The Advanced Proposal for the Successful Cadastral Resurveying in South Korea

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Key words: Korean Modern Cadastral System, Cadastral Resurvey, Network-RTK, World Geodetic Reference System Korea Positioning Service System (KOPOSS)

SUMMARY

Korean modern cadastral system was established by the Japanese land survey project to levy taxes on land owners during the Japanese colonial period in the early 1900s. In 1950, the cadastral law had legislated to seek for the effective management of the land and protection of the proprietary rights in Korea. However, since the early 1990s, many people have been steadily demanding the cadastral resurveying due to the low quality of reference points, usage of worn-out cadastral map of the paper-made about a hundred years old, existence of unclear ownership land, and the increase of discordance between cadastral book and actual land tenure.

Preliminary and experimental research on cadastral resurvey lasted from 1992 till 1994, and in 1996 legislative special law of the cadastral resurvey was formulated and proposed, but it was rejected after disagreement among the involved government departments. After this, from 1996 to 1997, the coordinate system conversion research from a local cadastral coordinate system to a world geodetic reference system was studied in connection with nation GIS.

As a result of these efforts, today the model project of the cadastral resurvey has been implemented in seventeen nationwide districts. According to the executive planning, the model resurvey will be implemented from 2008 to 2010, and afterwards, Korean cadastral resurvey will be diffused throughout the whole country as from 2011. This project involves the use of various experimental measurement methods such as Terrestrial Laser Scanning, Cadastral Leveling, and RTK-GPS Surveying to achieve the resurveying purposes which are the introduction of the global coordinate system in cadastral part and the materialization of the 3-D multi-purpose cadastre. Furthermore, South Korea has a Korea Positioning Service System (KOPOSS) which provides four important services such as Raw Data Service, Quality Control Service, Automatic Computation Service, and Network-RTK Service.

In conclusion, the main objective of this paper has been to proposal the Korea cadastral infrastructures for the cadastral resurveying, and to develop the current KOPOSS for successful cadastral resurveying in South Korea.

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1. INTRODUCTION

Korean modern cadastral system was established by Japanese land survey project to levy taxes on land owners during the Japanese colonial period. The project was performed sequentially land survey, from 1910 to 1918, as well as forest survey from 1918 to 1924. However, the cadastral map, which was created by the land survey project, has used to cadastral survey about 100 years since 1912. As a result, the map can not service with good accuracy. Moreover, Korea has many different cadastral local control point networks which are originated from different coordinate datum whereas the co-ordinates of each control point have its own errors. It causes gross survey error and incurs the enmity of the people. Hence through the cadastral resurvey in Korea, it would be served the high accuracy and homogeneous survey result to cadastral surveying. The proposed cadastral infrastructure and advanced KOPOSS should be contributed the successful cadastral resurveying in South Korea.

2. KOREA CADASTRAL SYSTEM AND RESURVEY PROJECT

2.1 Korea Cadastral System

The current Korea cadastral system was established according to the results of the land and forest surveying projects from 1910 to 1924. Through these projects, overall cadastral surveying and land review were performed and progressed to graphical cadastre by surveying of control network and plane surveying. The government had implemented land survey project to register and certify the people's ownership of lands. The results of the cadastral system have been used to provide information for: reliable taxes, legal protection of land rights, and efficient management of lands (Ryu, 1994). However, Korean cadastral system has the following problems so the cadastral resurvey is required by South Korean people.

- The cadastral control points originated from Tokyo datum
- Gall, damage, and warp of the paper map
- There is no land ownership or There is Japanese land ownership
- The inaccuracy of the survey result due to using different local control points
- Existence of the uncorrected island
- Increase of the court costs for Land dispute(271 million $ / year)

2.2 The Resurvey Project in South Korea

South Korea has been executed the research on cadastral resurvey, establishment a basic plan, holding a public hearing for enactment a special law, and making a budget plan for cadastral

resurveying from 1992 to today. As a result, the model project of the cadastral resurvey has been implemented in seventeen nationwide districts from 2008 to 2010 during three years.

2.2.1 The History of the Cadastral Resurvey

The first cadastral resurveying project was started by the Ministry of Home Affairs in 1992 with preliminary and experimental research on cadastral resurvey, and the basic plan of the cadastral resurvey project was established by the Ministry of Home Affairs in 1995. In 1996 the legislative special bill of the cadastral resurvey was formulated and proposed to the legislature however, it was rejected due to disagreement among the involved government departments. After this, the special bill of the cadastral resurvey was presented to the National Assembly in 2006. However, the Korean government and the National Assembly agreed that the model project should be started firstly for cadastral resurveying after the model project the special bill will be legislated.

