



Alma Mater Studiorum Università di Bologna
School of Engineering and Architecture - Forlì

Monday, May 8th from 1pm to 3pm - Lecture Hall

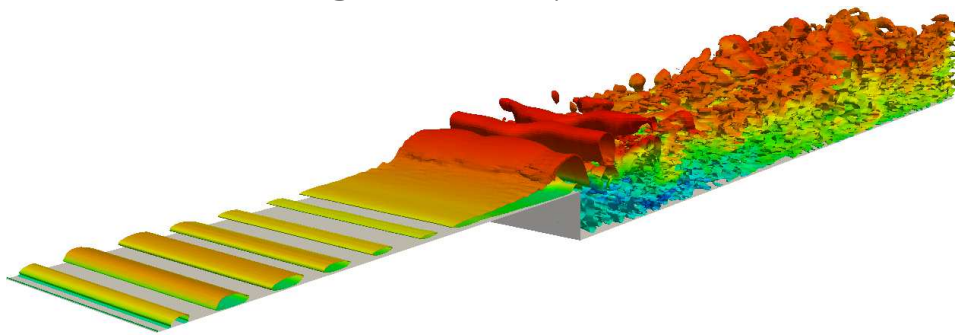
Computational fluid dynamics for transport applications

Dr. Humberto Medina

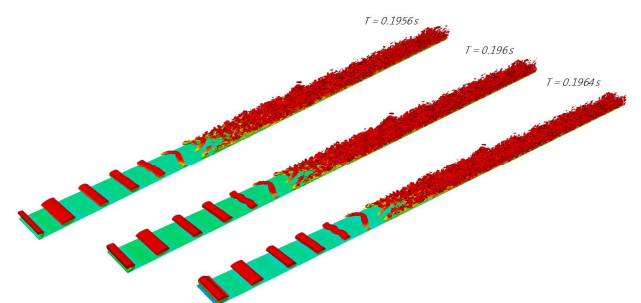
Senior Lecturer in Aerospace Engineering
Faculty of Engineering, Environment and Computing
Centre for Mobility and Transport
Coventry University



Abstract: The mechanics and dynamics of fluids can play an important role in many engineering systems found in transport vehicles. For instance, the aerodynamics of an aircraft wing directly relates to the overall performance of aircraft (control, maneuverability, safety, fuel consumption, etc.). Likewise, the external aerodynamics of road vehicles also drive their performance. Additionally, the performance of many internal systems can be dominated by their fluid



dynamics e.g. heat exchangers, fuel lines, cooling systems, ventilation systems, exhaust systems, just to name a few. Therefore, it is increasingly important to be able to predict fluid and heat flow to estimate the performance of transport systems during their design and achieve optimal system designs/configurations. Computational fluid dynamics (CFD) has become a standard tool used in the design of engineering systems. However, there are many challenges in the application of CFD for practical flows. This seminar will provide, firstly, a brief review of the most common modelling approaches used in CFD and, secondly, illustrations of current challenges in turbulence and transition modelling (RANS and LES) which are being addressed at Coventry University's Centre for Mobility and Transport for a range of Aerospace and Automotive applications.





Alma Mater Studiorum Università di Bologna
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Tuesday, May 9th from 10am to 12am - Lecture Hall

Challenges in the control of aerospace vehicles under incomplete actuation or sensing

Dr. Nadjim Horri

Senior Lecturer in Aerospace Engineering
Faculty of Engineering, Environment and Computing
Course Director (MSc Aerospace Engineering)



Abstract: This seminar will consist of two parts focused on two of the current challenges in the control of aerospace vehicles: Underactuation and incomplete measurement feedback. The underactuation challenge will be focused on a satellite attitude control problem in the presence of actuator failures. Results from previous research on 3-axis

attitude control using two reaction wheels will be discussed together with more recent results from the collaboration between Bologna University and Coventry University. Open problems in this research area will also be discussed. The second control challenge to be discussed will an application to coordinated navigation and control of UAV formations with distributed and incomplete sensor measurements, which is currently being undertaken at Coventry University as part of another collaborative PhD. The challenge in this case is to optimise guidance and control of all UAVs in the formation in the presence high uncertainty or indeed when certain types of sensors are not available. The navigation methods to deal with degraded measurements and partial state feedback will be discussed.

