and control applications. in this paper, we present a method for developing the aerodynamic model of a vehicle. the aerodynamic coefficients are determined by using a regression model and a discrete-time controller. the method is validated by comparing the results of the regression model with the results of cfd simulations. a novel methodology for developing a self-steering scheme for high-lift vehicles is presented. the methodology is based on a general three-dimensional model of the aircraft, which is validated with the results of cfd simulations. a discrete-time flight control controller is developed for the model and is validated with the results of flight tests on the aircraft platform. a methodology for creating a controlled flight path for a small aircraft is presented. the methodology is based on a discrete-time model of the aircraft and is validated with the results of cfd simulations. this paper presents an experimental setup for generating flight paths for a small unmanned aircraft system (uas) employing a measurement-based stabilization approach. the method allows for the prediction of the entire set of aerodynamic forces that the uas is subjected to. this, in turn, makes it possible to generate control trajectories for the uas. the setup consists of a flight dynamics model that is able to predict all aerodynamic forces and moments at the flight phase level in the uav's reference frame. the control trajectories are generated by solving a constrained optimal control problem. a numerical example is used to demonstrate the viability of the approach. the results clearly show that the uas is able to follow the reference trajectory within the error margins determined by the model. 5ec8ef588b