Years	History of resurvey	Others
1992 ~ 1994	Preliminary and experimental research on cadastral resurvey	
1995	Establishment of basic plan of the cadastral resurvey project	the Ministry of Home Affairs
1996	Legislative special bill of the cadastral resurvey was formulated and proposed	
2006	Presentation of the Special law of the land resurvey to the National Assembly	Rejected because of disagreement among the involved departments
2006 ~ 2007	Studies in coordinates conversion system from local to global coordinates	
2007	Reported to government on making a digital cadastre project plan	Changed the project name from resurvey to digital cadastre
2008	Started the digital cadastral model project	MLTM

Table 2-1: History of the Cadastral Resurvey

2.2.2 The Model Cadastral Resurvey Project

The model cadastral resurvey project has started by the Digital Cadastral Model Project Agency since 2008. The table 2-2 shows an outline of the model project and the project carries out as follows;

- Introduction of the global coordinate system
- Professional training for experts
- The parcel surveying
- Carrying out of the control point surveying and leveling

- Measurement of 3-dimensional database
- Liquidation
- Registration of the cadastral records
- RTK-GPS surveying

The main objective of the model project is that it finds some problems which will be appeared to cadastral resurvey, and seeks a solution to solve the problems.

Project Period	2008 ~ 2010	3 years
Project Scope	17 districts	Nationwide scale
Project Load	8,874 / 5,559 ㎡	Parcel/㎡
Project Budget	$10.7 Million	US Dollar

Table 2-2: The model project of the cadastral resurvey

3. KOREA POSITIONING SERVICE SYSTEM

The Korea positioning service system can be divided two kinds of system such as KOPOSS for the land area and DGNSS Central Office for the coastal sea area in South Korea. The KOPOSS (Korea Positioning Service System) was established by National Geographic Information Institute (NGII) in 2003 till 2008. In 2003 it planned first time and started services in 2006 and finally has been completed on 21 April, 2008. The KOPOSS consists of four main important parts such as Data Service for the Post-processing, Automatic Computation Service on the GPS Data Download Service & NGPS Web, Quality Control Service, and Network-RTK Service. The services are providing free of charge to users.

3.1 Permanent Reference Stations

The first permanent reference station was established by NGII in 1995. It was an opportunity to spread positioning service system in South Korea. Today (July 2008), South Korea has 92 permanent reference stations of GNSS which are controlled by six different organizations.
The permanent reference stations can be seen in Table 3-1. According to the changes of the government organization at April 2008, the NGII is going to operate unified 44 permanent reference stations which have been operated by MOGAHA and NGII (see Figure 3-1). Result of unified the permanent stations has the following advantages. One is that it improved the quality of surveying as reduction of average distance for the permanent reference stations (before unified 80km → after unified 40km). The other is that it is easier to maintain the KOPOSS and to provide services to users.

As mentioned previously, South Korea has installed 92 permanent stations therefore the network station's configuration has not caused any problems. Sharing of the permanent reference stations into one system is essential issue because each of the different agencies is operating the stations independently. Hence it has to integrate from six each organization to one main organization to strengthen national competitiveness and upgrade the KOPOSS.

Table 3-1: Korea Permanent reference stations of GNSS (July, 2008)

Name of the Organizations			Quantity	Set up
MLTM	MOGAHA	Unified stations(21.04.2008)	30	1998~1999
	NGII		14	1995~2000
	DGNSS Central Office		25	1999~2006
Korea Astronomy Observatory(KAO)			9	1995~2001
Korea Institute of Geosciences and Minera l Resources(KIGAM)			7	2002~2007
Korea Electric Power Corporation(KEP)			5	1999
Korea Cadastral Surveying Corporation(KCSC)			2	1995~1997
Sum total			**92**	

