Study on Snap-Through-Type Nonlinear Dynamic Damper

1996 Fiscal Year Final Research Report Summary

Study on Snap-Through-Type Nonlinear Dynamic Damper

Research Project

Project/Area Number

07650281

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

Dynamics/Control

Research Institution

Kanazawa University

Principal Investigator

SATO Hidenori   Kanazawa University, Department of Human and Mechanical Systems Engineering, Professor, 工学部, 教授 (90019745)

Co-Investigator(Kenkyū-buntansha)

IWATA Yoshio Kanazawa University, Department of Human and Mechanical Systems Engineering, Ass, 工学部, 助教授 (90115212)

Project Period (FY)

1995 – 1996

Keywords

Dynamic Damper / Nonlinear System / Chaos / Vibration Suppression

Research Abstract

Characteristics of suppressing vibration of a dynamic damper with snap-through-type nonlinear spring are investigated theoretically and experimentally. The result is described as follows :

1.Theoretical analysis

A damper model of a single-degree-of freedom system which consists of a viscous damping and a nonlinear spring is considered. Nonlinearity of the spring is represented with cubic polynomial and has two stable equilibrium states.

(1) Impact free vibration response of the system where the nonlinear damper is attached to an undamped single-degree-of-freedom system to which is numerically analyzed. It is found that there are systems with the better effect of vibration suppression than linear systems.

(2) The optimized solutions in forced vibration was a little better than those of the linear system by PQ theory. Chaotic vibration can be often seen, but it doesn't always lead to large suppression of the vibration.

2.Experimental analysis

A snap-through-type damper which consisted of laminated buckled thin plates with clearance ends and a mass at a center of the span was made. The damper was set up on a cantilever beam considered as a single-degree-of-freedom system.

(1) It is found that the vibration response by impulsive force is in general agreement with the numerical result and that the vibration of the system can be suppressed by the damper.

(2) It is confirmed that the forced vibration response due to unbalance can be also suppressed by the damper and that the chaotic vibration occurs over the frequency range with the vibration suppression effect.

It is concluded that the dynamic damper proposed is effective for impulsive force. For practical application, an improvement in the damper structure is necessary.

Research Products (2 results)

All Other

All Publications (2 results)

[Publications] 佐藤 秀紀: "飛び移り型非線形ダンパの制振特性" 日本機械学会,機械力学・計測制御講演論文集. 160-162 (1995)

[Publications] H.Sato, Y.Iwata, N.Koga and T.Akabosi: "Damping Characteristics of Snap-Through-Type Nonlinear Dynamic Damper" Dynamics and Design Conference '95. 160 (1995)

URL: https://kaken.nii.ac.jp/report/KAKENHI-PROJECT-07650281/076502811996kenkyu_seika_hokoku_

Published: 1999-03-08