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Numerical Investigation on Toggled Actuator Forces in Active Vibration Control System

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ABSTRACT:

In this paper a numerical investigation of installation of actuator in a toggle configuration for decreasing of active control forces in engineering structures has been carried out. During the past two decades, researchers have been focused to prevent the vibration of tall building from strong earthquakes. For achieving this purpose, they applied either massive conventional bracing or passive energy dissipation dampers. Subsequently, they developed active control systems in structures to resist against the high seismic loads. However, this later method eventuates installing massive actuators in building which are not only very costly and uneconomically but also needs large electricity power. In this research, using by known earthquakes, investigation of the effects of the toggle configuration on actuator forces has been performed numerically. For numerical investigation, active tendon control system was selected as a comparison. The numerical investigation shows significant reduction in actuator forces through using toggle configuration. Finally, comparing results through the numerical processe express high matching that relies on mitigation of control forces in the toggled active model.

Keywords: Active control system, Control forces, Structural active vibration control

1- Introduction

Utilization of active control systems for resisting against seismic loads such as strong earthquakes or intensive wind gust turbulences loads on structures has been developed in the past two decades[1-5]. Producing of high strength material and achieving the reliable and accurate structure analysing software caused to be built more tall and flexible buildings[2]. The more strength against the excitation, the more structure strength and ductility is required. Obviously, providing high strength and ductile construction materials are very costly. Using the bigger cross sections for achieving to the higher structure strength, however, attracts more seismic force onto these members. Consequently, they will require even bigger sections. This process is endless spiral design. One of the important advantages of smart structures is to overcome to this problem. The previous researches and practical installations proved their efficiency to protect the structures against the seismic excitations. In the structures once multiple modes are determinant in structure respond, need for more powerful and adaptive system to prevent structure from very large excitations and damages will be more essential [6]. There are many real implementation of active control systems in the world [7-16]. Also, utilizing of this system in the large