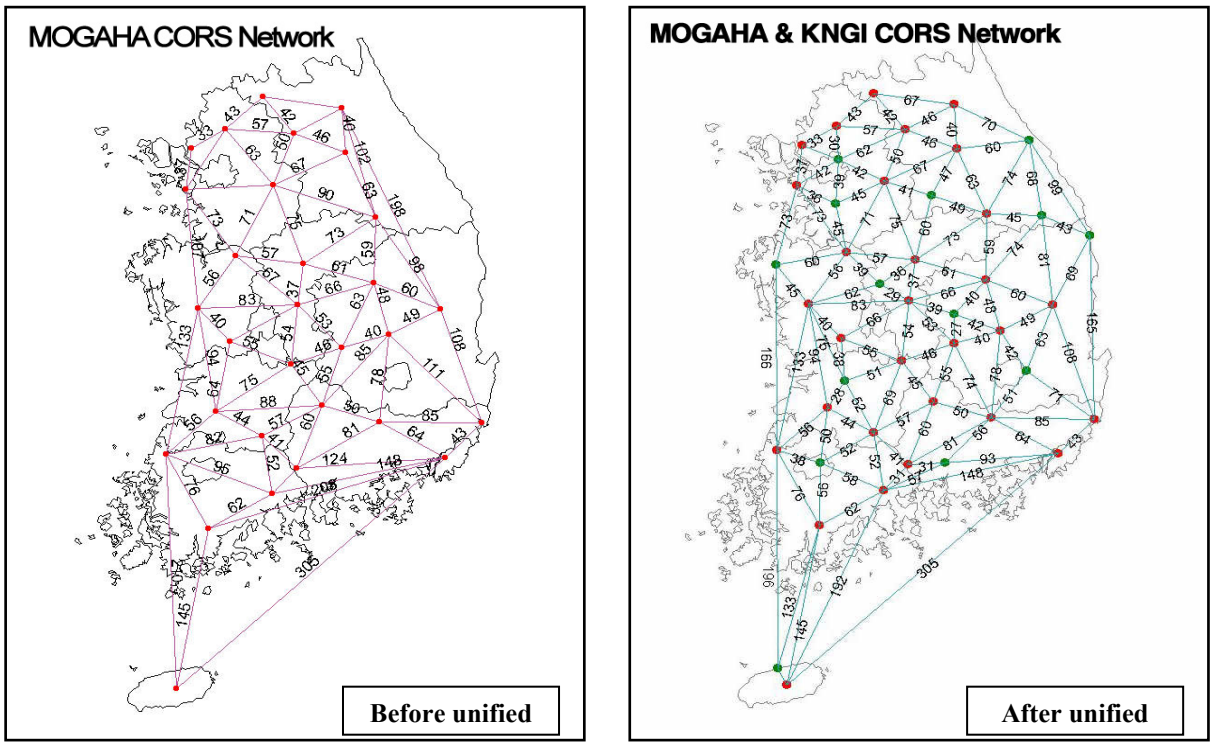

Figure 3-1: the unified permanent reference stations status

3.2 Korea Positioning Service System

The Korea positioning service system is divided into four parts such as raw data service for Post processing users, quality control service, automatic computation service, and VRS-network service.

3.2.1 Raw Data Service

The raw data for the post- processing can be downloaded on a World Wide Web (WWW) in Receiver Independent Exchange (RINEX) format with free of charge. It provides 30 seconds interval time of international standards and observed the day 09:00 to next day 09:00 during

24 hours. Observed data is processed automatically processing baselines and adjustment after that it is transformed into RINEX file. However, it does not provide both GPS and GLONASS RINEX-data because some receivers can observe only GPS signal so these receivers must be replaced by new receiver which can observe both GPS and GLONASS as wall as in the near future Galileo.

3.2.2 Quality Control Service

The quality control service can be checked the observed GPS and GLONASS data quality when you enter the data into a Web site, http://gps.ngii.go.kr/open_content/control/control01.asp, with RINEX 'N and O' files. It is provides the following services; analysis of the satellite signal (signal strength of the L1 and L2), flash videos with each satellite location or time-phased display, analysis of the DOP (GDOP, PDOP, HDOP, VDOP, TDOP), analysis of satellite altimeter and also this system can save the result reports with text file.

3.2.3 Automatic Computation Service

The automatic computation service system, called NGII GPS Processing Service (NGPS) in South Korea, calculates static point positions. When submit the RINEX file via Internet, users can be found unknown point position automatically within 1~2 minutes (large volume, for instance 8 MB, need 8 minutes) on the Web site. It is very valuable and convenient for unskilled users.

However, the final co-ordinates are delivered the Latitude and Longitude on the WGS-84 coordinate and same Ellipsoid. if it is required the local co-ordinate, especially cadastral survey using Bessel 1841 Ellipsoid and Tokyo datum, the user have to transform the result to the desired co-ordinate. Hence the system should be improved to provide both global and local co-ordinates for geodetic surveyor and cadastral surveyors.

3.2.4 Network-RTK

The first Network-RTK planning was established by NGII in 2003 and the network-RTK started services in 2006 using 14 permanent reference stations after that, it added 18 permanent reference stations, which were managed by MOGAHA, for the provision of better accuracy to geodetic surveyors since April 2008. Control center of the network-RTK consists of hardware and software. The hardware has one RTKNet server and one GPStream server. The other hand the software was composed of Trimble VRS S/W (GPSNet, DGPSNet, RTKNet), Apache for homepage services, and MS Access for management of database.

