

# **Three-dimensional Vortical Structures around Gliding and Flapping Insects**

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## Abstract

Insects fly using both gliding and flapping motions. The butterfly is known to be one of the versatile flyers using gliding and flapping efficiently. On the other hand, hovering using flapping motion is amazing to watch. In this presentation, we consider two insects: a gliding swallowtail butterfly and a flapping fruit fly. We simulate flows around these insects using our immersed boundary methods (Kim, Kim and Choi, JCP, 2001; Kim and Choi, JCP, 2006). Three-dimensional vortical structures around these insects and the roles of these vortices in the force generation will be discussed.