 Proceedings of ICCES'08, pp.795-795

Line Search Partitioned Approach for Fluid-structure Interaction Analysis of Flapping Wing

T. Yamada[1] and S. Yoshimura[1]

Flight dynamics of flapping insects is still an open area of research, though it is well known that they can provide superior flight abilities such as hovering motion. The numerical analysis of flapping wing requires fluid-structure interaction (FSI) analysis to evaluate the effect of deformable wing on flight ability. Such FSI analysis is quite challenging because not only the tight coupling approach to predict flight ability accurately, but also the robust mesh control to trace the large motion of the wing with elastic deformation are required. A new iterative partitioned coupling algorithm for the FSI problems is proposed in this paper. In the proposed approach, non-linearity of the FSI problems is mainly treated on the interface using the line search method, which minimizes non-equilibrated displacements on the interface in each fixed point iteration. This approach is introduced to improve the robustness and efficiency of computation. A two-dimensional FSI analysis of a flapping wing shows that elastic deformation of the wing results in passive feathering motion and generates lift force effectively.

[1]The University of Tokyo, Bunkyo, Tokyo, JAPAN