In the case of communications systems, the control center is using exclusive line of KT Kornet 256Kbps, Router, and VPS. The permanent reference stations are using KT ADSL MyIP, ADSL Router, and VPS. Lastly users are surveying using by CDMA (cell phone) and GPS receiver. The current system of network-RTK is shown in figure 3-2.

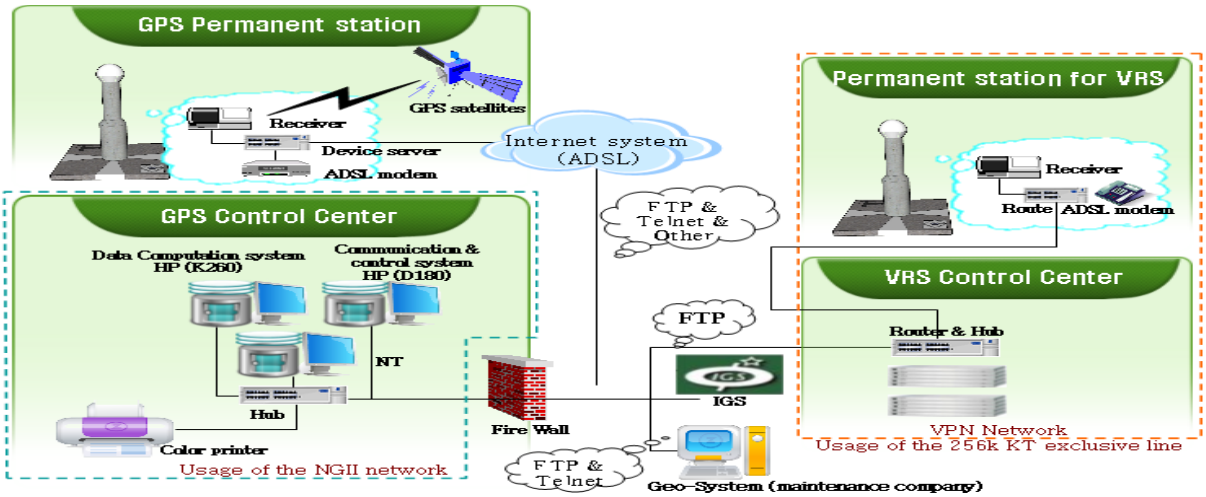

Figure 3-2: the current network-RTK system of the NGII

The *Root-Mean-Square Error* (RMSE) of the network-RTK system is 3.1cm that is not only very good accuracy but also very well-built system because normal RTK-system's RMSE is 2.0 ㎝. However that accuracy was calculated by the mean distance of permanent reference within 50km. The RMSE is rapidly increasing more than 50km. Hence additional installation of the permanent reference stations is a very important subject.

3.3 DGNSS Central Office

The Ministry of Land, Transport and Maritime Affairs, MLTM, has been provided DGNSS service for the secure voyage in South Korea coastal area since 1999 at the west coast. The East and South coastal area started the same service since 2001. The MLTM will be spread out the DGNSS service coastal area as well as land area inclusion forest area.

3.3.1 The roles of DGNSS Central Office

The main roles of the DGNSS Central Office are not only the DGNSS service for the secure voyage in coastal area but also the Raw Data Service via Internet with the RINEX formant to general users. Moreover it services original role as lighthouse for the ships.

3.3.2 Components and Functions

The DGNSS Central Office consists of the three main parts such as 11 Coast Reference Stations, 9 Integrity Stations, and 5 Inland Reference Stations.

The Coast Reference Station: The eleven Coast Reference Stations are located in the coastal islands of the Korean Peninsula such as Socheong-Do, Palmi-Do, and Eocheong-Do etc. There are 3 people to work in the each Coast Reference Station. The main functions are both the DGNSS service and the lighthouse service. Besides it carries out meteorological

observations and coastal survey as well as Raw Data Service for the post-processing users via Internet with free of charge.

The Integrity Station: The nine Integrity Stations are located in the coastal area and near the Korean islands such as Dokdo, Jukbyeon-do, seoyimal-do etc. The main function of the Integrity Station is the checking of the accuracy of DGNSS signal which was broadcasted by the Coast Reference Station as users. Besides it carries out Raw Data Service for the post-processing users via Internet also free of charge.

The Inland Reference Station: In 2004, the DGNSS-Muju-Office firstly opened as the Inland Reference Station after that five Inland Reference Stations are opened as same office. The Inland Reference Station provides DGNSS service, system operating, system control, management of the data for land users. However, the Inland Reference Station duplicates the function and location with the KOPOSS function and location. Hence, it needs to unify the function and office but it is difficult to unify.

