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On-site experiment of seismic monitoring network by utilization inside sensors of mobile terminal

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Mobile terminal devices have a small, lightweight, and cheap accerelation sensor called MEMS, and also have a bettery and wireless communication adaptor inside it. If we use such MEMS sensor for observation of earthquake and then upload to cloud computing system, we would know detailed information of shaking. And If we share information observed by MEMS sensor using the cloud computing system, we could raise awareness about disaster prevention. For example, Yoshida et al.(2011) developed an experimental earthquake observation system using the iPhone/iPad/iPod touch named ”i-Jishin”, and released in August, 2010.

Furthermore Naito et al. (2011) installed ”i-Jishin” on the base and observed in parallel with K-NET02 seismometer. They compared same seismic waves, then concluded as regarding JMA intensity, over 3 it is within the margin of 0.1, but up to 2 it becomes overestimate.

In this research, we report about the performance of MEMS acceleration sensors and on-site experiment of seismic monitoring network by utilization inside sensors of mobile terminal.

In order to examine the possibility of application about strong motion observation of the building using ”i-Jishin”, we installed it on two different floors in the low-rise 5 RC buildings, and started monitoring from January 2012. After installation, we were able to get a large number of earthquake records corresponding up to an intensity 4. By analyzing these data, one building showed significantly high velosity response value. This building was significantly damaged in the non-sutructual component after the Tohoku-Pacific Ocean Earthquake. After that, we tried the microtremor observation using JU-310(Hakusan Corp.), we found the largest gain compared to others in this building looking at the H / V spectral ratio, and it was consistent with the result as previously mentioned.

In addition, for the purpose extracting social issues, we installed ”i-Jishin” on the floors of more than 30 different buildings which have different types of structure and network environment around the city of Nagaoka, Niigata Prefecture and Fujisawa, Kanagawa Prefecture since January 2012.(Azuma et.al, 2012) In that case, the staff of NPO installed terminals and they are considered favorable, so well understood about the effect of sensing. However, many problem was found such as, diversity of networking enviroment, no easily understandable benefits of the installation, requirement to ensure the stability of the measurement, and the human resources for maintenance.

To solve these promblems, we will develop a more reliable and accurate system or a sytem that is easily understanble for general person. Besides we are going to enhance the cooperation with ”i-Bidou” which is the system of the cloud type microtremor observation system(Senna et al.2012). We will keep developing the system to visualize the harzard information of regional soil and building conditions, and keep performing experiments of the sensor network system so that everyone can measure and share information of the buildings.

Keywords: MEMS, Cloud, Sensor Network, On-site experiment