REMOTE SENSING APPLICATION BASED ON
WEB MAPPING API AND HTML5

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ABSTRACT: Recently, information communication technologies such as smartphone or mobile app greatly affect various application fields including geo-spatial domain. And development scheme of mobile web app or hybrid app regards as the most important computing technology which is combined each advantage of mobile app and mobile web. Despite these trends, it is general case that satellite images are used for the background image for other contents services. With this motivation, geo-based image application based on web mapping API (Application Programming Interface) and geo-based standards on web is designed and implemented in this study. The aim of this study is at investigating the applicability of web mapping and HTML5 in remote sensing application development running on smartphone. HTML5, which is the core technology on an international standardization process for hybrid app, is applied. In the implementation for smartphone devices, PhoneGap and Sencha Touch as mobile SDK(Software Development Kit) supporting HTML5 on cross-platform are used. They are also open source SDK for application developers, not end-user. Furthermore, OpenLayers, web mapping API, is also used for implementation, and it is in world wide developer communities for web services dealing with geo-spatial information and contents. According to a prototype in this work, it is thought that generating mobile contents using remote sensing images is one of important themes in future. This prototype will be provided as hybrid app for smartphone to disseminate and publish those contents, derived and constructed from many types or sources.

1. Introduction

As smartphone app and mobile web are popular in the various fields, interests from both developers and users with respect to geo-based contents are continuously increasing. However, currently most mobile app or web services are for general users or public users, so that those for domain experts are world-widely rare. This is main motivation for this study, and a kind of prototype of remote sensing application running on mobile environments using web standards and web mapping API (Application Programming Interface) is designed and implemented.

As for the type of mobile app, it is categorized into three types: native app, web app and hybrid app. Native app is embedded application by installation into mobile devices, and this shows fast performance, but it needs separate development and installation according to each device. Development of application for iPhone of Apple is done by Object-C language, whereas application of Android does Java language. While, as the second type, web app does not need installation, and works in the webkit-based browser. More, HTML language is used, so that development process is comfortable. But features provided by mobile device are limited, unlike native app. Hybrid app is installed application, but web language is used in the same manner of web app, so as to work platform-independent task (Butchart and King, 2010).

In this work, hybrid app is chosen as implementation type, in consideration to these aspects. HTML5 is the core web standards in de facto for hybrid app. As well as the main features of the previous HTML, new features and specifications are added, and it is used for development of mobile app for multi-platforms. In HTML5, geo-processing such as Geolocation API is included.

While, open source SDK (Software Development Kit) is used for a prototype implementation: PhoneGap and Sencha Touch. PhoneGap is Javascript-supported development environment for smartphone features of vibrating, acceleration recognition, or GPS. Sencha Touch is also Javascript framework for mobile web client.

OpenLayers, web mapping API, is Javascript library for geo-based contents in the web browser, and tiled remote sensing images and geo-based layers using this API are visualized in the multi-platform mobile devices.

2. Mobile SDK and Web Mapping API

2.1 PhoneGap and Sencha Touch

PhoneGap is composed of HTML, CSS, and Javascript. Thus, it is framework for development of native app regardless of iOS, Android, Blackberry, WebOS, and Symbian.

This environment makes web language to access to mobile device. Current version of PhoneGap supports many features: Accelerometer, Camera, Compass, Contacts, File, GeoLocation, Media, network, Notification, Storage. In application stage, build process of PhoneGap is necessary, and a project is constructed. Then insertion of web language developed works user operations using mobile app.

Sencha Touch is Javascript framework for web application running on client, based on ExtJS. As well, jQTouch for Touch UI and Raphael for SVG processing is contained (Kim and Lee, 2011). It is important that PhoneGap and Sencha Touch support HTML5 for hybrid app.

2.2 Web Mapping API

OpenLayers, web mapping API, is Javascript library for map data display in web browsers, in accord to OGC web standard. This is often used for web-based GIS applications from world-wide developers' communities. It also supports to access Google maps and Yahoo map. As for the coordinate system, it basically supports EPSG:4326 projection, besides EPSG:900913. Vector layers can be generated and manipulated using SVG, Canvas or VML. Extension of vector layer is to support file formats such as KML, GML, or GeoJson (Hazzard, 2011).

3. Remote Sensing Hybrid App

There are many strategies for design and implementation of hybrid app in a given purpose. This work uses Sencha Touch and PhoneGap, as Mobile SDK. For client mapping system in mobile device, OpenLayers is applied.

