

Searching position in non-residential areas in emergency and disaster situations by using the national point number

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Key words: National point number, Grid reference system

SUMMARY

The address system based on the street name and the parcel number have been used for searching position effectively in the residential areas. But it is not easy to search position in non-residential areas like mountains, forests, shores, if there is not enough information of position about these areas. So in these areas, it is impossible to tell exact position to rescue team in emergency and disaster situations.

In order to make up for this problem, the national point number was introduced for searching location in non-residential areas in Korea. The national point numbers have been installed in the mountains, forests, shores to prepare for emergencies and disaster. It is produced by the grid reference system and composed of a two-letter pair Hangul and 8 Arabic numerals. These letters indicate position of specific region.

As accuracy of the national point number is very important, a designated organization by the government can verify position of it to enhance the reliability of accurate position.

The purpose of this paper is to introduce the current condition of the national point number in Korea and the verification method of it for accurate position.

1 . Introduction

The Korean government changed its address system based on the parcel numbers that have been using over the last 100 years to address system based on street name.

The reason why the government changed its address system is that assigning lot numbers to land was in regular sequence according to the order of creation in the beginning, but as time passed, it was irregularly assigned due to the division and merger of land because of the progress of urbanization. So, the arrangement of lot numbers is disordered, and the connectivity of the address neighboring is deteriorated. Therefore, it is very difficult to find buildings using lot numbers. Since the lot number is the information given to the land, if multiple houses are in one lot number and one address is shared, it is not possible to indicate the address of the individual house as lot number.

1.1 Address system based on the street name

- Street name address is a new address system. All the roads and streets are assigned identifying names. Buildings are assigned building numbers on a regular basis by street name. Street name address consists of a street (or road) name, a building number, and other complements (floor, room number, apt number).
- It is easy to get direction with systematic street name address and efficient to promptly cope with emergency such as fires or crimes.
- It is advisable to follow globally standardized address system and beneficial to reduce time and costs for transportation.

All of the parcels had each lot number representing the position in the address system based on the parcel number, but in the address system based on the street name, only parcels which have the building can have the address representing the position. Therefore, it is easy to notify your current location and to find specific location in the residential areas, but there is a limit to indicate the position in the non-residential area, because these areas can't have the address based on street name. So it is difficult to notify your current position quickly in the emergency, disaster situations in the non- residential areas like mountains, forests, shores. To cope with this problem, the national point number was introduced for searching location in Korea by the government. Fire department, Coast Guard, National Park operated each point number for searching location, but there was no unity, connectivity among these organizations. So the government has integrated with existing point numbers to the national point number operated by grid reference system for responding systematically, rapidly emergency situations.

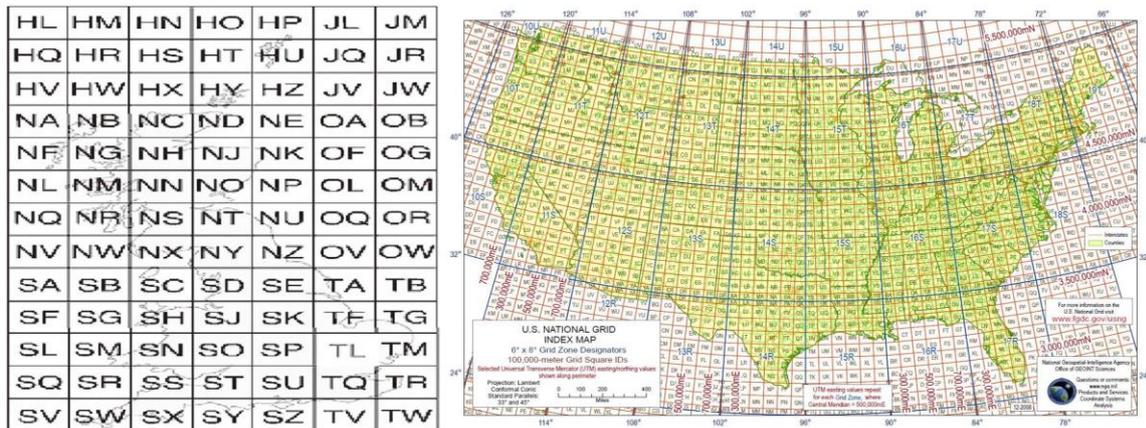
1.2 Example in other countries.

