



IMAV 2011

International Micro Air Vehicle Conference and Flight Competition

summer edition

Proceedings

 TU Delft



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Preface

It is our pleasure to present the proceedings of the International Micro Air Vehicle conference and competitions 2011 (IMAV 2011) Summer Edition that was held in 't Harde, the Netherlands from September 12th through 15th. This event has been organized by Thales and Delft University of Technology, and aims at presenting an overview of state-of-the-art research in the emerging field of Micro Air Vehicles (MAVs). The received submissions show that the field of MAV research is very active all over the world. The topics addressed by the articles in the proceedings range from the autonomous mapping of unknown environments to the investigation of vortex rings on both a butterfly and a flapping-wing MAV. These proceedings contain the peer-reviewed scientific articles presented at the IMAV 2011 Summer Edition.

The research on MAVs is making swift progress, as shown by both the research and practical demonstrations at the IMAV 2011. The competitions, which had a record number of 23 participating teams, illustrated the technological advances being made and the challenges that are ahead. For example, it is noteworthy that the IMAV 2011 Summer Edition was the first IMAV-event to have six teams participating in the "pylon challenge" with an autonomously flying MAV. The pylon challenge requires the MAVs to fly in 8-shapes around two brightly colored orange pylons. Despite the predefined color of the pylons, this challenge is not as easy as it may seem at first sight: with the exception of one system that used a laser scanner, all other autonomous systems used a single, relatively small field-of-view camera. As a consequence, most of the systems based their flight on monocular visual cues. In particular this implied that the systems had to deal with the presence of distractors, and well-known problems of varying light conditions. The difficulty of the challenge is reflected in the final ranking. Despite a considerable bonus for autonomous flight, the indoor pylon challenge is led by a very well-designed tiny MAV controlled via video goggles, followed by the autonomous MAV with a laser-scanner, and on the third place a team that used monocular vision.

The outdoor mission challenge, in which the participating teams had to monitor a simulated "drugs deal", was also remarkable for two reasons. First, it was the first time at an IMAV that teams used multiple MAVs at the same time. While multi-MAV research has received considerable attention in the past years, the practical demonstration of such systems in a competition was novel. This year, teams with multiple MAVs typically had one ground station per MAV. Exceptions include the team behind the open source Paparazzi system, in which multiple systems were controlled from one ground station. The use of multiple MAVs is a promising step towards groups of MAVs that exploit self-organization to accomplish tasks given by the operator. Such a self-organizing multi-MAV system is typically referred to as a 'swarm'. A second remarkable observation is that there were at least two MAVs this year that can both hover and transition to forward fixed-wing flight. Such systems form a promise for missions in which the MAV will have to perform a detailed observation mission at a long distance from the take-off location. The design of these systems requires a tight integration of knowledge and expertise in the areas of structures, aerodynamics and control.

We would like to thank the program committee for their efforts in reviewing all the IMAV 2011 articles:

H. Bijl	Q.P. Chu	C. De Wagter
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B. van Oudheusden	E.O. Postma	R. Ruijsink
W. Shyy	S. Shkarayev	A. Visser
P. Vörsmann	S. Watkins	V. Trianni

Finally, we want to express our hope that the open access to all the articles in these proceedings will contribute to the advances in this young and exciting research area.

On behalf of the IMAV 2011 organization committee,

Guido de Croon and Matthijs Amelink,

program chairs of the IMAV 2011.

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