Figure 1 represents system components and work flow of hybrid app for remote sensing application, using HTML5. In PhoneGap environment running on Android 2.3 platform, GPS signal is received. Sencha Touch is for touch events. In this prototype, several layers and image sets are basically provided: OSM(OpenStreetMap), remote sensing images, road, building, and marker Layer. In image server in this system, KOMPSAT-2 image sets are tiled and stored in several levels of details for image visualization. As for feature sets of road and building, Shapefile format is applied and stored in PostgreSQL, open source database management system.
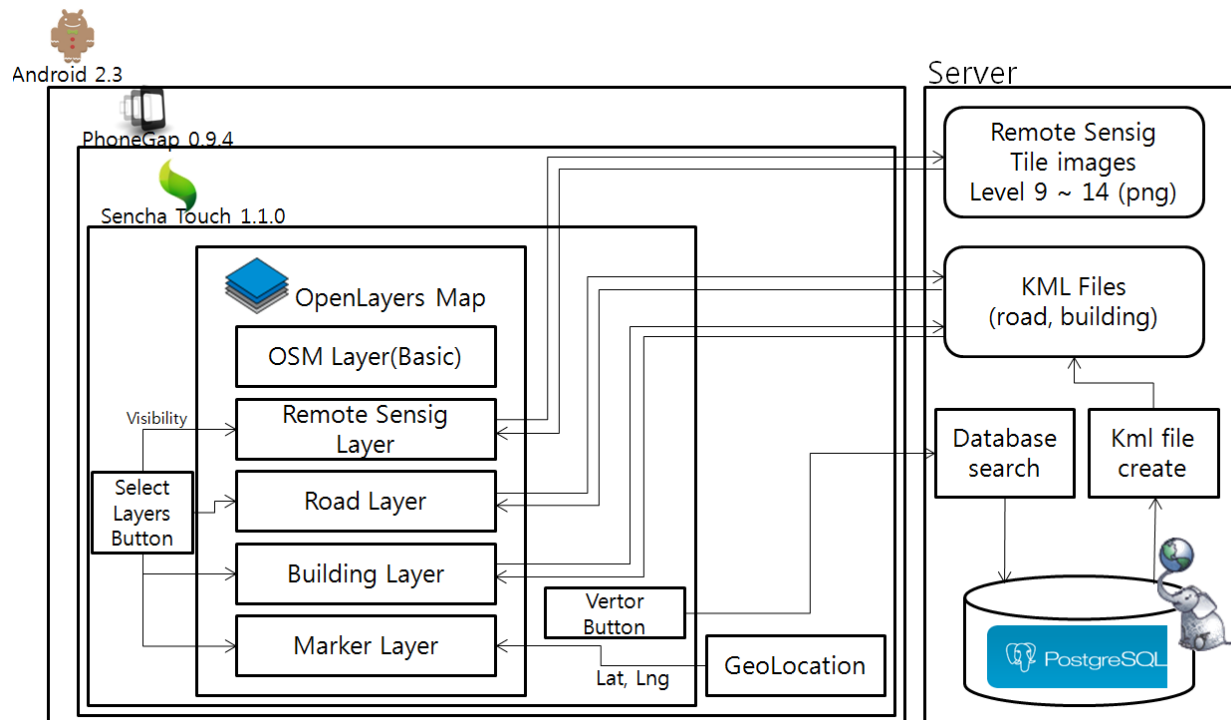

Figure 1. System components and work flow of Hybrid app for remote sensing application.

Figure 2 is implemented results with initial user interfaces. Using Geolocation class in PhoneGap, map is moved at the user current position with marker layer. In toolbar, basic operations such as zoomed-in and zoomed-out are provided in figure 2 (a), (b), and (c). A button of vector can load feature sets of road or building in KML format. SelectLayers button is used for layer activation or inactivation.

