Detection of Roads Illegally Occupied by Objects Using Spatiatl Information

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***Abstract*—This paper presents a procedure designed for the use of the spatial information in the monthly updated road name/address base map and the constructed road occupancy information in detecting the roads illegally occupied by objects ("RIOOs"). Towards this end, first, the spatial information between the existing road name/address base map and the monthly updated road name base map is compared to detect new road-occupying objects, including those occupying building access roads. Second, the spatial information in the detected new road-occupying objects and the land-lot address in the road occupancy system are compared to detect the RIOOs.**

Keywords-Road Occupying Object; Spatial Information; Road Information System

I. INTRODUCTION

The assertion that 80% of information are related to spatial location was proven to be true by Caitlin based on various papers. Of these, a paper published in 1987 reported that spatial information will become part of the crucial information for government agencies in the future [1]. KALI reported, based on the results of a survey on spatial information utilization levels for administrative matters, that the spatial information utilization rate was 94% for road/water/sewage works, 57% for transport works, and 49% for land management works [2].

South Korea's Ministry of Land, Infrastructure, and Transport (MOLIT), given the nature of its function, uses more spatial information than the other ministries do. Notably, road occupancy approval must be obtained from the Road Management Authority prior to the installation of facilities in the central- and local-government-owned roads, and certain road occupancy fees are required to be paid according to the approval scale. With many regional development projects being performed of late mainly along the roads, the Road Management Authority's management of roads illegally occupied by objects ("RIOOs") is becoming increasingly tough.

To address such difficulties, this paper seeks to present a procedure for detecting RIOOs through the convergence of spatial information and road occupancy information. Also, RIOOs are limited to occasions when a new access road to storefronts and other buildings is installed, resulting in spatial information changes.

II. PROCEDURE FOR RIOOS

A. Detection of new road-occupying objects

In 1978, South Korea began government administration informatization in accordance with the master plan for administration computerization, and in 1998, the government's administration informatization project was pursued. Meanwhile, the national GIS project begun in 1995 is being pursued in the following way: a master plan is formulated every five years, ensuring consistent system construction and inter-ministerial cooperation with the aim of eliminating the duplicated construction of spatial information. The national GIS systems thus constructed include the Korea Land Information System (KLIS), road name/address information system, road management system, waterworks and sewerage management system, and underground facility integrated management system. The road name/address system involves configuring and managing the road name/address base map, which shows the information on roads, buildings, clusters of buildings, building history, etc., in the form of GIS layers. South Korea started implementing the road name/address system in 2015, across the board; as such, the system updates the spatial information in the road name/address base map every month to provide the information to the general public free of charge [3].

New building access roads are detected by mapping the existing and newly disclosed road name/address base maps.

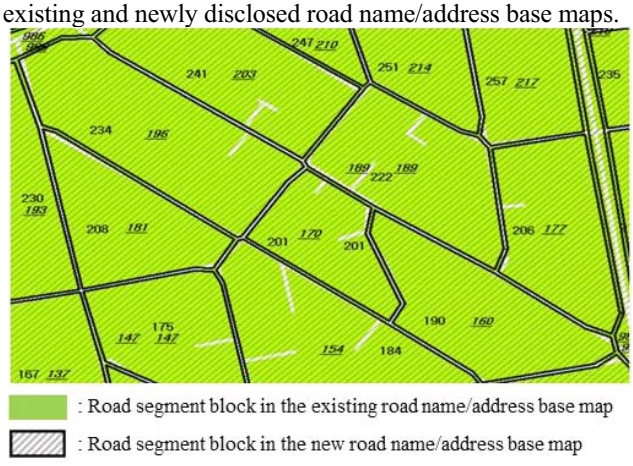

Figure 1. Matched block pair

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Fig. 1 presents the mapping of the newly disclosed road name/address base map onto the existing road name/address base map. The block where new building access roads exist in the map is illustrated in Fig. 2 The block, created due to the new building access road, consists of a concave polygon, and the new building access road consists of a node that does not connect with another road.

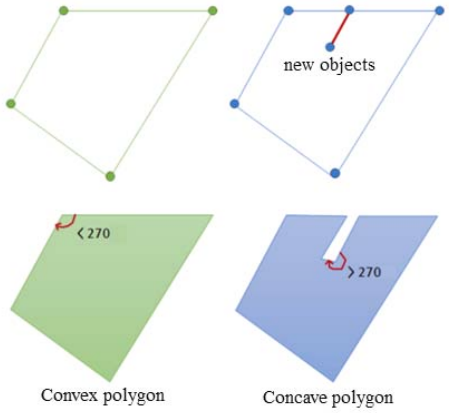

Figure 2. Principle of the detection of new roads occupied by objects

Based on the above two features, blocks where new access roads exist can be identified (Fig. 3), and in the road segment block, new building access roads can be detected. Specifically, if road segments with 0-link nodes in the road segment block are detected in the road name/address base map, they are the very new building access roads (roads occupied by objects).

