심근세포의 생체역학적 기전에 대한 수치해석적 연구

사종엽†(영남대) · 심은보*(강원대)

Numerical study on the biomechanical mechanism of a cardiac myocyte

Jong Youb Sah, Eun Bo Shim

Key Words: Cross bridge dynamics(크로스브릿지 동역학), Excitation-contraction mechanism(흥분-수축기전), Force-velocity relation(힘-속도 관계식)

Abstract : We investigated the effect of cross-bridge dynamics of cardiac cell on heart mechanics using a newly proposed mathematical model. The alternation of sliding effect in cross bridge filament is mediated through phosphorylation by beta receptor stimulation and closely related to heart failure. A formulation and related variables were introduced to express the sliding effect on cross bridge mechanics. For the delineation of the sliding effect, we developed a cell excitation-contraction model that simulates the sequential cellular events from cell membrane excitation to cross-bridge mechanics. In a whole cell level, the isotonic simulations with variable loadings showed that force velocity relation was closely related to the cross bridge sliding rate that quantitatively represented the sliding effect in cross bridge dynamics.

응집구조 추출기법을 이용한 전방 계단에서의 난류 소음 원인 분해

조문환† · 배영민*(고려대 원) · 문영준**(고려대)

Turbulent Noise Source Decomposition for Forward-Facing Step Flow by Coherent Structure Identification Methods

Munhwan Cho, Young Min Bae and Young J. Moon

Key Words: Coherent Structure Identification(응집구조추출), Turbulent flow Noise(난류유동소음), Proper Orthogonal Decomposition(정규직교분해)

Abstract : The flow structures and acoustic sources are identified by coherent structure identification methods for the turbulent forward-facing step flow at Re_h=8,000 [AIAA paper 2005-3006, S. Becker *et al.*, 2005]. The identification methods like proper orthogonal decomposition (POD) and its complement method with others are applied to the turbulent flow and acoustic field, which are able to decompose the properties into each mode that has its own characteristics and energy level. These methods are not only to study the random fluctuated hydrodynamic and acoustic properties but also to extract the relation between the turbulent flow structures and the acoustic sources.