Adaptive control for bioinspired micro air vehicle

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ABSTRACT

The amazing world of small unmanned aircrafts (drones) supposes a field of aerospace research really exciting for universities and centers of excellence, and practically without technological limitations. Perhaps the reality is that the use of these vehicles is less glamorous than the media suggest. And, on the other hand, its operations are still limited by pending aspects of aeronautical regulation. But in the field of aerospace research the previous arguments are weak compared to the potential of new aerospace designs and developments.

The authors have been carrying out several research projects in the field of micro air vehicles. In addition, last researches have been outstanding in the analysis of bioinspired micro air vehicles (MAVs). Experimental and theoretical studies have been developed and aircraft prototypes based on morphing wings and wing-grids have been designed. For the design of this type of non-conventional geometry it is essential to select the appropriate composites that will meet the initial design specifications. And when the geometry and materials are finally defined, the next essential phase is focused in the design of the wing geometry control system. This system will allow to fulfilling the morphing and shaping requirements. This paper shows the methodology carried out to design the flight control system applied to these vehicles. The initial basis begins from our development in traditional flight control for guidance, navigation and control systems in conventional geometry airplanes.

Flight control function is to fulfil roll and pitch moments with optimal efficiency in drag and lift. The effect of the aircraft dynamic can be modelled as aircraft dynamic system mathematically represented by a space state model including such as states related to morphing actuator. Subsequently, the foundations of adaptive and optimal control will be shown and applied to these vehicles. Finally, the results of flight control over micro air vehicles’ prototypes will be analyzed in the current design phase. Figure depicted the general control design of morphing wing.

REFERENCES


