

Presents the Spring 2014 EECS Seminar Series



**Dr. Mario Innocenti**

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**“Guidance and Control Aspects of Unmanned Systems”**

Tuesday, January 21, 2014 • 2:00 p.m. • HEC 101

The seminar presents some issues relative to guidance and control of UAVs in the general context of control management of unmanned, cooperative, autonomous agents.

The first topic is the so-called descriptor function framework. The descriptor function framework has shown potential as a tool for the synthesis of control structures of swarms of heterogeneous agents. The seminar presents a novel extension where the descriptor functions are modified so that some special sensor characteristics are included in a coverage scenario. In addition, obstacle avoidance is introduced in the algorithm, in order to cope with a scenario that has obstacles, as well as inter-agent collisions.

The second topic deals with guidance law improvement due to the addition of target visibility. The presentation describes the synthesis of a new guidance law, which aims at keeping high visibility of a target during the engagement. The scenario under consideration is a urban environment with a known obstacle distribution. A probabilistic target visibility map is defined, and a guidance law is developed, which moves the vehicle in the direction of increasing visibility while chasing the target. The approach is verified with several simulation examples with moving targets.

**BIOGRAPHY**

Mario Innocenti was born in Florence, Italy in 1951. He received the "Laurea" Degree in Aeronautical Engineering from the University of Pisa in 1977, and the Ph.D. degree from the School of Aeronautics and Astronautics, Purdue University, Indiana, in 1982. From 1982 until 1992 he was on the Faculty of Auburn University, Alabama, Department of Aerospace Engineering, as an Assistant Professor and later tenured Associate Professor. From 1992 to 1999 he was Associate Professor of Automatic Control in the Department of Electrical Systems and Automation, University of Pisa. He has been Full Professor since the year 2000. Since 2012 is a member of the Department of Information Engineering at the University of Pisa. During the academic year 2008-2009 he was a Senior Research Fellow of the American National Academy of Sciences performing research for the US Air Force Research Laboratory, Munitions Directorate, Eglin AFB, Florida and a visiting professor at the University of Florida REEF. He is currently an Associate Fellow, American Institute of Aeronautics and Astronautics, and a member of the Institute of Electrical and Electronic Engineers. He graduated 19 PhD students and more than 70 MS students. His main research interests are in the areas of man-machine interface, human operator modeling, pilot-in-the-loop analysis and synthesis; control theory, adaptive control, variable structure control, path planning; guidance and navigation systems; vision systems, optimization, neural networks, fuzzy systems; handling qualities for advanced aerospace vehicles; autonomous systems, swarm control, cyber-complex physical systems.