Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Flow Characteristics and Noise Performance on Side Mirror Models by 4D PTV and AI-Based Data Assimilation[1] KYUNG CHUN KIM, DONG KIM, MIRAE KIM, School of Mechanical Engineering, Pusan National University, EDOARDO SAREDI, FULVIO SCARANO, Department of Aerospace Engineering, Delft University of Technology — A time-resolved three-dimensional Lagrangian Particle Tracking Velocimetry (4D PTV) has used to measure flow characteristics of three side mirror models adopting the Shake-the-box algorithm with four high-speed cameras on a robotic arm. Helium filled soap bubbles are used as tracers in the wind tunnel experiment to characterize flow structures around automobile side mirror models. Full volumetric velocity fields and evolution of vortex structures are obtained and analyzed. Instantaneous pressure fields are deduced by solving a Poisson equation based on the 4D PTV data. To increase spatial and temporal resolutions of velocity field, artificial intelligence (AI)-based data assimilation method has applied. ANFIS (Adaptive Neural Fuzzy Inference System) based machine learning algorithm works well to find hidden 3D vortical structures behind the automobile side mirror model. Using the high resolution ANFIS model, power spectrum of velocity fluctuations and sound level spectrum of pressure fluctuations are successfully obtained to assess flow and noise characteristics of side mirror models.

[1]This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korean government (MSIT) (No. 2011-0030013, No. 2018R1A2B2007117).

Kyung Chun Kim
School of Mechanical Engineering, Pusan National University

Date submitted: 30 Jul 2019 Electronic form version 1.4