

Smart Structures for Bio-Inspired Morphing

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ABSTRACT

Several unique uses of piezoceramic composites and shape memory alloys to achieve unique airfoil shapes are presented. The aerodynamics and control that birds using in gliding result in efficiencies in performance not yet realized by fixed wing aircraft. With the advent of smart, multifunctional composites, it is now possible to implement motions inspired by avian gliding in small, unmanned air vehicles (UAV). Initially motivated by the casual observation of flight control motions made by birds, morphing research has proceeded with only limited understanding of how and why birds use their aerodynamic surfaces for flight control. In addition, previous research has not made use of the full spectrum of active materials. A summary of relevant previous results from two fields: avian biology and morphing aircraft, is presented followed by current results on morphing trailing edge research and rudderless yaw control.