-USNG(United States National Grid) in the United States

It was developed as a national standard to ensure compatibility with location-based service of paper map, and for encouraging industry of location-based service. The size of grid is composed of 100km, 1km, 100m, 10m, 1m and they can cover the entire earth.

-NGRS(National Grid Reference System) in the United Kingdom

It was introduced in order to provide a unified coordinate system to the whole country, regardless of the scale of the map. The size of grid is composed of 500km, 100km, 10km.



[Figure1. Example of NGRS(left) and USNG(right)]

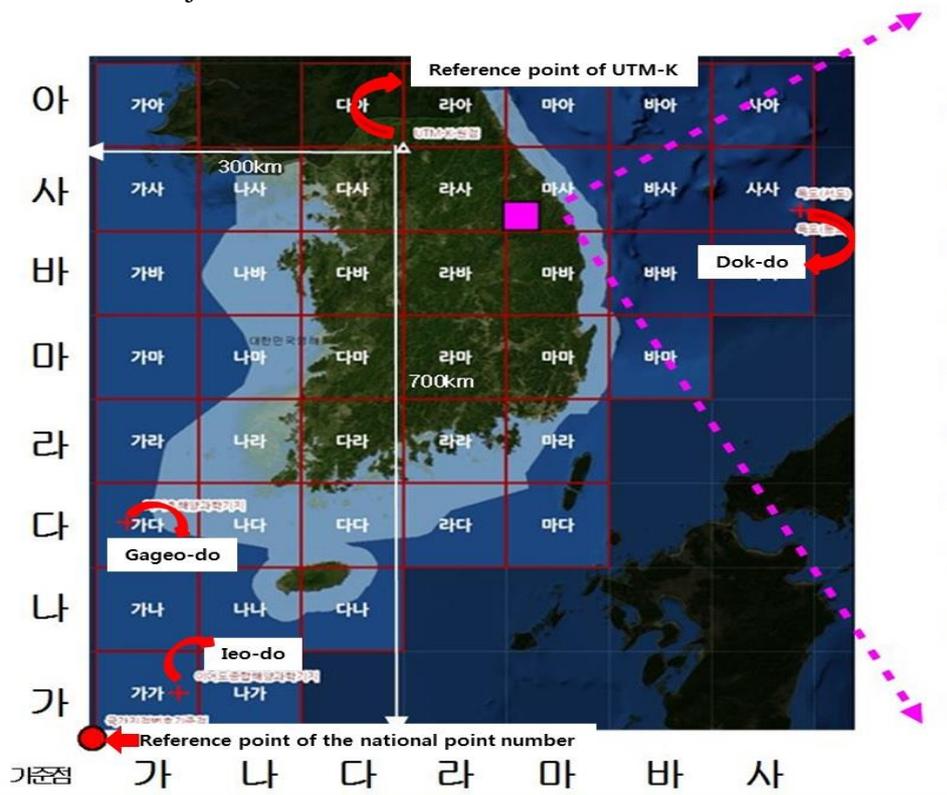
2. Main Subject

2.1 The reference point of the national point number.

The reference point of the national point number is to the south of 700km, to the west of 300km from the reference point of UTM-K. It includes the southernmost – Ieodo total marine science base, the westernmost-Gageodo marine science base, the easternmost-Dokdo.

The coordinate of its reference point is East longitude $124^{\circ}20'11.895''$, North latitude $31^{\circ}38'51.314''$ converted from the coordinate of X(N)1,300,000m, Y(E)700,000m.

The position of its reference point is the lower left corner point of the grid for covering entire land and its adjacent ocean.



[Figure2. The reference point of the national point number on the Korean map]

