Developing Building Damage Assessment Model Utilizing Web-based GIS API on Tablet Device

Munenari INOGUCHI¹, Keiko TAMURA², Kei HORIE³, Shuichi SAKUMA⁴ and Haruo HAYASHI⁵

Once disaster occurs, local responders should start building damage assessment for issuing Victim Certificate. Because this assessment has to be applied to all damaged buildings, work volume would be huge. This causes difficulty of data management about building damage assessment. Against this issue, we aimed to develop effective and assured model for building damage assessment utilizing online-based application on tablet devices.

Kinds of operating system installed into tablet devices are android, iOS, windows and so on. Usually we have to develop applications for each operating system. Considering manageability of tablet devices, we decided that this application should be cross-platform in designing process. The solution is that we should develop this application as web-based application. Wherein we derived to utilize WebEOC, which is Web-Enabled incident management system and allow responders to develop common operational picture easily. Furthermore, we focus attention on the feature of WebEOC that is to establish the data management platform only by configuring templates like input forms. This indicates that preparation for assessment could be decreased absolutely.

First, we analyze the workflow of building damage assessment, and clarified data items which should be collected in the process of assessment. Second, we developed templates for WebEOC following that result of analysis. In this process, we made consideration about user interaction with this application and expectation of application operation from responders, and designed screen transition flow and automated calculation function which should be installed onto this application. Third, we tried to integrate Web-based GIS API (Application Programming Interface) in order to detect location of targeted building. It is necessary to detect the location of damaged building in order to issue Victim Certificate reliably as pointed out by previous research, however it takes much cost to innovate some kinds of mapping service. Against this issue, we decided to integrate with Google Map API, because Google Map developed housing map and aerial photo covered all area in Japan, and it is easy to gain locational data on the map by using published API. Finally, we developed this application as web-provided service, and installed it onto a web server.

In 2013, we implemented it to 2 actual affected city and town for verification of its effectiveness; one is Fukuchiyama city impacted by Typhoon No.18, the other is Oshima town impacted by Typhoon No.26. Through these implementation, it was verified stable operation of this developed application. Furthermore, we got 2 kinds of effect and 1 issue to be solved. One of effects is that this application supported rational resource management in building damage assessment. This application can upload the result of building damage assessment in real-time through internet connection. Staffs, who are assigned a duty of planning and administration, can watch the progress of at office, and understand which team finishes assessment earlier than expected. When they detect a team which finishes their task earlier, they reassign it to support other team which has not finished their task. This means effective resource management. The other of effects is they can lack of data about building damage assessment instantaneously, because those data was digitalized in uploading to the server using tablet devices. When staffs recognize lack of data, they collect the team which inputted indicated data, and order to correct those data by themselves. This process realized high-quality data management in building damage assessment. On the other hand, one issue was exposed at Typhoon No.26, that is about the quality of Google Map covered Oshima town. While Google Map provided aerial photo, however the housing map was not developed. This issue indicates that Google Map does not completely provide housing map for all area in Japan. Against this issue, we set up the web-based map providing service hurriedly by ourselves, and connected it to application.

In this research, we designed and developed the application supporting for effective and efficient building damage assessment. In near future, we are planning to solve issues learned from implementation at actual disaster, and to standardize this developed application for all responders to utilize as soon as disaster occurs. We will contribute to improvement of disaster prevention by publishing the result of our research.

¹ Assistant Professor, Research Institute for Natural Hazard & Disaster Recovery, Niigata University, Niigata, Japan
² Professor, Risk Management Office, Niigata University, Niigata, Japan
³ Team Leader, Inter Risk Research Institute & Consulting, Inc., Tokyo, Japan
⁴ Section Chief, NTT Learning Systems Corporation, Tokyo, Japan
⁵ Professor, Disaster Prevention Research Institute, Kyoto University, Uji, Japan