IEEE CIS Seminar

Professor Daniel Delahaye

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Venue: Lecture Theater South 05 (B30-LT05), UNSW Canberra

Time: 10:00 AM

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MULTIDISCIPLINARY DESIGN OPTIMIZATION

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Mathematical Models for Aircraft Trajectory Design

Abstract: Air traffic management ensures the safety of flight by optimizing flows and maintaining separation between aircraft. After giving some definitions, some typical feature of aircraft trajectories are presented. Trajectories are objects belonging to spaces with infinite dimensions. The naive way to address such problem is to sample trajectories at some regular points and to create a big vector of positions (and or speeds). In order to manipulate such objects with algorithms, one must reduce the dimension of the search space by using more efficient representations. Some dimension reduction tricks are then presented for which advantages and drawbacks are presented. Then, front propagation approaches are introduced with a focus on Fast Marching Algorithms and Ordered upwind algorithms. Applications of such tools to the following problems are then presented :

- Large scale trajectory planning (continental and oceanic)
- Wind optimal trajectory design
- Tactical trajectory planning

Daniel Delahaye is a full Professor at D´epartement de Math´ematiques et d'Informatique, Ecole Nationale de l'Aviation Civile (ENAC) Toulouse, France. Prof. Delahaye is doing research on Air Traffic Management since 1992. He obtained his engineer degree from the French Civil Aviation ENAC School and did a Master of Science in signal processing from the national polytechnic institute of Toulouse in 1991. He obtained his PH.D in automatic control from the aeronautic and space national school in 1995 and did a Post-Doc in the Department of Aeronautics and Astronautics at MIT in 1996 with Pr A.Odoni. He got his tenure in applied mathematic from the University Paul Sabatier in 2012.

Prof. Delahaye is the head of the optimization group of the Applied Mathematic Laboratory of the ENAC and he is conducting research on optimization for airspace design and large scale traffic assignment problem. He developed many Evolutionary Algorithms for ATM applications (airspace sectoring, routes and slots allocation, TMA optimization, etc ...). Since 2004, he focus his research on infinite dimension space optimization using Evolutionary Computation and basis reduction tricks (wavelet, spines, PCA, etc...). He applied such approaches on trajectory design at the strategic, pre-tactical and tactical levels.