Figure 3 shows an example of KML creation in the internal process. Touching a button of vector, layer named buttons are evoked, and touching process on layer button what user wants to create a KML file makes corresponding KML file in server.
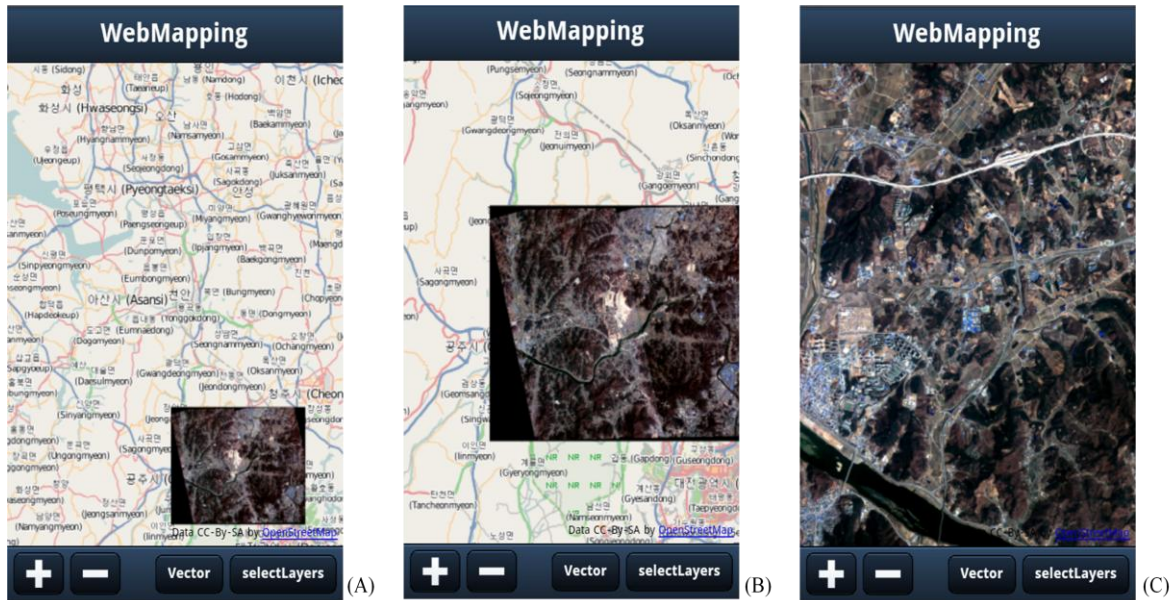

Figure 2. Remote sensing image sets in some levels: (A) Zoom level 9, (B) Zoom level 11, (C) Zoom level 14
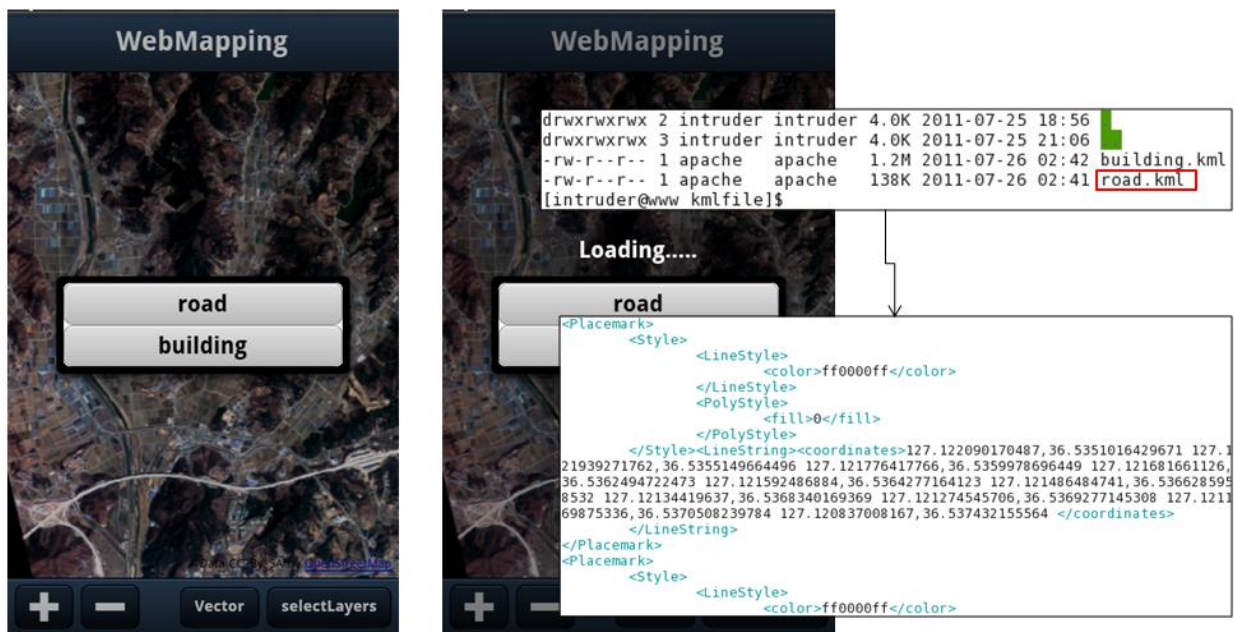

Figure 3. KML File creating process.