2.2 The composition of the national point number.

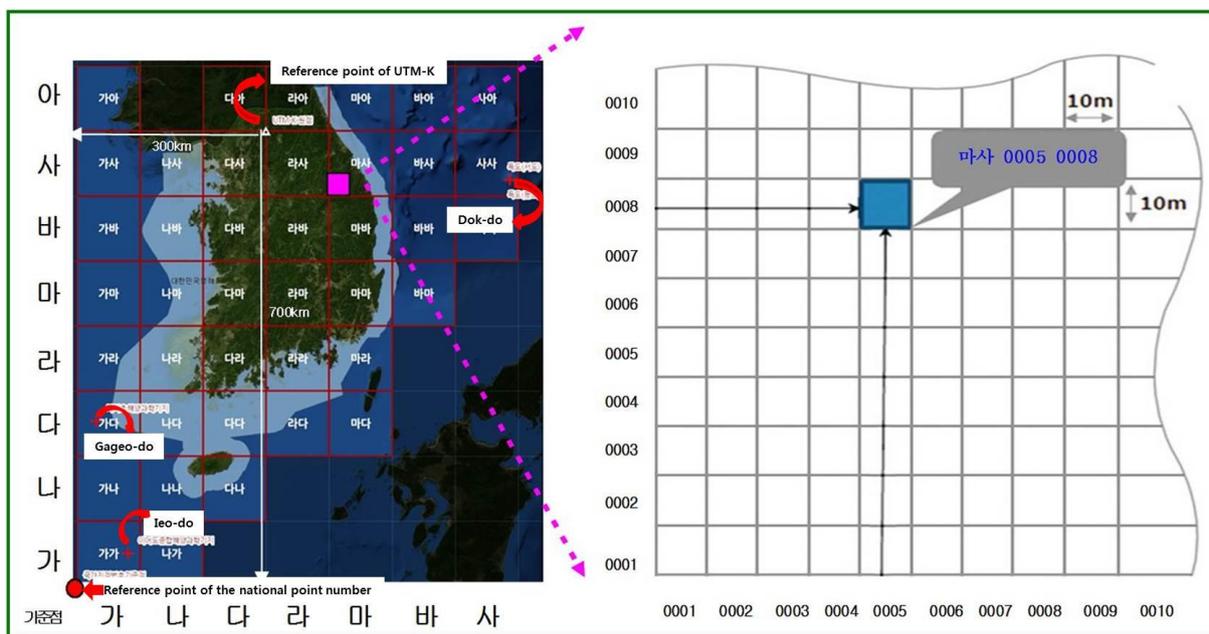
The national point number is composed of a two-letter pair Hangul(Korean alphabet) and eight Arabic numbers.

The size of grid designated by Hangul is 100km. The letter of Hangul consists of consonant and vowel ‘ㅏ’, like ‘가, 나, 다’. Each letter is assigned to grid in sequence from the reference point to the east side and to the north side. The first letter means the grid of the east-west direction and the second letter means the grid of the south-north direction.

The numbers consist of eight digits. In front of four-digits of them mean the east-west direction, the remaining four-digits mean the south-north direction. Each digit of numbers refers to the size of the grid, 10km, 1km, 100m, 10m by the 10m unit.

National Point Number (Example : 1 2 3 4 1 2 3 4)								
Axis	West - East				South - North			
Grid Number	1	2	3	4	1	2	3	4
Grid Size	10km	1km	100m	10m	10km	1km	100m	10m

[Figure3. Size of grid (Part of number)]



[Figure4. The process of national point number expressed in Hangul and Arabic numbers]

2.3 The area installed of the national point number.

2.3.1. The national point number is installed in the non-residential areas with the facilities. These facilities are pylon, telegraph pole, water gate, and breakwater and so on.

2.3.2. The specific areas are really required of indicating position in the non-residential region for managing them, because there are no address system based on street name and buildings and the facilities – pylon, telegraph pole, water gate and breakwater. This specific region is trails in the National Park

2.3.3. The danger areas including high-accident frequency of damage of human life is demanded for searching position in the emergency situations in order to rescue people effectively. These regions are river, valley, lake, reservoir and bridge where distress and drowning accidents happen a lot. It is very difficult to find the position without the national point number in these regions.



[Figure5. Installation of the national point number]

