A study on Census Supporting Method using Aerial Image System

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Background

The population and housing census is a large-scale survey to investigate change, population and housing characteristics, which are used to establish and evaluate development plans for economic, social and private sectors.

Since the introduction of a digital map was used for creating Enumeration Districts(E.D.) for large-scale census, Geographic Information System(GIS) technologies have made a lot of progress. Nevertheless, there have been some limitations in solving problems such as map updating and determining location of survey targets from maps. As a result, we have launched a study to increase the efficiency of census and statistical surveys using aerial images.

Statistical survey research using GIS and RS

The United States and many European countries have recognized the connection between GIS and statistics as essential for efficient execution and service of large-scale census. Statistics Korea (KOSTAT) has utilized GIS throughout it's census from producing data to Statistical GIS services.

Recently, with the evolution of new technologies such as GIS, RS(Remote Sensing), GPS and mobile devices; the potential for new geographic representations over the role of traditional maps is improving. Internet based map tools extend the reachability of statistical information (Choi E. Y., 2008)

Survey researches using satellite or aerial images have been used to identify fish farming facilities and to estimate fish production for the Korea Maritime Institute since 2004. The Korea Rural Economic Institute (KREI) have obtained 90.8% accuracy of classification for rice cultivation using satellite images.(Kim. B. S., 2010)

KOSTAT introduced aero maps to overcome the limitation of digital map. It built the aero image system that supported our census by overlapping census maps with aerial images. They were used to correct buildings, administrative and census boundary DB using 50 cm resolution aerial images. Visual interpretation and distance measurements enabled us to increase the effect of time and cost in that were difficult to reach.

Using Aerial Image System for 2010 Population and Housing Census

Based on the experience of the 2009 pilot system, Statistics Korea has built an aerial image system using Open API for aerial image service, provided by the domestic internet portal company (NAVER). The introduction of aerial image services using Open API could enhance the efficiency of work and system operations at the same time.

With respect to work efficiency, using and receiving real-time data for various topography enables us to prevent omission and duplication of survey targets. It plays an effective role for enumerators to overcome geographical obstacles such as creating visiting plans for survey routes and identification of access paths for isolated targets in the field by overlapping aerial images and census maps. In addition, the printing function of the E.D. unit enabled users to print the same size maps as the search screen and to use them with E.D. map. It was also very useful to identify the survey targets in the field. As a result, 17,630 users per day from 3500 local headquarters visited this system and recorded 7.4 page views per user during the preparatory work.

With respect to system operation; additional efforts to manage the latest map information and data processing needed for aerial image service could be saved. Despite increased activity, additional storage to manage the mass of aerial images and back-up data was not required. System architecture planed to minimize the service load by installing ActiveX Control in users' PCs as well as providing image of census map and boundaries from KOSTAT aerial image systems. As a result, the server load was dramatically reduced during the intensive period of use by concurrent users. The CPU and memory of system (CPU 4.2 Ghz $\times$ 4 Core, Memory 32 GByte) maintained a stable status up to around 20% during self test by 4,000 concurrent users. Other technologies have been used for system load balance such as memory caching techniques to improve search speed, applying to an L4 switch through the server partitioning and a round robin job schedule of web application servers.

Future direction

API methodology based on aerial image opens the way to use world portals using aerial and satellite images as well as Korean portals using aerial images. It would be a practical alternative for the countries which are geographically widespread and have field survey constraints with on precise census maps. This would work particularly well for developing countries that do not have either statistical E.D.s or digital maps. Another approach is to build field survey systems based on GPS-equipped smart phones or tablet PCs. With these, enumerators can use portable equip to input in survey results in the field, using spatial DB, satellite images and aerial images. Additionally, it would be possible to use 3 Dimensional (3D) census maps but

currently it is not cost effective to build and maintain 3D data. It would require additional studies to determine the applicability of such a census based maps.

Subtitle

Figure or Table Title

REFERENCES (RÉFERENCES)

Kim B. S., 2010, Pilot study of rice cultivation area survey using satellite, The Korea Rural Economic Institute(KREI).

Choi E. Y., 2009, The role of GIS for production and service of space statistics of the population and housing census, Statistical Research Institute.

RÉSUMÉ (ABSTRACT) — optional

This paper is to introduce how to enhance conducting census and surveys using aerial images. It focuses on discussing experiences with respect to both work efficiency and system operation for 2010 Population and Housing Census in Korea. Finally, It is proposed how to build aerial image system with world portals using aerial and satellite images based on API methodology with aerial image.