Figure 4 is to present visibility related to SelectLayers button. In this app, OSM is a basic layer in active mode, and remote sensing and marker layer is turned on once running this app. Road or building layers, representing feature sets, need touching process for visible mode.

Figure 5 is a proof of multi-platform supporting to show advantage of HTML5. Previous cases are on Android, but this is on iOS by xCode build and copying a project with the same sources.

Figure 4. (A) KML road layer visible status, (B) KML building layer visible status, and (C) invisible process.
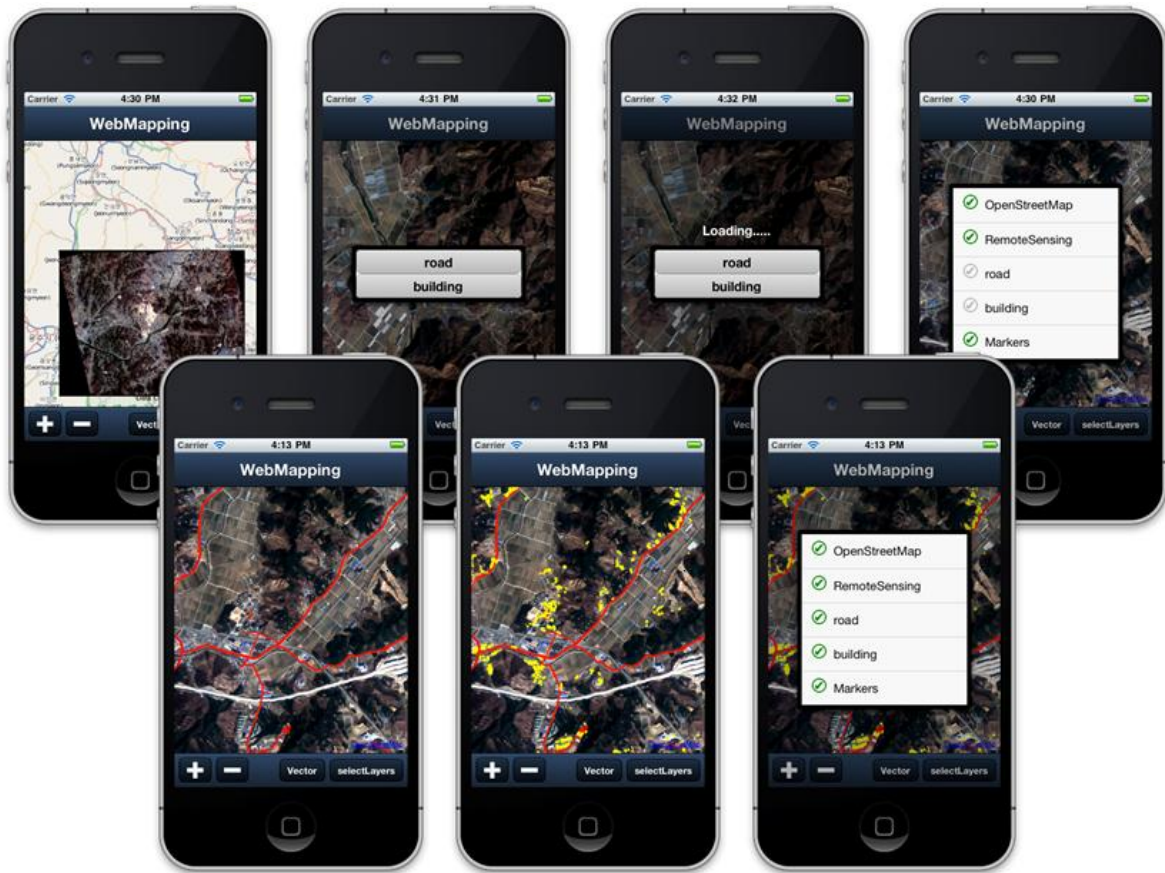
Figure 5. Applied result on iOS simulator 4.2, a proof multi-platform supporting.

4. Conclusion

In this study, a kind of smartphone app prototype for remote sensing application is designed and implemented using several frameworks and technologies: mobile SDK of PhoneGap and Sencha Touch, OpenLayers API, HTML5, and so on. This approach is for hybrid app, an important technical strategy for mobile application building.

As a matter of fact, it is likely that this mobile app is not a remote sensing area. But in the most organizations in any countries related to satellite image operations, public dissemination and distribution of remote sensing image sets are regarded as an important task.

This implementation of smartphone app is a case of KOMPSAT-2 images, and it is not finalized yet. Furthermore, it is certain that mobile app is an advancing technology. It is thought that this work contributes to remote sensing on mobile environments.

References

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