2.4 Verification of the national point number's position.

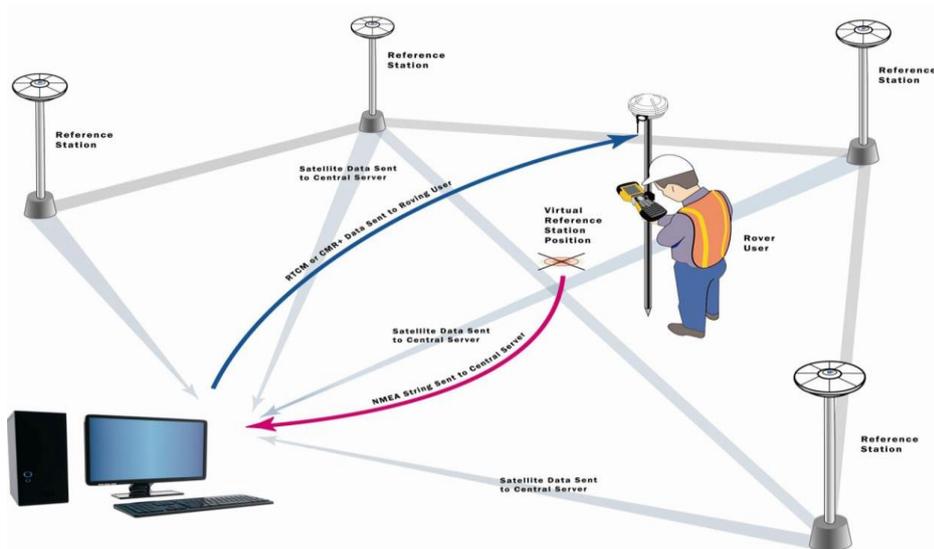
The national point numbers are installed by local government, police station, fire station, the forest service and coast guard, and made by unified official form that the government legislates. We can notify our location easily and quickly by using it in emergency and disaster situations.

So, in these situations its accurate position is related to life directly. Therefore, accuracy of the national point number is very important factor.

The government designates Korea Land And Geospatial Informatix Corporation (LX Corporation) as a organization verifying position of it for reliability of position. The LX Corporation verifies position of it by using Network-RTK surveying, when it receives a request from the organization installing the national point number.

-Network RTK Surveying

With RTN surveying, a permanent network of reference stations is required. Spacing of the reference stations can be 10-50 miles and can cover a local, regional, or statewide area. The reference station network continuously streams data (using LAN, Internet, or radio links) to a central location (server). The server then performs several functions including storage of RINEX data, performance of quality assurance checks on the raw data, network modeling and estimation of systematic errors, calculation of and conversion of correction data to a user format (RTCM format or CMR+), and communication of the data to the users. The user then receives the corrections (using LAN, Internet, radio links, or a cellular modem) in real time.



[Figure6. The process of Network RTK surveying]

Network RTK is based on the use of several widely spaced permanent stations. Depending on the implementation, positioning data from the permanent stations is regularly communicated to a central processing station. On demand from RTK user terminals, which transmit their approximate location to the central station, the central station calculates and transmits correction information or corrected position to the RTK user terminal. The benefit of this approach is an overall reduction in the number of RTK base stations required. Depending on the implementation, data may be transmitted over cellular radio links or other wireless medium.

The LX Corporation provides the letter of verification to the organization installing the national point number after surveying of Network-RTK, whether or not this location is accurate.

The letter of verification includes coordinate of X, Y, Z, longitude, latitude, height, projection, reference point, and datum.

Over 3000 surveyors who have enough experience, skill employed in the LX Corporation verify position to enhance reliability of the national point number's location to people.

국가지점번호 검증결과 통보서					
Point number	라사55732565		Facility	CCTV	
Coordinate and Longitude, latitude	X	1925652.432	Longitude	128-07-44.8258	
	Y	1055735.261	Latitude	37-19-41.5274	
	Z	690.329	Height	690.329	
Coordinate and Longitude, latitude	* 투영법 : T.M(축척계수 0.9996)		Projection		
	* 원점의 경위도 : 경도 동경 127° 30' 00", 위도 북위 38° 00' 00"		Longitude, latitude of reference point		
	* 투영원점 가산수치 : X(N) 2,000,000, Y(E) 1,000,000				
Address	강원도 영월군 수주면 두산리 산2번지				
Photo					
	Certificate and Name		지적기사 이**		
『도로명주소법』 제8조5 및 같은 법 시행령 제11조15에 따라 지점번호 검증결과를 통보합니다.					

[Figure7. The official letter of verification]

3. Conclusion

- Searching location is easy and prompt in the non-residential areas where the address system based on the street name doesn't exist in the emergency and disaster situations.
- User can notify position and somebody also can find promptly user's position by the grid reference system (The national point number) expressed in Hangul and Arabic numbers instead of coordinate of X, Y, Z, longitude, latitude, and height.
- As the government has separated the institution installing the national point number from the institution verifying its location, the accuracy of it is thoroughly reliable to everyone.

REFERENCE

-Yang, Sungchul, 2013, A study on Introduction of the National Point Number for Advanced Location-Finding

- http://water.usgs.gov/osw/gps/real-time_network.html

BIOGRAPHICAL NOTES

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