Primary role		DGNSS
Expected error		Within 1m
Coverage area	The coast area	185km
	The inland area	80km
Stations	Coast Reference Station	11 stations
	Integrity Station	9 stations
	Inland Reference Station	5 stations

Table 3-2: Outline of the DGNSS Central Office

4. THE ADVANCED PROPOSAL

4.1 Establishment of the Cadastral Infrastructures

This paper has been suggested the establishment of the cadastral infrastructures as following three ways. First is re-establishment the cadastral survey control points by a unified control-point-network system. Second is making an introduction of the World Geodetic Reference System to cadastral segment. The last is legislative special bill for the cadastral resurvey.

These infrastructures have the following advantages:

- Providing same cadastral survey result in case of observing the same object several times in Korea as well as all of the world
- Leading successful cadastral resurvey
- Coping with disadvantages of cadastral resurvey by unified control point network system
- Supporting of the secure and continual budget by an enacted special bill of the cadastral resurvey

4.1.1 Re-establishment of the cadastral control points

South Korea has many different cadastral local control point networks which are originated from different coordinate datum whereas the co-ordinates of each control point have its own errors. Further there is a coverage problem where control points are concerned; some areas don't have control points. Due to these conditions, the cadastral survey result is not homogeneous as wall as same result. To cope with this problem, this paper proposed the re-establishment of the cadastral survey control points in South Korea.

Type	Quantity	Name	Coordinates
3 unification Origin	3	Eastern origin Central origin Western origin	South-North : 500,000m East-West : 200,000m Jeju-Do : 550,000m 200,000m
Aged the Sosamgak-origin	11	Mangsan, Gaeyang Jobon, Gari, Dongkyeong etc.	South-North : 0 間 East-West : 0 間 間 : a Gan is 1.818 meter
Special the Sosamgak-origin	18	Pyongyang,Uiju, Shinuiju, Jinnampo, Ulleungdo etc.	South-North : 10,000m East-West : 30,000m

Table 4-1: Korea cadastral survey origins

4.1.1.1 Project Overview

This project, the re-establishment of the cadastral control points, has been started in March 2009 and will be finished end of 2009 by $1.5 million's project budget. Primary business is establishment of a unified control-point-network system for cadastral survey, convert to World Geodetic Reference System, calculation of the parameters, running a trial etc.

4.1.1.2 Establishment of a Unified Control-point-network

Korean cadastral control points are 545,404 points which can be seen in Table 4-2. However, these control points originated from different coordinate datum whereas the coordinates of each control point have its own errors and coverage problems. As a result, the cadastral survey result can not offer homogenous and harmonious survey result. So to cope with this problem, the paper proposed a unified control point network. The project objective is that it provides homogenous and accurate survey result to cadastral surveyors by the established cadastral control point network.

Types	Quantity(point)	Others
Grand total	545,404	
Station of cadastral triangulation	4,652	Field survey
Station of sub cadastral triangulation	15,269	Field survey
Supplementary control point	525,483	indirect survey

Table 4-2: Status of the cadastral control points

Several methods can be used to investigate the cadastral control points. This paper used both field survey for the cadastral triangulation and sub cadastral triangulation stations and indirect survey for the supplementary control points to examine the whole cadastral control points. Through the investigation, the 1600 points were selected as control points to make a unified control point network to cover the whole South Korea for cadastral survey.

4.1.1.3 GPS Survey and Calculate the World Geodetic Reference Coordinates

The above-mentioned 1600 control points and another 2400 supplementary control points were observed by GPS surveying. The 1600 control points have been used to establish a unified network and the 2400 supplementary control points have been used to convert the local coordinates to world geodetic reference coordinates. The observed 4000 control points were used to calculate the parameters to convert between local cadastral coordinates and world geodetic coordinates. These calculated parameters corresponded with current national reference network, permanent reference station network, to offer the same survey result both cadastral segment and geodetic segment. The established network can provides same survey result and good survey accuracy in all of Korea. Besides, in the long run it can be coped the disadvantage of cadastral resurvey and it will be played an important role of the cadastral infrastructure to carry out Korea cadastral resurvey project.

4.1.2 Introduction of the World Geodetic Reference System

The defense and the marine sector are using the world geodetic reference system since 2003, but the geodetic and the cadastral sector still are using the local coordinates system which is called Tokyo datum. The geodetic and the cadastral sector will be introduced the global coordinates system in 2010. In 2009, the central and the local government have a plan to establish the cadastral infrastructures.

There are 3 types of the conversion program in Korea. Detailed information is shown in Table 4-3. Among others the GeoDT is the best software not only to edit and manage the database but also to apply the various data formats such as DWG, DXF, NGI, SHP, DGN, SGD etc. but the production requires using fee. Hence this paper suggests the KASM-trans software which has various functions like a GeoDT but it is free of charge.

