



Avian Inspired Morphing for UAVs

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Nature through careful observation and tests of gliding avian species have resulted in new thoughts on how to design morphing uninhabited air vehicles (UAV) and what morphing motions might make for better performance. An understanding of avian flight stability suggests a new approach to morphing aircraft design. Of interest is how to create these motions using smart materials to gain avian abilities. Coupled with new learning algorithms, methods for designing smart autonomous morphing airfoils for use in small UAVs are presented. Hardware based reinforcement learning (RL) techniques are used to teach a smart morphing wing to respond to gusts, following the inspiration of gliding gulls who respond immediately and autonomously to unknown changes in flow to maintain stability and control in unpredictable environments. We strive to translate this knowledge to flight control of UAVs. Last, a way forward is suggested to create new class of structures: autonomous multifunctional structures. An outline of what is needed in terms of future research is presented.