Conceptual design of flapping wing using shape memory alloy actuator for micro unmanned aerial vehicle

ABSTRACT

Micro Air Vehicle (MAV) has the capability to fly autonomously in complex environments which enables human to conduct surveillance in areas which are deemed too dangerous or in confined spaces that does not allow human entry. Research and development of MAVs aim to reduce their size further, thus novel techniques need to be explored in order to achieve this objective while still maintaining the MAVs' current performance. In this paper, a conceptual design of an MAV with a main drive system using shape memory alloy (SMA) actuator to provide the flapping motion is proposed. SMA is considered superior to other smart materials due to its efficiency and large energy storage capacity. By incorporating SMA in the flapping wing MAV, it will provide users the flexibility to add more payloads by reducing bulky cables or reduce operating cost by using less fuel. However, there are some drawbacks in using SMAs such as nonlinear response of the strain to input current and hysteresis characteristic as a result of which their control is inaccurate and complicated.

Keyword: Control; Flapping wing; MAV; SMA