Development of User-Interactive Application Supporting for Detection of Tsunami Evacuation Route with Land Features and Hazard Information

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1. Background and Objectives

Based on lessons learned from 2011 East Japan Earthquake, Cabinet office of Japan has promoted local governments and communities to develop “Community Disaster Management Plan”. Local governments started to develop the plan in the view of the circumstances in their regional characteristics. Niigata city also organized the workshops in order to develop it against tsunami disaster with residents. Only a few residents participated in this workshops and they build their capacity due to workshop schedule and largeness of place. Other residents did not have opportunities to discuss about disaster prevention. Against this issue, we decided to develop an application supporting for individual disaster management plan in analyzing hazard risks and land features around their habitation area.

2. Clarification of Work-flow for Developing Evacuation Plan at Tsunami

We conducted preliminary survey in these workshops in order to design the work-flow for users to develop their own disaster management plan at tsunami. Especially, in this research, we narrowed down a target to evacuation plan because evacuation is most important behavior to save their lives. Through the workshops in Niigata city, we found the processes of developing evacuation plan was consisted of 5 steps. 1) Introduce fear of tsunami disaster and countermeasure at tsunami disaster, 2) Survey the evacuation route from each participant’s house to public tsunami evacuation center, 3) Discuss potential risks behind participants’ community, 4) Design strategic plan for their community and to discover potential evacuation center such as non-pubic high-rise buildings, 5) Report and share the result of their discussion. Furthermore, it is a unique feature in these workshops to set 2 evacuation goal. First goal is near-by their habitation place and it is built in high elevation area. Second one is far from the impacted area by tsunami and it is located in higher elevation area than first one. This was followed by lessons learned from Kamaishi Evacuation Story at East Japan Earthquake in 2011.

3. Development of Prototype of User-Interactive Application

We developed a prototype of application based on the system-design described above. In this application users can detect rational evacuation route considering hazard risks and land features. Because we supposed that users cannot detect it at one time, we decided to develop the application as web-based and user-interactive application. This means our developed application should respond the result of analyzing the risks around their detected evacuation route in conjunction with the modification of users’ evacuation route. Finally we developed the prototype of application following 7 users’ steps: 1) Set start point for evacuation, 2) Set first evacuation goal, 3) Set second evacuation goal, 4) Search shortest evacuation route, 5) Review change of elevation on evacuation route, 6) Judge hazard risks and land feature on evacuation route, 7) Download evacuation route dataset as a local file. From step1 to step5, we utilized Google Map API for searching specific place name or street address, and for evaluating transition of elevation on the detected evacuation route. In step7, users can download the detected evacuation route as GPX file for reviewing it on GIS software they have later.

4. Discussion

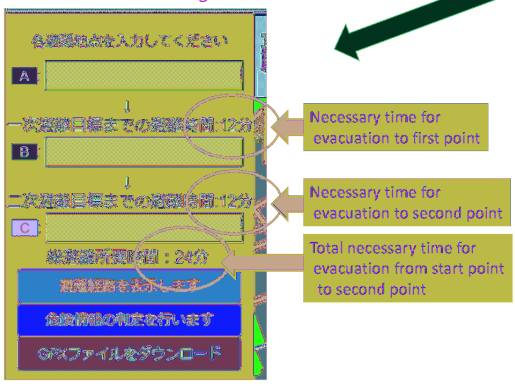
We implemented the application and published it for 10 days in order to examine its effect. Through this examination, we gained 1,960 users' logs. Deciphering those logs, only 223 of rest 851 users detected their rational evacuation route considering hazard risks and land features around the detected evacuation route. We found that the complicated user-interface and system transaction caused this result. Against these issues, we are planning to modify it with higher user-friend interface and to build a story for developing their evacuation route in it.

Keywords: Micromedia Service, Tsunami Disaster, Evacuation Route, Urban Resilience

This application detect "Shortest Route" from start-point through 1st goal to 2nd goal.

This application evaluate transition of elevation on users' detected route dynamically.

This application suggest the minutes should be taken to walk to each goal.



This application evaluate hazard risks around the route.