Production Name	Software Name	Functions			Data Format	Cost
		Calculation of distortion	Conversion to DXF	Conversion to SHP		
NGII	GDK-trans	○	○	×	DXF, NGI	Free of charge
KASM	KASM-trans	○	○	○	DXF, NGI	Free of charge
GITC	GeoDT	○	○	○	DWG, DXF, NGI, SHP, DGN, SGD	A charge

Table 4-3: the Conversion Programs in Korea

4.1.2.1 The 9 steps for Conversion of the World Geodetic Reference System

The following nine steps can be converted to the world geodetic reference system from local coordinates system. The nine steps are Confirmation of common points, Calculation amount of distortions, Classification and erasure for non matching points, Classification and erasure for overcrowding common points, Calculation of residual distortions, Calculation of the Covariance function, Modeling of the distortion, Converting(making cadastral maps), and Valuation of the accuracy for new cadastral map.

Steps	Items	explanation
Step 1	Confirmation of common points	Confirmation both local and global coordinates about same common points
Step 2	Calculation amount of distortion	Using national parameters, conversion to the global coordinates(ITRF+GRS80) from local coordinates (Tokyo datum) after that calculation of the amount of distortion
Step 3	Classification and erasure for non matching points	To secure data quality, classification and erasure for non matching points(if the common points three times over the root-mean-square error, it will be classified and erased)
Step 4	Classification and erasure for overcrowding common points	Classification and erasure for overcrowding common points
Step 5	Calculation of residual distortions	Calculation of residual distortions for X and Y axis
Step 6	Calculation of the Covariance function	Calculation of the Covariance function for the residual distortions on the X and Y axis
Step 7	Modeling of the distortions	Using an interpolation
Step 8	Converting	Converting by local parameters and then making cadastral maps with global coordinates
Step 9	Valuation of the accuracy	GPS observation for checking an accuracy by the selected checking points

Table 4-4: The nine steps for translation to the world geodetic reference system

4.1.2.3 Conversion of the KLIS Data-base to Global Coordinates

Korea has Korea Land Information System (KLIS) that consists of the topographical map, cadastral map, and use zoning map. The Table 4-5 below shows volume of the KLIS database. Among these data, the 1/5000 topographical maps were converted by central government and the 1/1000 topographical maps are concerting by local governments. It will be finished the conversion before 2010 year. However, the cadastral maps and the use zoning maps still can not carry out the conversion because of many problems. The central government, Ministry of

Land Transport and Maritime Affairs, has the schedule to convert the cadastral and the use zoning maps to global coordinates system until 2010.

Items	Amount of layers	Volume of data(MB)	Others
Grand total		123,567	
topographical map(1/1000)	44	77,724	Converting now
topographical map(1/5000)	41		Finished conversion
Cadastral map (37 million parcels)	9	12,887	The conversion will be finished in 2010
Use zoning map	330	32,956	"

Table 4-5: Volume of the KLIS data

4.1.3 Legislation of the Special Bill for Cadastral Resurvey

The special bill for the cadastral resurvey should be included diverse and comprehensive contents such as work force, budget planning, organization, enforcement methods, techniques, liquidation methods, registration and management of cadastral records etc. There are two major approaches to legislate general bill in Korea. One is assemblyman legislation and the other is government legislation.

Until now, the assemblyman legislation type was used to legislation the cadastral resurvey bill because of simple method and express processing. However it was against with involved departments therefore, this paper recommended the government legislation due to agreement with related government departments. The national project should be led by government, and the semi-government or private enterprises must be supported the government project.

Legislation types	Advantages	Disadvantages	Character
Assemblyman legislation	- possibility to legislate bill by short time(5~9 months) - simple to legislate	- Exception by involved government departments - Lack of the justice and transparency	Quickness
Government legislation	- security of the justice and transparency for new bill - agreement with involved government departments	Need the long time to legislate(140~270 days more longer)	Stability

