6th International Conference and Exhibition on
Mechanical & Aerospace Engineering
November 07-08, 2018 | Atlanta, USA

Danesh Tafti

Virginia Tech, USA

Investigation of bat flight aerodynamics

Bats have highly dexterous and articulated membrane wings which can be manipulated by their hand digits during flight. This allows them to exert fine control over the shape and mechanical properties of the wing by flexing their finger bones and changing the wing membrane stiffness and shape. Many bat species are able to navigate and hunt in dense vegetation and can capture prey on the wing, often within very short time intervals and while operating in confined spaces. Challenges in studying bat flight include experimental data acquisition of wing kinematics and simulations of a highly deformable surface in space and time. An optical motion capture system of 21 cameras was used to mitigate wing self-occlusion while tracking 108 discrete marker points on the bat's wings (Pratt's roundleaf bat, *Hipposideros pratti)* over the course of a meter-long flight. The surface of each wing is reconstructed in 3D space and time by the use of Proper Orthogonal Decomposition (POD) to filter noisy low energy modes of motion. The resulting kinematic model is interfaced with an unsteady incompressible flow solver using the Immersed Boundary Method (IBM) and Large Eddy Simulation (LES) to characterize force production. To aid fundamental understanding, the complex wing kinematics is deconstructed into canonical descriptors of flapping flight and related to aerodynamic force production.

Biography

Danesh Tafti is the William S Cross Professor of Engineering at Virginia Tech. He obtained his PhD from the Penn State University and after post-doctoral studies at the University of Illinois at Urbana Champaign (UIUC) spent 10 years at the National Center for Supercomputing Applications at UIUC before joining Virginia Tech in 2002. At Virginia Tech he directs the High Performance Computational Fluid Thermal Science and Engineering Lab. He has over 220 peer-reviewed journal and conference publications. He serves as the Associate Editor of the ASME J Heat Transfer and is a member of the Editorial Board of several journals.

dtafti@exchange.vt.edu

Notes: