

Ornithopter Vector Control by Micro-Motion Mechanism

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Abstract

Flapping wings generate propulsion, lift and control forces simultaneously, acting as a periodic vector generator. Birds, insects, have achieved enviable flight efficiency and maneuverability through this flap-generated vector, which is completely different from traditional aircraft that relies on control surfaces deflection. In this talk, typical mechanisms and control methods of artificial flapping-wing aircraft will be analyzed, followed by our recent research progress in the aerodynamic design, flapping mechanism, servo control, etc. of long-endurance large-scale flapping-wing aircraft and small sparrow flapping-wing aircraft, as well as relative applications in military and civilian fields.



Zongxia Jiao, Academician of Chinese Academy of Engineering. Obtained his doctoral degree from Zhejiang University in 1991 and served as a visiting professor at Hamburg University of Technology in Germany in 2000. He is currently a professor at the School of Automation Science and Electrical Engineering, Beihang University, and holds the position of Chief Professor of Mechatronic Engineering. He is also the Director of the Beihang Innovation Center for Aviation airborne system and the Dean of Beihang Ningbo Innovation Research Institute. He is the Executive Director and Director of the Fluid Control Branch of the Chinese Society of Mechanical Engineering, as well as the Executive Director and Honorary Director of the Electromechanical Branch of the Chinese Society of Aeronautics and Astronautics. He has been engaged in research on aircraft electromechanical systems and flight control systems, and has achieved multiple original results in the areas of electro-hydraulic control theory and core components/devices. He has made great progresses in field of high-reliability hydraulic systems, servo actuators, high-safety aircraft brakes. He has been awarded 2 second-class National Technical Invention Awards, 1 second-class National Science and Technology Progress Award, and 3 first-class Ministerial and Provincial-Level Science and Technology Awards (all ranked first). He has been granted more than 80 invention patents, published over 400 papers, and has been cited over 3000 times in SCI. He has been selected as a highly cited scholar by Clarivate Analytics for four consecutive years. He was awarded the Ho Leung Ho Lee Foundation Science and Technology Progress Award in 2016 and the National Innovation Medal in 2020.