Preliminary Biotop Mapping Using High-Resolution Satellite Remote Sensing Data[1]

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Abstract: Biotop map can be utilized in the urban area for nature conservation and impact assessment for the proposed activities. High resolution satellite data such as IKONOS and KOMPSAT1-EOS were used to classify land use activities in biotop mapping. After land use classification, field-check was done to survey the wildlife and vegetation. These maps were combined and the boundaries were delineated to produce the biotop map. Within the boundary the characteristics of each polygon were identified, and named.
This study was carried out at Daedok Science Town in Taejeon Metropolitan Area. The purpose of this study is to produce the biotop map using high resolution remote sensing data together with other ground data.
Keyword: Biotop Map, Nature Conservation, Land Use, Wildlife, Vegetation

1. Introduction

There are numerous plant and animal species which are adapted to the conditions of the urban environment. The object of nature conservation in cities can be considered as the preservation of these organisms as the basis for a direct contact between urban dwellers and the landscape elements(Ra, et al., 1998).

However, urban areas have expanded rapidly in South Korea since 1960's. So, wildlife habitats are fragmented and decreased. Efforts to restore these deteriorated habitats have been implemented recently. Green network connection and biotop mapping are some of those efforts.

A large city is made up of a great number of habitats, each with specific biotic communities. The prerequisite for successful nature conservation strategies is knowledge of the individual biotopes, their ecological characteristics, location and distribution in the city and the composition of their plant and animal communities (Sukopp and Weiler, 1988).

The availability of remote sensing data applicable for global, regional and local environmental monitoring has greatly increased over recent years. New technologies such as Global Positioning System(GPS), digital photogrammetry and multi-source satellite remote sensing are opening new application fields for remote sensing. The advent of high-resolution satellite images and digital airborne offers new possibilities for very accurate mapping of the environment(Ehlers et al., 2003). Recent, studies about biotop mapping using high resolution remote sensing and airborne data are implemented(Cousins et al., 1998, Ehlers et al., 2003, Thomson et al., 1999).

In addition, several studies about wildlife habitat management, conservation of threatened species and urban biotop mapping in urban area have been carried out for urban ecosystem restoration. However, such biotop studies in Korea is confined to flora not including wildlife habitat.

Therefore, the purpose of this study is to produce the biotop map using high resolution satellite remote sensing data together with other ground data including wildlife habitat and to contribute to the wildlife habitat management and nature conservation in urban area.

2. Materials and Methods

1) Study Site

The study site was Daedok Science Town in Taejeon metropolitan area located at the central part in South Korea. From 1970's the population of the science town have grown rapidly mainly due to the relocation of

[1] This work was supported by grant R01-1999-000-00173-0 from the Basic Research Program of the Korea Science & Engineering Foundation.

institutes. There are institute facilities and education facilities in the study site. Also, some mammals and birds are verified at Tahndong stream and its surrounding forest area in the study site(Kang, 2001). A flora and fauna was referred to the former research data(Her, 2000, Kang, 2001).

2) Thematic Data Used

For RS data, Korea Multi-Purpose Satellite 1 (KOMPSAT1) Electro Optical Camera(EOC) images and IKONOS satellite images were used(Table 1). For thematic data, 1:5,000 scale digital topographic maps were used to select ground control points(GCP's). Digital map of ecological wildness and detailed digital vegetation map were used for producing biotop map. Detailed digital vegetation map was produced at the authors' laboratory(Her, 2000). Tables 1 and 2 show RS and GIS data and other thematic data used in this study, respectively.

Table 1. RS data used in this study.

Data source	Resolution	Date	Data type
KOMPSAT1-EOC	6.0m	2000. 3. 1 2000. 3. 9 2000. 5. 8 2000. 10. 2 2000. 10. 27	Digital Panchromatic
IKONOS	1.0m	2000. 7. 27 2001. 11. 19	Digital Pan-Sharpened

Table 2. Other thematic data used in this study.

Data source	Scale	Date	Data type	Publisher
Topographic Map	1:5,000	1996	Digital	Korea National Geography Institute
Detailed Vegetation Map	1:5,000	2000	Digital	Landscape Information Lab., Dept. of Landscape Architecture, SKKU.
Map of ecological wildness	1:25,000	2002	Digital	Korean Ministry of Environment

3) Methods

KOMPSAT1 EOC images were geometrically corrected by second order polynomial transformation and cubic convolution resampling into 6.0m resolution image. And IKONOS images were geometrically corrected by 1st order polynomial transformation and nearest neighborhood resampling into 1.0m resolution images(Ahn and Lee, 2003) as we can see in Table 1.

The biotop mapping was done using four thematic maps: hydrologic map, green space map, wildlife habitat map and impermeable pavement ratio map. Hydrologic map was produced on the stream order from topographic map and RS image interprestantion. Green space map was produced RS data and field survey. Wildlife habitat map was produced based on the field data. There are three classes: raccoon habitat forest, other forest and other land use type according to the confirmation of raccoon from the fieldwork. Finally, impermeable pavement ratio map was produced from IKONOS interpretation and field check. For visual interpretation of RS data, IKONOS data were mainly used.

For RS and GIS software, PCI(RS) and ArcView(GIS) were used in this study.

3. Results and Discussion

Using the above mentioned procedure the biotop map was produced. In this study, biotop evaluation indices were also produced. After producing biotop type map, it can be utilized in the urban area for wildlife habitat conservation and land use control. For the biotop type area with high degree of wildness potential, it needs to be preserved and the land use which might disturb the current environment would be strictly restricted.

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