

Present and Future Vision of Surveying and Geospatial Information System in Korea

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Foreword

Recently, surveying has been made constant efforts in gathering and processing the informations required for the preservation and development of earth environment. Especially, it achieved great progress in many fields i.e., utilization of advanced technologies such as computers and electro-optical instruments using laser, infrared, microwave, and other electromagnetic waves; application of image information such as terrestrial photo, aerial photo, satellite imagery, underwater photo, radar imagery, video imagery, etc.; utilization of satellite technology, such as GPS, LANDSAT, SPOT, IKONOS, etc.; and construction and utilization of information systems such as Geospatial Information System (GSIS or GIS).

Also, the science and technology of surveying and GIS confront with the profound changes of technological environment - from analogue to digital processing, hardcopy to softcopy, temporal to long-term and repeat observation, ground-base to aerial and spaceborne observation, central to network based distributed processing, single to interdisciplinary study, closed to open and common type information systems [1].

Considering many facts mentioned above, we can state that the surveying and GIS play an important role in many fields of national development and preservation, construction, information infrastructure, and so on. Accordingly, surveying and GIS need to play an active role in the process of scientific and technical development, exploitation of new horizon of business to meet the requirement of information society.

Consequently, surveying and GIS have increasingly contributed to improve the quality of humane life through the development of its technology. In this paper, we aim to study the concepts and presence of newly used terminologies, present state and future prospects of surveying and GIS in Korea.

Concepts of Terms

1) Surveying

For long time surveying(or geomatics) has been used to develop the residential area, to construct the brilliant cultural assets, to rule over the vast national territory, to manage land development project, and to perform facility surveying, etc. While today's surveying is essential not only in the traditional fields of topographic mapping, construction surveying, but also in the newly introducing fields of resources and environmental survey, acquisition and processing the information for the development project of land, ocean, underground or space.

The oriental term of "測量學(surveying)" comes from the ancient (about 3100 B.C.) chinese words "測天量地" which means "observe the astronomical phenomena and survey(or investigate) the land (or geography, topography)". Surveying has been used as the measure of constructional technology and used for map making and for providing the positional data for construction work. Modern surveying has the power of analyzing the positional relationship and its characteristics of the features and points on earth or in space using the fundamental observing elements - length, angle, time, mass and gravity, etc.

Also science of surveying is developing continuously for the better life circumstances through the technology of positioning, mapping and graphical analysis, quantification of information system, observation and assessment of viewscape for friendly relationship to natural environment. Accordingly, the extent of surveying has been broadened from the traditional surveying to the resources surveying, environmental phenomena surveying, and surveying for the better quality of life.

2) Geospatial Information System (GSIS or GIS)

Today acquisition and processing of various kinds of information are needed. The efficiency of Geospatial Information System - helpful for synthetic and systematic management of various informations needed to efficient project planning and rational decision making - is expanding throughout the progress of information society.

Especially, vast amount and various kinds of information for natural, social, economical or cultural present situation related to the land, resources, environment, etc. are needed so much to take successful achievement and planning of the projects - such as national land planning, regional planning, urban planning, resources development, construction project, etc.

To acquire and systemize various kinds of information properly and to retrieve, process, and analyze the information is the key to success of whole projects. And it is most ideal or desirable if any kind of data or information such as graphic, imagery, positional, or attribute could be processed or output in proper matter or format in real time which can fulfill the user's complicated demands [2].

To meet the above requirements, many types of autonomous data processing systems or computerized information systems have been implemented. Currently the integrated and relational mechanism are general trend to process the complex and diverse object data.

In the meantime there has been urgent needs to integrate various information systems, such as GIS(Geographic Information Systems), LIS(Land Information Systems), UIS(Urban Information Systems), AM/FM(Automated Mapping and Facility Management) into a comprehensive terminology to reveal the interrelationships and dependency among them. Therefore, the author created the synthetic term "Geo-Spatial Information System" first time in the world on February 3, 1992. The author recognized "Geo" as earth or features, phenomena on it (natural or artificial features) and the "Space" means the human environment or concerning region(time-space). And we realized that they can be combined to make composite term "Geo-space" or its adjective form "Geo-spatial".

