압축성 유체 內 탄성 외팔보의 유체-구조 상호작용

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Fluid-Structure Interactions of an Elastic Cantilever in Compressible Fluids

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Key Words: Fluid-Structure Interactions(유체-구조 상호작용), Cantilever(외팔보), Aero-acoustics (공력소음), Instability(불안정성)

Abstract : Fluid-structure interactions (FSI) of an elastic cantilever are numerically predicted to analyze the characteristics of the cantilever and induced sound field under various cantilever properties. A moving-grid based system and 6^{th}-order compact scheme are adopted, which is based on non-conservative form of Navier-Stokes equation. First, a flow field is simulated with an immovable cantilever. Through this simulation, the basic information of a flow instability is obtained. Then forced-vibration simulation is performed, to understand the behavior of the elastic cantilever. After these simulations, FSI results are shown, which is treating both the flow field and the elastic cantilever simultaneously. These results report that the movement of beam reduces sound considerably.

고속 이산화탄소 유동장의 속도 및 밀도 동시 측정에 관한 연구

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Study on Simultaneous Measurement of Velocity and Density Distributions for High-Speed CO_2 Flow

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Key Words: Visualization(가시화), Tomography(토모그래피), PIV(입자추적속도계), Initial flow(초기유동), CO_2(이산화탄소)

Abstract : A high-speed and initial CO_2 jet flow has been analyzed by a developed three-dimensional digital speckle tomography and a particle image velocimetry(PIV). Because a shape of a nozzle for the jet flow is asymmetric and the initial flow is fast and unsteady, three high-speed cameras have been used for tomography and PIV. The speckle movements between no flow and CO_2 jet flow have been obtained by a cross-correlation tracking method so that those distances can be transferred to deflection angles of laser rays for density gradients. The three-dimensional density fields for the high-speed CO_2 jet flow have been reconstructed from the deflection angles by a real-time tomography method, and the two-dimensional velocity fields for the same flow have been investigated by a PIV method simultaneously and instantaneously.