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## Foreword

The series *Advances in Industrial Control* aims to report and encourage technology transfer in control engineering. The rapid development of control technology impacts all areas of the control discipline. New theory, new controllers, actuators, sensors, new industrial processes, computer methods, new applications, new philosophies, . . . , new challenges. Much of this development work resides in industrial reports, feasibility study papers and the reports of advanced collaborative projects. The series offers an opportunity for researchers to present an extended exposition of such new work in all aspects of industrial control for wider and rapid dissemination.

Nonlinear control theory and applications are the main focus of much recent research within the control community at present. A common sentiment is that to make further performance gains it is necessary to formulate and work with the full nonlinear modelled behaviour of practical systems. Aeronautic applications are one field where nonlinear models are often available and where there is a key necessity to use high performance control systems. However, whilst many control researchers have access to fairly sophisticated nonlinear aeronautical system models, few will have access to working and experimental systems in the field. One solution to this might be to explore the control of mini-flying machines. This *Advances in Industrial Control* monograph by P. Castillo, R. Lozano and A. Dzul provides just the right sort of inspiration to start such an initiative. It is a fascinating mix of mini-flying machine history, modelling and experimental results from constructed mini flying machines.

The volume opens with a historical review featuring the inventions of Leonardo da Vinci, the success of Heinrich Focke and Gert Achgelis (1936) and the first certified commercial helicopter of Igor Sikorsky (ca1950) supported by some fascinating pictures of these technological developments. Throughout the volume, a number of aeronautical control problems are investigated theoretically and then pursued using various type of mini flying machine experimental platforms. One of these platforms is a quad-rotor rotorcraft used in Chapters 2 and 3 for which experiment videos are available on the web at [http://www.hds.utc.fr/~castillo/4r\\_fr.html](http://www.hds.utc.fr/~castillo/4r_fr.html).

This rotorcraft is also used in experiments for Chapter 4. Chapter 6 sees the use of a different experimental set-up, a vertical flying stand, which is used to investigate the altitude control of mini- helicopters.

Chapter 7 reviews and investigates the control of the tail-sitter unmanned aerial vehicle; again there is an interesting description of an experimental platform devised by Dr R.H.Stone of the University of Sydney, Australia. The chapter includes the derivation of a six-degrees of freedom model and experimental results.

To complete the set of flying technologies and configurations, autonomous airships are introduced in Chapter 8. This chapter is contributed by Dr Y.Bestaoui at the University of Evry, France and presents modelling and control system results motivated by the experimental platform, the AS200 airship devised by the Laboratoire des Systemes Complexes.

The volume concludes with a very detailed chapter on sensors, modems and micro controllers for unmanned aerial vehicles. These devices are very important for the accurate control of mini-flying machines and the detailed descriptions provide a useful introduction for the novice reader and excellent reference material for the expert.

The industrial, commercial and scientific uses of mini-flying machines are still under development and the aeronautical control engineer interested in this field will find this monograph a valuable source of new modelling and control material. In the academic world, educators are always seeking new and exciting ways of demonstrating control system techniques and technologies; some of the experimental platforms described in this volume seem tailor made for such a role. A most satisfying aspect of this new Advances in Industrial Control monograph is the way aeronautical technology, models, control systems theory and control engineering come together in the experimental results presented and as such, the volume should also appeal to the wide range of control engineering readership.

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