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Low-cost and User-friendly Field Survey Assisting System powered by Open Cafe System

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In traditional field survey in natural environment, the survey values are recorded in the paper such as field notes, and they are digitalized and analyzed indoors. The digitalization of this method is so complex that it is time-consuming. Then, the system into which digital data can be inputted directly in the field has developed recently. However, it is so expensive and the manner of operation is so complex that it doesn't become popular. In this study, we tried to develop low-cost and user-friendly Field Survey Assisting System (FSAS) in natural environmental field with open source software.

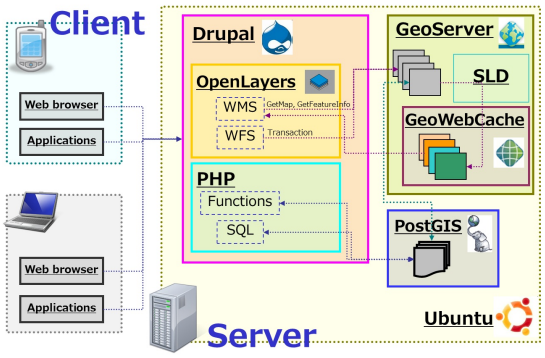
In this study, the positional information was treated as the main survey item by FSAS. So we used Free and Open Source Software for Geospatial (FOSS4G). Then, to improve usability of FOSS4G, we developed a package called Open Cafe System (OCS) and FSAS was powered by OCS. OCS has two features to improve the usability for users of FSAS. They are Web-GIS architecture and wrapping of FOSS4G with content management system (CMS). Web-GIS stimulate users without technical knowledge to use the system because users can use Web-GIS with just web browsers which they are familiar with. CMS manages web contents integratedly. In general, CMS makes it easy for users without technical knowledge to use the system. In OCS, users work with interface made by CMS, without struggling with FOSS4G.

The architecture of OCS is shown in Figure. OSC is composed by two main components: OCS server and OCS client. In OCS server, FOSS4G applications and Drupal (CMS) work on Ubuntu OS. Spatial data is stored by PostGIS (spatial extension of PostgreSQL). GeoServer works as GIS server which supports WMS (Web Map Service) and WFS (Web Feature Service). SLD (Styled Layer Descriptor) describes the appearance of map layers. GeoWebCache accelerates the processing by caching request. Drupal works as user interface and manages FOSS4G applications integratedly. PHP scripts controls database queries. WMS and WFS works on web pages with OpenLayers. In OCS client, users access the server with web browsers or specific applications. Client devices are laptops, smartphones, PDAs, and so on. They can get web pages made by CMS with web browsers, or can use the functions of OCS server easily with optimized applications.

The workflow of a field survey with FSAS consists of three steps. First, users make a format before the survey. The format has information of the survey such as title, date, item, note, area of the survey and base maps. Because users can freely customize survey items, FSAS can be used in various fields such as forests and rivers. Second, users input data on the survey. They just input the location on the GUI map and value of items into the format, because the format has information of the survey. All data is stored into the same table on the database. Each data has fields of belonging format, location, and value of items. Third, users export data after the survey. They can choose the export file type from CSV and KML. In this way, they can manage and use data for each survey in the unified way.

To examine the utility of FSAS in various fields, we did field surveys on water quality and tree position as an application study of FSAS. The study area is spring water in Hadano (Kanagawa, Japan) and street tree of Itabashi (Tokyo, Japan). Citizens in those places survey water quality or tree position with FSAS. They inputted the obtained data into FSAS with Android smartphones and iPhones. Participants could browse the results of the survey on site with the client devices.

We had a questionnaire after the survey to get the users' impression of FSAS. From the results of questionnaire, we thought that FSAS was easy for participants to use, nevertheless they did not have technical knowledge. The function of inputting data and browsing the result on site assisted them. It is suggested that FSAS has high usability in various natural environmental fields.



Keywords: field survey, digital data, GIS, FOSS4G, content management system, open cafe system