Table 4-6: the legislation types

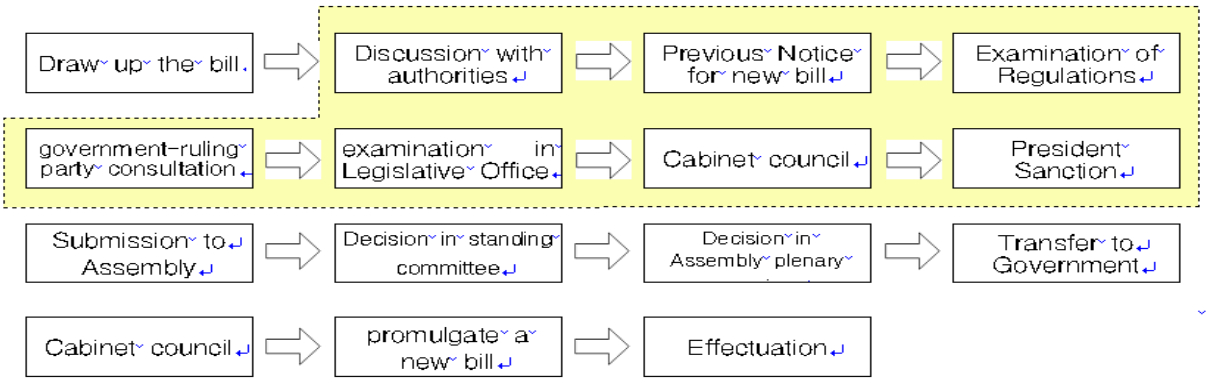

Figure 4-1: the Legislative proceedings: In the case of the Assemblyman legislation is omitted the legal formalities of the yellow box.

4.2 Advanced Proposal for the KOPOSS

In chapter 3, fourth functions of the Korea Positioning Service System were discussed. However, there is no cadastral service menu for cadastral systems such as management of the cadastral records, three-dimensional registration or management, conversion function for cadastral maps between local and global coordinates system. Especially for the cadastral resurvey, the KOPOSS has not any functions without cadastral survey so this chapter suggested advanced proposals such as conversion system, and three-dimensional registration and management system in the KOPOSS.

4.2.1 Conversion System

Table 4-3 has been shown Korean conversion programs but these programs focused on the 3-dimensional coordinates system. For this reason, the programs can not use for current cadastral system because the cadastral map has only two-dimensional coordinates such as X and Y. That is to say, it does not use the height to indication of position in the cadastral map.

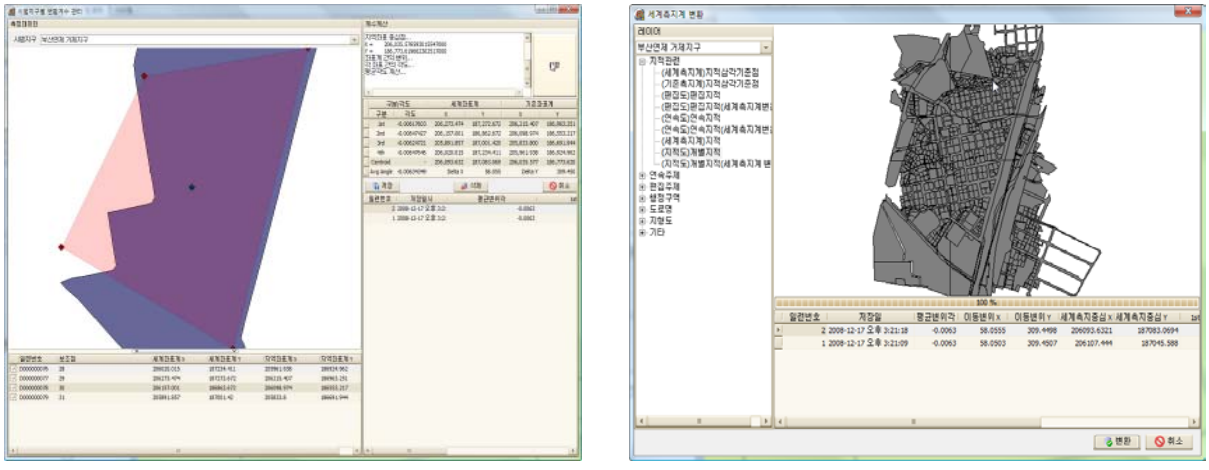

Figure 4-2: the conversion by the CMT

4.2.2 Making of the Conversion Program for Cadastral 2-D Map

Figure 4-2 shows the made software for cadastral map conversion from local coordinates to world geodetic reference system. This system was made considering only 2-dimensional plane coordinates it was called Cadastral Map Translation (CMT). This software carries out several steps which were mentioned in Table 4-4; the nine steps for translation to the world geodetic reference system. The Figure 4-2 shows calculation conversion parameters (the left side) and completed conversion map to global coordinates (the right side).

For the validation of the new conversion program, CMT, GPS surveying has been used. The first step for validation is the GPS observation with static surveying on the 42 selected points. The second step is calculation both local coordinates and global coordination on the same point through the Post-processing. Finally it can be calculated the RMSE through the comparison of results between calculated results by observed GPS and converted result by new conversion program. The Table 4-7 shows the conversion result by the CMT program.

