

Kinematic and aerodynamic modelling of bi- and quad-wing flapping wing micro-air-vehicle

ABSTRACT

A generic approach to model the kinematics and aerodynamics of flapping wing ornithopter has been followed, to model and analyze a flapping bi- and quad-wing ornithopter and to mimic flapping wing biosystems to produce lift and thrust for hovering and forward flight. Considerations are given to the motion of a rigid and thin bi-wing and quad-wing ornithopter in flapping and pitching motion with phase lag. Basic Unsteady Aerodynamic Approach incorporating salient features of viscous effect and leading-edge suction are utilized. Parametric study is carried out to reveal the aerodynamic characteristics of flapping bi- and quad-wing ornithopter flight characteristics and for comparative analysis with various selected simple models in the literature, in an effort to develop a flapping bi- and quad-wing ornithopter models. In spite of their simplicity, results obtained for both models are able to reveal the mechanism of lift and thrust, and compare well with other work.

Keyword: Bi-wing ornithopter; Flapping wing aerodynamics; Flapping wing ornithopter; Micro air vehicle; Quad-wing ornithopter