

축 방향 추진력을 받는 자유 비행 구조물의 동적 안정성 해석

은성진[†](한양대) · 유흥희*(한양대)**Dynamic Stability Analysis of a Free Flying Structure Undergoing Axially Driving Force**

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Key Words: Parametric excitation(매개변수 가진), Dynamic stability(동적 안정성), Floquet's theory(Floquet 이론), Rocket structure(보 구조물), Transition matrix(전이 행렬), Transition curve(전이 곡선), Flutter-type instability(플러터형 불안정성), Divergence-type instability (다이버전스형 불안정성)

Abstract : Dynamic stability of a free flying structure undergoing axially driving force is investigated in this paper. The equations of motion of a free-free beam are derived using the hybrid deformation variable method and the assumed mode method. Unstable regions due to periodical driving force are obtained by using the Floquet's theory. Stability diagrams are presented to illustrate the influence of the dimensionless driving force, amplitude, and frequency. Also, buckling occurs when the driving force exceeds a certain value. It is found that relatively large unstable regions exist around the first bending natural frequency, twice the first bending natural frequency, and twice the second bending natural frequency. The validity of the stability diagram is confirmed by direct numerical integration of the equations of motion.

주파수응답특성을 이용한 백래시 추정개념의 이론적 분석

백주현(넥스원퓨처(주))[†] · 정의봉 · 허기영 · 김지역 · 김진천**Theoretical Analysis on the Backlash Estimation Concept using Frequency Response Characteristic**Joo Hyun Baek, Yui Bong Jung, Gye Young Hur, Jie Eok Kim
and Jin Cheon Kim

Key Words: Backlash Estimation(백래시 추정), Frequency Response(주파수응답)

Abstract : This paper presents an backlash estimation concept to estimate the magnitude of backlash in a servo system with a gear reducer. The concept to estimate the magnitude of backlash is based on the change of frequency response characteristic, in particular, the change of anti-resonant frequency and resonant frequency, due to the change of backlash magnitude. This paper theoretically shows that the influence of backlash to change the frequency response characteristics can be amplified by the magnitude of motor input voltage. We think that it is possible to use the proposed concept for estimating the change and magnitude of backlash in a servo system with a gear reducer.