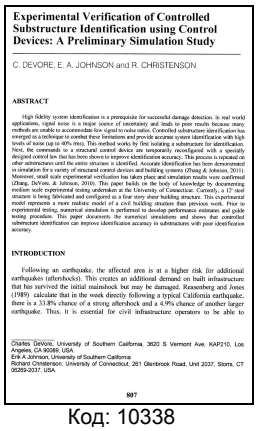

Experimental Verification of Controlled Substructure Identification using Control Devices: A Preliminary Simulation Study

C. DEVORE, E. A. JOHNSON and R. CHRISTENSON

ABSTRACT

High fidelity system identification is a prerequisite for successful damage detection. In real world applications, signal noise is a major source of uncertainty and leads to poor results because many methods are unable to accommodate low signal to noise ratios. Controlled substructure identification has emerged as a technique to combat these limitations and provide accurate system identification with high levels of noise (up to 40% rms). This method works by first isolating a substructure for identification. Next, the commands to a structural control device are temporarily reconfigured with a specially designed control law that has been shown to improve identification accuracy. This process is repeated on other substructures until the entire structure is identified. Accurate identification has been demonstrated in simulation for a variety of structural control devices and building systems (Zhang & Johnson, 2011). Moreover, small scale experimental verification has taken place and simulation results were confirmed (Zhang, DeVore, & Johnson, 2010). This paper builds on the body of knowledge by documenting medium scale experimental testing undertaken at the University of Connecticut. Currently, a 12' steel structure is being fabricated and configured as a four story shear building structure. This experimental model represents a more realistic model of a civil building structure than previous work. Prior to experimental testing, numerical simulation is performed to develop performance estimates and guide testing procedure. This paper documents the numerical simulations and shows that controlled substructure identification can improve identification accuracy in substructures with poor identification accuracy.

INTRODUCTION

Following an earthquake, the affected area is at a higher risk for additional earthquakes (aftershocks). This creates an additional demand on built infrastructure that has survived the initial mainshock but may be damaged. Rassenberg and Jones (1989) calculate that in the week directly following a typical California earthquake, there is a 33.8% chance of a strong aftershock and a 4.9% chance of another larger earthquake. Thus, it is essential for civil infrastructure operators to be able to

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Код: 10338

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Издательство DEStech Publications, Lancaster, 2011 год

8 стр; формат: 23,5 x 16 см; библиографический список: 7 единиц
ISBN: 978-1-60595-053-2

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**Ключевые слова:**

**Содержание.**