

A Study on Unsteady Vortical Structures and Substantial Drag Reduction

Project Representative

Keiji Sumitani

Vehicle Engineering Group, TOYOTA MOTOR CORPORATION

Authors

Yusuke Sugita ^{*1}, Keiji Sumitani ^{*1}, Tatuya Kubota ^{*1}, Chisachi Kato ^{*2}, Yoshinobu Yamade ^{*2}, Hitoshi Uehara ^{*3}, Yuichi Hirokawa ^{*3}

* 1 Vehicle Engineering Group, TOYOTA MOTOR CORPORATION

* 2 Institute of Industrial Science, the University of Tokyo

* 3 Super Computer System Planning and Operations Department, Japan Agency for Marine-Earth Science and Technology

Abstract

The aerodynamic drag has the unsteady fluctuation in time line due to the various size vortexes that are appearing, growing, separating and vanishing. This paper presents the results about numerical simulation of unsteady flow around a vehicle using Large Eddy Simulation (LES), to analysis the flow condition at a lower situation among the unsteady fluctuation drag. The numerical simulation of tetrahedral mesh and hexahedral mesh were calculated to examine the adaptability of the calculation code and mesh resolution and to understand the flow field around the vehicle. It was clarified the hexahedral mesh and 38 million mesh resolution are necessary from the almost good agreement between the numerical and experimental result.

Keywords : Vehicle, Aerodynamic, Unsteady Flow, LES, Drag