

Preface

This book is based on part of the research work I carried out at the Measurement and Control Laboratory of the Swiss Federal Institute of Technology (ETH Zurich) over the past few years in the unmanned aerial vehicle (UAV) group founded by Professor H. P. Geering in 1986. At that time, research focused on developing navigation algorithms and robust control techniques applied to unmanned helicopters. In 2006, our colleague Markus Möckli successfully completed flight tests of an aircraft autonomously flying aerobatic maneuvers. In 2007, Marco Gerig flight tested guidance and control algorithms for aerobatic maneuvers with a small autonomous helicopter.

Concurrently, in the context of my PhD work completed in 2007, a new research activity was initiated dealing with the design of fault-tolerant flight control and guidance systems for a small unmanned aircraft. This work focused on designing techniques to detect and isolate faults among sensors and actuators and on developing methods to adaptively reconfigure the flight control laws and the vehicle trajectory. Reasonable complexity, real-time capability and modularity were the main requirements for the algorithms designed.

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