



SEMINAR SERIES: THE MECHANICAL AND MATERIALS ENGINEER IN SOCIETY

Department of Mechanical Engineering & Materials Sciences and Engineering, Cyprus University of Technology



Planning and Operational Algorithms for Autonomous Helicopters

Speaker: **Professor Omri Rand**

Faculty of Aerospace Engineering, Technion - Israel Institute of Technology

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Presentation Abstract

The work is focused on targeted flight mission of a Rotary-Wing Unmanned Aerial Vehicle (RW UAV) in indoor environments. Targeted flight is characterized by a known initial position and a definite final goal, while the map of the environment is a priori unknown. In addition, in indoor environments, the operation methodology cannot rely on GPS due to poor reception, or no reception of the signal. However, compared with fixed-wing aerial vehicles that must maintain a minimum speed, RW UAVs are more adapted to indoor tasks due to their hovering ability and agility. In this work, a comprehensive modular system for targeted flight of autonomous helicopters was developed and implemented in a detailed simulation.

The proposed system consists of several modules that are integrated to allow RW UAV autonomous flight. These components include: (i) a model-free, virtual scan based method for simultaneous position estimation and map construction; (ii) methods for planning a flight path towards a target while taking into account obstacles detected so far during the mission and the maneuverability limitations of the helicopter; (iii) a methodology for calculating the required flight commands for leading the vehicle along the planned path. The overall methodology is based on using a lightweight laser rangefinder as a sole onboard sensor. The simulation results illustrate the qualities of each component and the overall effectiveness of the approach.

Speaker

Prof. Omri Rand earned his Ph.D. degree at the Technion in 1986. After a postdoctoral position at the University of Maryland Rotorcraft Center, he joined in 1987 the Faculty of Aerospace Engineering at the Technion. During 1993-4 was a Resident Research Associate, at the Advanced Systems Research & Analysis Office of the U.S. Army at NASA Ames Research Center. Since August 2000 Dr. Rand represents Israel as a Member of the General Assembly and Program Committee of The International Council of the Aeronautical Sciences (ICAS). Since 2003 he is a Professor with the Faculty of Aerospace Engineering, holding the Shirley and Burt Harris Academic Chair since 2005.

Between 2006 and 2010 Dr. Rand served as a Dean of the Faculty of Aerospace Engineering and as a Head of the Aerospace Research Center at the Technion. Dr. Rand was one of the initiators of the Technion Autonomous Systems Program (TASP) and since 2010 he is a Head of this Program. During 2010-2011, he served as a Visiting Professor at the Rotorcraft Center, University of Maryland, USA. Dr. Rand's research interests are in the rotorcraft and rotary-wing theory, composite structures, autonomous systems and rotorcraft autonomous operation.

Information

Dr. Soteris Kalogirou, **Telephone:** 2500-2621, **Email:** Soteris.kalogirou@cut.ac.cy