

Structure Health Monitoring Experiment of 10-stories RC building applying i-Jishin

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i-Jishin cloud system is a disaster prevention sensor cloud system consisting of a free iOS app "i-Jishin" and Web services "Geonavi / icomi". In order to evaluate the applicability of this system for Structural Health Monitoring, it was carried out vibration experiments of 10 layers of RC structures on E-Defense in November-December 2015.

This article does not address until more information about the earthquake disaster determination method based on the system, we describe to the state estimated by the data acquisition and building response spectra up to the previous diagnosis.

Experimental methods: Method of the experiment is as follows.

- We attached two iOS terminals installed i-Jishin on the wall of each 10,6,5,1 layer of the RC structure test body, and uploaded the data to icomi via wireless LAN.
- We carried out shaking test held four days of the 2015, on November 25th, 27th, December 9th and 11th, measured microtremor in the same position of the i-Jishin installation floors prior and subsequent to each shake.
- Measurement parameters of i-Jishin were trigger setting 30 gal, trigger duration 2s, pre-trigger 20s, post-trigger 60s.
- As analysis of the acquired data by the MEMS acceleration sensor, seismic intensity, response spectrum (acceleration, velocity, displacement) were calculated respectively.

Result of the experiment: The experimental results are as follows.

- A dominant period prolongation of response spectrum was observed corresponds to the input ground motion.
- This is roughly consistent with the measurement results of the microtremor former and latter the shake.
- Success rate of the data uploaded by the mobile line was 93 percent.

Although structural health monitoring (SHM) systems using acceleration sensors are operating for commercial bases on the high-rise buildings, valuable data obtained are not shared for disaster prevention research for privacy reasons. There is a problem of trade-off between reliability and cost.

This experiment showed possibility to evaluate damage of the medium-sized apartments by earthquake with smartphone's accelerometer. If it is possible, it can be regarded as an easy and powerful disaster prevention tool at a low cost that contributes to the rapid ensuring safety at the time of disaster. It is still insufficient to allow the disaster judgment in the instant, but state estimation of the structure is possible immediately.

Keywords: SHM, Sensor Cloud, mobile terminal, i-Jishin, E-Defense