According to the result of the validation (see Table 4-7), the RMSE is 1.21cm (dx is 0.57cm and dy is 1.21cm) so that the validation of new program has been confirmed. Moreover, for cadastral resurvey it needs the upgrade to service the more good accuracy, and if it introduces the 3-D cadastral system, it will be applied the 3-D conversion function in the CMT program.

ID	local coordinates by GPS		global coordinate by GPS		conversion results by CMT			
	X	Y	X	Y	X	Y	dx	dy
5	189829.78	144121.62	190136.10	144195.40	190136.10	144195.42	0.0015	-0.0113
6	189674.05	144200.55	189980.38	144274.33	189980.37	144274.34	0.0052	-0.0082
7	189885.05	144297.01	190191.38	144370.79	190191.37	144370.80	0.0071	-0.0146
8	189760.47	144232.67	190066.79	144306.45	190066.79	144306.46	0.0055	-0.0100
9	189382.64	144121.36	189688.96	144195.15	189688.96	144195.15	0.0037	0.0009
10	189435.29	144194.50	189741.61	144268.29	189741.61	144268.29	0.0059	-0.0009
. . .				. . .				. . .
40	188801.16	143789.10	189107.48	143862.89	189107.49	143862.87	-0.0034	0.0170
41	188825.78	143706.83	189132.11	143780.63	189132.11	143780.61	-0.0068	0.0165
42	188907.04	143720.55	189213.36	143794.34	189213.36	143794.33	-0.0072	0.0144
				RMSE			**0.0057**	**0.0121**

Table 4-7: the conversion result by the CMT software

4.2.3 3-D Registration and Management System for Cadastral Information

Until now in Korea, three-dimensional cadastral system had not introduced in the cadastral system. However, in the near future, the 3-D cadastral system should be introduced in Korea. Hence the cadastral resurvey must be considered the 3-D registration and management system.

This system will be applied to the KOPOSS after that the KOPOSS will be in charged the important role for the Korean cadastral resurvey project.

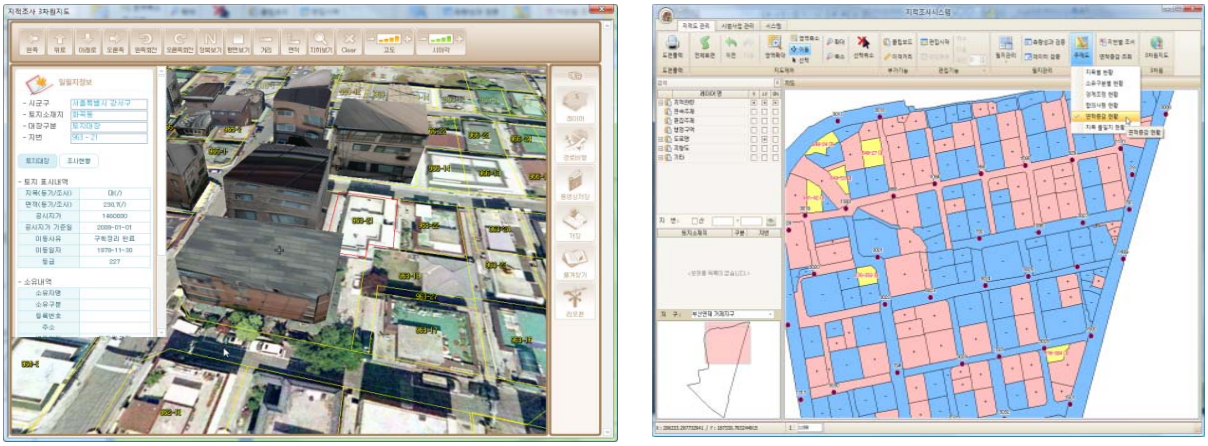

Figure 4-3: 3-D legislation and management system (left) and thematic map management system (right)

5. CONCLUSIONS

Until now Korea has insisted on the way of Cadastral resurvey project concurrently with national scale on whole land. However this way requires huge budget, manpower, equipments, technology and so on. Especially it can cause people's confusion as the property dispute. Therefore it is difficult to get the agreement from government. To cope with the problems, this paper proposed following ways to succeed the cadastral resurvey project in Korea. Firstly establishment of cadastral infrastructure was announced and secondly development of KOPOSS is done.

If cadastral resurvey project will be promoted gradually from urgent areas on the basis of these established infrastructures, like doing a puzzle, it is convinced that cadastral resurvey project successfully will be accomplished with homogeneous surveying results on whole Korean peninsula. Moreover it is also convinced that advanced KOPOSS will keep down the cost and manpower of resurvey project through providing rapid and accurate surveying results.

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