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Analysis of Vortical Structure in Terms of Local Flow Topology in an Isotropic Homogeneous Turbulence DAIKI AOYAMA, Graduate School of Engineering, Aichi Institute of Technology, KATSUYUKI NAKAYAMA, Department of Mechanical Engineering, Aichi Institute of Technology — The present study investigates vortical structures in an isotropic homogeneous decaying turbulence in the Direct Numerical Simulation. We apply the swirl plane and physical quantities, the swirlity, sourcity and vortical flow symmetry quantity, associated with the invariant local topology (Nakayama, FDR 2014). The swirlity and sourcity specify the unidirectionality and intensity of the azimuthal flow and radial flow, respectively in an arbitrary plane, and the symmetry quantity specifies the direction and the degree of skewness of the vortical flow. The vortical structure is statistically analysed in terms of the distribution of azimuthal velocity and radial velocity which are extracted from the flow in the swirl plane around points where the swirlity has maximum value after respecting the direction of skewness of the vortical flow in that plane because vortical flow generally swirls with respective skewness. The swirling radius is estimated from the distribution of both azimuthal velocity and swirlity. The distributions of azimuthal velocity and radial velocity that are non-axisymmetrically and non-linearly, respectively, indicates that none of vortex models is similar to this vortical structure.

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