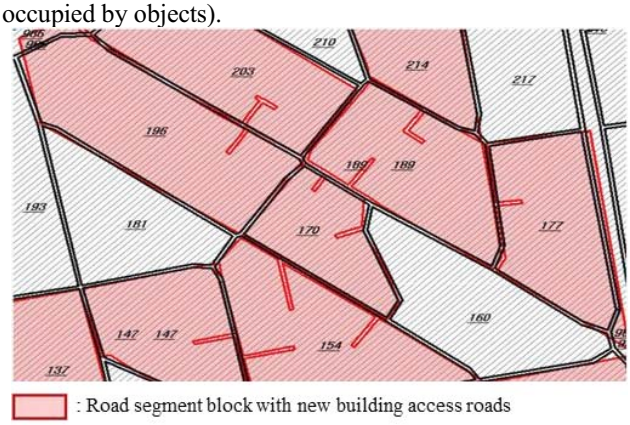

Figure 3. Block pair with a new road occupied by objects

B. *Detection of RIOOs*

The MOLIT-run road occupancy system manages the building access road location information as the land-plot number information in accordance with the Road Management Authority's road occupancy approval [4]. In this study, the land-lot number/address-based building access information and the GIS-based road name/address base map are converged to distinguish between approved building access roads and illegal building access roads. According to [5], the relationship between land-lot numbers and buildings are categorized into six types: a single land-lot number with no building or with only one building, and several land-lot numbers with no building or with one or several buildings (complex buildings) (land-lot number:building=1:0, 1:1, 1:n, n:0, n:1, n:n). The fact, however, that a road name/address is assigned means that a building exists, and thus, this study excluded the case of 0 building and classified the relationship into four types: 1:1; 1:n; n:1; and n:n. The new building access roads detected in Fig. 3. and the road occupied by objects' land-lot numbers shown in the road occupancy system can be compared, the comparison can be visualized, and RIOO can be detected (Fig. 4).

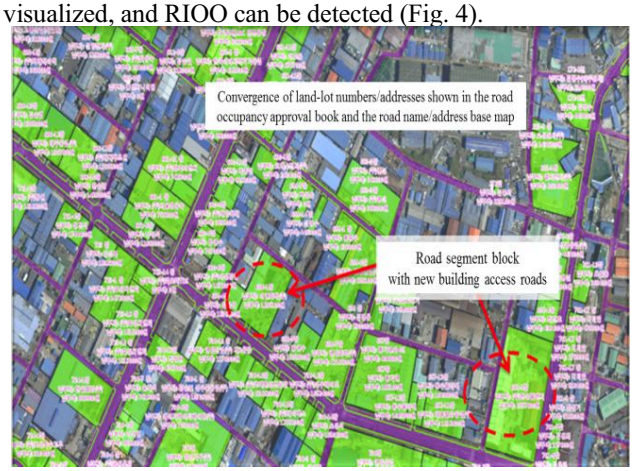

Figure 4. Convergence of land-lot addresses and new building access roads

III. CONCLUSION

Proposed in this study was the procedure by which, using the road segment layers in the existing constructed road occupancy information and the monthly updated road name/address base map, it can be determined if a building access road is an illegally occupied road. The proposed procedure is expected to boost the Road Management Authority's roads illegally occupied by objects' (RIOOs') management efficiency and to improve the government revenue associated with illegal road occupancy.

REFERENCES

[1] Caitlin Dempsey, "Where is the Pharase "80% of Data is Geographic" From?", http://www.gislounge.com/80-percent-data-is-geographic/

[2] KALI, "Spatial Information Application Plan and Needs Analysis for Administrative Information System", Journal of Korea Association of Local Informatization, 2005.

[3] Jiyoung Kim, Kiyun Yu, "Updating Process of Pedestrian Network Data Sets Using KAIS Base Maps", Journal of The Korean Society for GeoSpatial Information System, pp. 57-58, May 2013.

[4] Road Occupation and Access System, "http://road.cpermit.go.kr"

[5] Seung-Li Lee, Yong-Soo Joo, Chang-Hyo Yi, "Construction of Lot Database Based on GIS for Effective Land-Use Management in Urban Area", Journal of The Korea Spatial Planning Review, Vol. 48, pp. 103-118, March 2006.