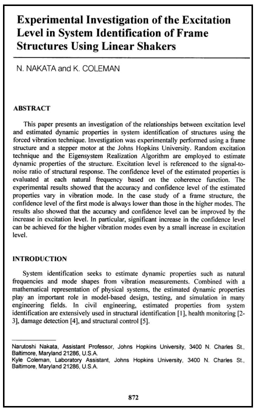

**Experimental Investigation of the Excitation Level in System Identification of Frame Structures Using Linear Shakers**

N. NAKATA and K. COLEMAN

**ABSTRACT**

This paper presents an investigation of the relationships between excitation level and estimated dynamic properties in system identification of structures using the forced vibration technique. Investigation was experimentally performed using a frame structure and a stepper motor at the Johns Hopkins University. Random excitation technique and the Eigensystem Realization Algorithm are employed to estimate dynamic properties of the structure. Excitation level is referenced to the signal-to-noise ratio of structural response. The confidence level of the estimated properties is evaluated at each natural frequency based on the coherence function. The experimental results showed that the accuracy and confidence level of the estimated properties vary in vibration mode. In the case study of a frame structure, the confidence level of the first mode is always lower than those in the higher modes. The results also showed that the accuracy and confidence level can be improved by the increase in excitation level. In particular, significant increase in the confidence level can be achieved for the higher vibration modes even by a small increase in excitation level.

**INTRODUCTION**

System identification seeks to estimate dynamic properties such as natural frequencies and mode shapes from vibration measurements. Combined with a mathematical representation of physical systems, the estimated dynamic properties play an important role in model-based design, testing, and simulation in many engineering fields. In civil engineering, estimated properties from system identification are extensively used in structural identification [1], health monitoring [2-3], damage detection [4], and structural control [5].

Narutoshi Nakata, Assistant Professor, Johns Hopkins University, 3400 N. Charles St., Baltimore, Maryland 21286, U.S.A.
Kyle Coleman, Laboratory Assistant, Johns Hopkins University, 3400 N. Charles St., Baltimore, Maryland 21286, U.S.A.

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Код: 10346

**N. Nakata, Coleman**

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Издательство DEStech Publications, Lancaster, 2011 год

8 стр; формат: 23,5 х 16 см; библиографический список: 9 единиц
ISBN: 978-1-60595-053-2

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**Ключевые слова:**

**Содержание.**