THE WILLIAM E. BOEING DEPARTMENT OF

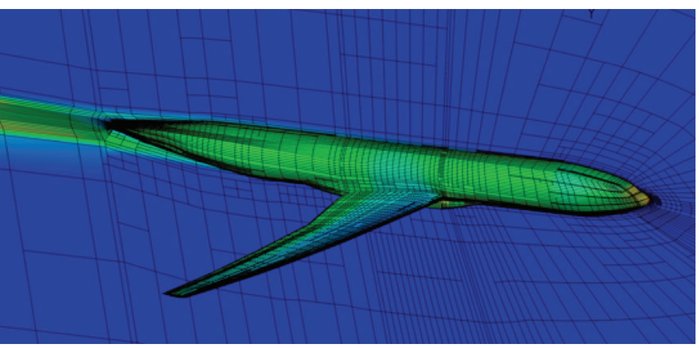
AERONAUTICS & ASTRONAUTICS

... welcomes ...

MARCO CEZE

AMAZON PRIME AIR

Algorithms in hp-adaptive discontinuous Galerkin for computational aerodynamics

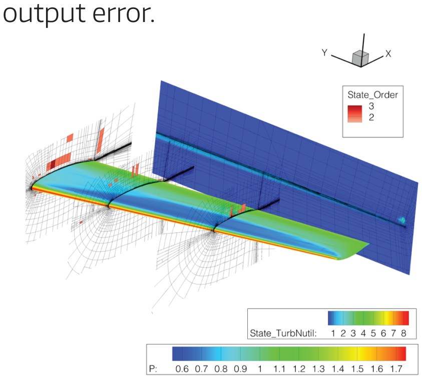


Quantitatively accurate results from realistic Computational Fluid Dynamics (CFD) simulations are often accompanied by high computational expense. Higher-order methods are good candidates for providing accurate solutions at reduced cost. However, these methods are still not robust for industrial applications. In this talk, I will present some of my research work to address this problem.

First, I present a solution advancement method that improves robustness of discontinuous Galerkin (DG) discretizations in the iteration to the solution. The method includes physical realizability constraints in the solution path and provides the solver with the ability of circumventing non-physical regions of the solution space that can occur during the numerical transient. The method relies only on implicit time integration and it can be applied to other discretization methods.

Then, I demonstrate an hp-adaptation method that directly targets output error by locally choosing between subdividing an element or raising the approximation order. The decision is made by finding the refinement option that maximizes a merit function that involves output sensitivity and computational cost. Results in two and three dimensions show savings of up to an order of magnitude in terms of number of degrees of freedom and at least a factor of two in terms of computational time.

Lastly, I describe the development of a high-order DG, matrix-free primal and adjoint solvers for the Navier-Stokes equations. The matrix-free framework allows for the use of very high orders of approximation accuracy (e.g. 8th, 16th) at an affordable computational cost. The final goal with high-order space-time adjoints is to adaptively improve the solution-space based on estimates of output error.



WILLIAM E. BOEING
DEPARTMENT OF AERONAUTICS & ASTRONAUTICS
UNIVERSITY *of* WASHINGTON

Monday, April 17, 2017 @ 4:00pm
Johnson Hall. Rm 102 | UW Seattle

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THE WILLIAM E. BOEING DEPARTMENT OF
AERONAUTICS & ASTRONAUTICS

... Distinguished Guest Speaker ...

MARCO CEZE
AMAZON PRIME AIR

Research Scientist

Dr. Marco Ceze is a Research Scientist at Amazon Prime Air flight controls team. Prior to Amazon, he was appointed a NASA Postdoctoral Fellowship at Ames Research Center where he worked on the Revolutionary Computational Aerosciences project under the supervision of Dr. Scott Murman at NASA's Supercomputing Division. Marco obtained his PhD. in Aerospace Engineering at the University of Michigan under the supervision of Prof. Krzysztof Fidkowski.

The William E. Boeing Chair's Distinguished Seminar Series brings scholars of national and international reputation who have made an impact in the field of aerospace engineering and beyond. This seminar series will cover a diversity of topics of current interest to those in academia, industry and the general public. It is our hope that these monthly seminars will encourage an exchange of ideas and bring aerospace engineering and science to the forefront.

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