

EXTENDED ABSTRACT

Sliding Mode Control Method Combined with Bang-Bang Control for Structures under Earthquake Excitation

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Shear Building, Sliding Mode Control Strategy, Bang-Bang Algorithm, Active Control.

1. Introduction

In the present paper, the improved sliding mode control algorithm are presented. This strategy is based on the combination of sliding mode control and Bang-Bang control theory. The Bang-Bang theory can switch abruptly between the on and off situation, this property can improve the performance of sliding mode control strategy. Also, three thresholds used to decrease the time of using the control system and optimizing the responses of structure.

2. Methodology

In this paper, the sliding mode control strategy employed to linear and shear building. This control method is a widely used method in different structures but has many weaknesses. For this reason, Bang-Bang control strategy and three different thresholds utilized to optimize the responses of selected structure. Due to the prevalence of displacement-based sensors, three limits based on the displacement have been used (1cm-3cm-7cm). These limits can help to reduce the time of using the control algorithm. Also, the controller is placed on different floors to find the best location for decreasing the responses of structure under the seismic excitation (Fig. 1).

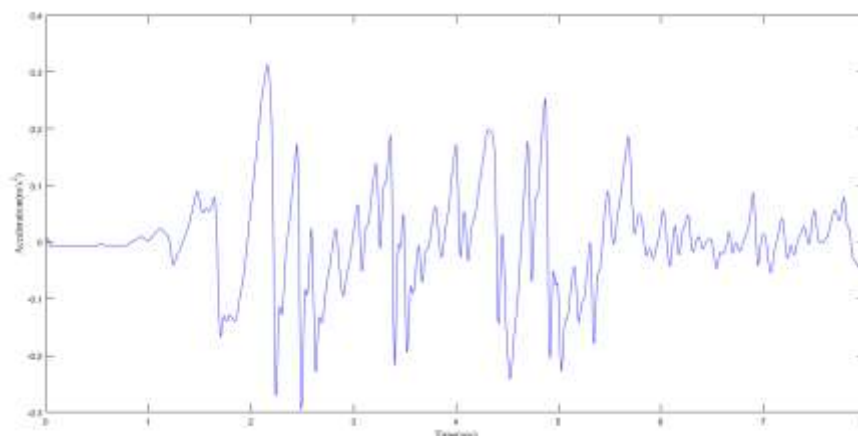


Fig. 1. El-Centro excitation

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3. Results and discussion

In order to investigate the performance of proposed strategy, the eight-floor building is considered. Also, the responses of the structure based on the different location of controller by considering the three limits are achieved. The using the control forces of proposed algorithm can be expressed in Fig. 2. The maximum of forces is fixed. But the time of using the controlling system has been different from each other. This feature can help the performance of control system under the seismic excitation.

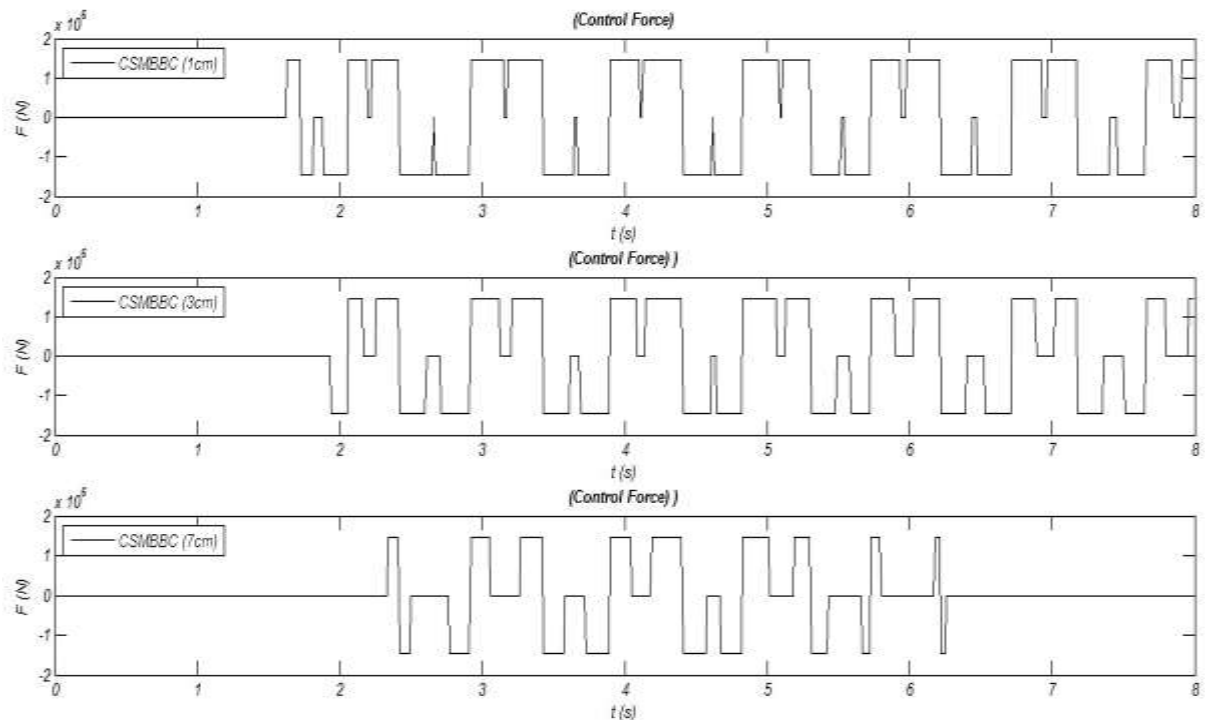


Fig. 2. The control force (the controller located on the first floor)

4. Conclusions

This paper presents a new control method based on the combination of sliding mode control and Bang-Bang control. The control system is located in different floors for finding the best responses of structure. Based on the mentioned process, locating the control system on the lower floors lead to optimum responses. Also, using the three limits (1cm, 3cm and 7cm) leads to different range of results, however the best performance of control strategy under the selected seismic excitation gained by locating the control system on the first floor and by adjusting the 3-cm limit.

5. References

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