MAE Seminar SERIES

THURSDAY,
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3:30 PM
114 HOCHSTETTER

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LEARNING FROM NATURE: NEW BODY-INVOLVED PERFORMANCE ENHANCEMENT MECHANISM IN BIO-INSPIRED PROPULSION

ABSTRACT

In this talk, a combined experimental and computational approach will be introduced for studying unsteady flow physics of freely flying and swimming animals. High-speed photogrammetry system and an accurate 3D data reconstruction technique are used together to measure the kinematics of animal body and appendages with extraordinary details. A model reduction tool is developed to extract the dominant kinematical components for analysis and computational modeling. A Cartesian-grid-based immersed boundary solver is then used to simulate corresponding unsteady flows in all their complexity. A block-structured Adaptive Mesh Refinement (AMR) technique is used to enhance the computational ability and increase the computational efficiency for the application of high-Reynolds number flow and complex geometries. Analysis of vortex dynamics due to body-appendage interactions and associated aero/hydro-performance of insect flight and fish swimming will be discussed. The discovery of the new body-involved performance enhancement will bring new insights on the design of highly efficient bio-inspired robotic systems.

BIO SKETCH

Dr. Haibo Dong is currently an associate professor of Mechanical and Aerospace Engineering at the University of Virginia. Prior to his position at UVA, Dr. Dong held positions at Wright State University and the George Washington University. He obtained his Ph.D. degree in Aerospace Engineering from UCLA. His current research involves computational fluid dynamics, fluid-structure interactions, low speed aero/hydrodynamics, and bio-inspired fluid dynamics. His work is supported by NSF, AFOSR and ONR MURI. He serves as the editor of International Journal of Micro Air Vehicles (IJMAV) and an associate editor of AIAA Journal. He is the recipient of a number of national and society awards including the NSF CAREER award (2011), the AIAA Foundation Abe Zarem Educator award (2016), the APS/DFD Gallery of Fluid Motion best video award (2015) and others.

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