Also to promote researches on Geo-Spatial Information Systems, the author established the society named KOGSIS (The Korean Society for Geo-Spatial Information System) on April 24, 1993. Later, he then presented the paper using this term at FIG XX International Conference in March 1994, Melbourne, Australia [3].

Nowadays, the comprehensive term "Geospatial" is widely used all over the world to name the information system, public committee or organization such as clearinghouse, FGDC, GITA, and private enterprise, etc [4]. For example, in 1994 AAG(American Association of Geographer) used the term "Geo-Spatial data" and "Geospatial Information". In 1996, University of Washington used "Geospatial Information Age(GSIA)". Recently, "Geospatial Information" is widely used as the integrated or representative name for the information systems such as GIS, LIS, UIS, AM/FM, ITS, etc. and their relevant technologies.

Present status of Korea

In Korea, the educational courses in university related to surveying and GIS are basically offered by "Department of civil engineering" or others. The "Department of Cadastre" founded at university about 20 years ago which deals with the surveying and related subjects as main courses. While surveying is offered by "Department of Landscape", "Department of Urban Planning", "Department of Forestry" as a selective course. The first department offering surveying as major is "Department of Geodetic Engineering", which is founded in 1992.

The newly born name "Geomatics" or "Geoinformatics" is used in the recently founded departments such as "Department of Geoinformatic Engineering", "Department of Geoinformatics". Table 1 shows the present status of Surveying or Geomatics oriented departments in Korea [3],[5].

Table 1. Present Status of Geomatics oriented Departments in Korea

University	Kyongil	Inha (univ.)	Inha (col. of tech.)	<u>Namseoul</u>	Seoul Municipal
Department	Urban Information and Cadastral Engineering	Geoinformatic Engineering	Geoinformatics	Geographic Information System	Geoinformatics
Founded Year	1992	1994	1991	1996	1996

Recently, the acquisition and analysis of spatial data are regarded as very important for the planning and manipulating of national land plan, urban plan, construction plan and so on. To meet the above tendency and supplement the social circumstances, the "Land Survey Act" is revised in detail. Especially, to reflect the trend of technical development and utilization of new technology in the field of surveying and GIS, the mother law and enforcement ordinance are revised in detail. The essential contents are as follows;

- The name for the technician is changed from "Surveying and Geodesy" to "Surveying and GIS".
- GPS Control station is designated as permanent surveying station.
- The reference ellipsoid shall be changed from Bessel to International Ellipsoid in a few years.
- The coordinate system for national control framework shall be changed from local plane rectangular system to three dimensional, geocentric Cartesian coordinates.
- The definition of "Digital Map" is extended to "Digital Topographic Map" and its variation map of a certain theme or purpose, i.e., underground facility map, urban planning, land use, etc.

Society and Association

Many societies and associations related to surveying and GIS are founded and take active parts in academic and professional work. Major societies are Korean Society of Surveying, Geodesy, Photogrammetry and Cartography (KSSGPC), Korean Society for Geo-spatial Information System (KOGSIS), Korean Society of Remote Sensing (KSRS), Geographic Information System Association of Korea (GISAK), and Korea OpenGIS Association (KOGISA). Major associations are Korean Association of Surveying and Mapping (KASM), Korea Association of Surveying & Geo-spatial Information Industries (KASGII), Geospatial Information and Technology Association Korea (GITAK). Some examples of their activities are as follows:

In February 2000, KSSGPC held the international symposium under the catch phrase of "New Millenium

and New Mapping Era". In this symposium international academic exchange has been made at 3 sessions; Disaster Preventing System and Digital Mapping, Up-to-date technology (RS, GPS, LIDAR), and Geospatial Information Infrastructure.

