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Computing Normal Shock-Isotropic Turbulence Interaction With Tetrahedral Meshes and the Space-Time CESE Method[1] BALAJI SHANKAR VENKATACHARI, National Institute of Aerospace, CHAU-LYAN CHANG, NASA Langley Research Center — The focus of this study is scale-resolving simulations of the canonical normal shock- isotropic turbulence interaction using unstructured tetrahedral meshes and the space-time conservation element solution element (CESE) method. Despite decades of development in unstructured mesh methods and its potential benefits of ease of mesh generation around complex geometries and mesh adaptation, direct numerical or large-eddy simulations of turbulent flows are predominantly carried out using structured hexahedral meshes. This is due to the lack of consistent multi-dimensional numerical formulations in conventional schemes for unstructured meshes that can resolve multiple physical scales and flow discontinuities simultaneously. The CESE method — due to its Riemann-solver-free shock capturing capabilities, non-dissipative baseline schemes, and flux conservation in time as well as space — has the potential to accurately simulate turbulent flows using tetrahedral meshes. As part of the study, various regimes of the shock-turbulence interaction (wrinkled and broken shock regimes) will be investigated along with a study on how adaptive refinement of tetrahedral meshes benefits this problem.

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