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Nature-Inspired Airfoils for Environmental Noise Reduction
SUYEONG HAN, Cheong Shim International Academy, RICHARD KYUNG, Seoul National University — Recently, study on the insects' flapping flight became one of the challenging research subjects in the field of environmental engineering and aeronautics because of its potential applicability to intelligent micro-robots capable of autonomous flight and the next generation aerial-vehicles. In order to uncover its curious unsteady characteristics, many researchers have conducted experimental and computational studies on the unsteady aerodynamics of insects' flapping flight. In the present work, the unsteady flow physics around insect wings are conducted by utilizing numerical and computational simulation. The e-AIRS [6] (e-Science Aerospace Integrated Research System) gives a balanced service between computational and experimental aerodynamics, along with integrated research process of these two research activities. This paper presents the wing motions and their aerodynamics with a two dimensional approach to reduce environmental noise during the airflight. Also this paper shows an optimal phase angle, where the thrust is maximized at the position of minimized drag, which occurs when noise is minimized. Aside from the two-dimensional approach, stroke angles and phase angles of the airfoils are set as parameters, to determine which motion yields the best aerodynamic characteristics.

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