In May 2001, KASM successfully held the first "Geomatics Forum" having the catchword "The Role and Importance of Surveying in the implementation of GIS". Many papers are presented and discussed through the 5 sessions; Establishment of relation between surveying and GIS, Present and prospects of GIS data acquisition, From data to Geoinformation, etc.

In March 2002, four independent societies related to GIS - KOGSIS, KSRS, GISAK, and KOGISA - held a joint conference successfully. The joint conference has continuously held once every year since then.

In April 2002, KSSGPC held the international symposium commemorating 20th anniversary of the society which has the slogan "Present and Vision of Geomatics". Many scholars and technologists on surveying and GIS joined and exchanged their professional know-hows.

Problems and Future Vision

Surveying and GIS is essential to solve the problems of human society because it has the solving potential as follows;

- It can efficiently acquire the spatial data for the temporary varying earth, land, or urban area. The advanced techniques of Remote sensing, GPS, digital photogrammetry can do them very efficiently, rapidly, widely, accurately comparing to the traditional techniques.
- It can make rapid retrieval and comfort management of various kinds of spatial data. GIS - one of the major stems of surveying or geomatics - can provide efficient data structure, standards of data format, database management system which are comfortable for manipulating and searching spatial data.
- It can utilize digital technology to accomodate the spatial data as pre-processing for analyzing spatial data or extracting and manipulating the information. Also it can give the way of processing or calculating technology for the various procedures of data processing such as coordinate transformation, scale unification, map projection and transform, interpolation, statistical processing, and logical operation.

Consequently, it can be said that synthetic and scientific approach is needed to utilize the techniques of information treatment in surveying and GIS. Also to fulfill the professionalism of surveying and GIS at university education, drastic investment and care for the majoring courses are needed so much. And more, curriculum with sufficient amounts of majoring subjects such as surveying, geodesy, GPS, photogrammetry, remote sensing, digital image processing, GIS, computer science, geography, mathematics, statics, etc. will be established and a lot of experts or professors for the course are needed basically.

On the other hand, most of the major enterprises have the vision and opinion for the development or change of future technology of surveying and GIS as follows [6];

- The utility of imagery information is spreading through plenty of satellite imagery.
- Geomatics market will be expanded and opened with the spreading information by internet.
- Surveying and GIS will act as the core in the procedure of integration of information technologies.
- The important factors to make further advancement of surveying and GIS are; first, convenient and sophisticated software and service for internet; second, powerful hardware of easy handling, communicating and networking between independent platform; at last user convenience.
- The basis of gathering and utilizing vast amounts of information in the government through the whole world will be realized.
- The profession of surveying and GIS will be activated by the induction of OGIS(Open GIS Standards).
- The policy and enterprise of surveying and GIS will be changed from the government initiative to the complex form of public and private, and shall arrive at private initiative.
- Total solution with S/W, H/W, data transformation, training and application will be introduced.

Conclusions

The surveying professions are now experiencing the crisis of identity in the advanced or developing countries. Traditional surveying profession based on construction surveying and cadastral surveying is gradually being contracted according to the shock of technological development and their influences on efficiency or productivity. The various phenomena such as rapid changes of technology, policy, global market, and spread of internet, etc. are oppressing the surroundings of surveying profession [7].

Hence, the surveying technology should cope with those changes and also should take great efforts on technical development, and raising the viability to meet the market demand. Also positive exploitation and challenge are needed for the expanding of professional region, technical development, creation of market demand. Moreover, it is considered that we should carefully focus on and study the introduction and use of diverse new terms of surveying and GIS to meet the current trend of technical development and rapid changes.

Also, we should cope with various surveying consumers such as civil engineering, construction industries, etc. to expand the market and their demands. For those purpose, enhancement of educational system and program for the training of experts or technicians is required. While the complement of laws and legal system, construction of cooperative system in business are also required to make the situation that surveyors should participate sufficiently in the procedures of investigation, design, construction and supervision of construction and related works.

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