Trend of urbanization in the suburbs of a large city in south Taiwan

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Abstract: In the suburbs of Kaoshiung in south Taiwan, irrigation projects extend several tens of thousands hectares had been implemented in a number of places since the 1910s. These areas have also been influenced by the urbanization due to recent high economic growth. The degree of development under this influence depends greatly on the distance from the big city. In this paper we have chosen 3 areas and performed a concrete analysis using the remote sensing techniques. We report the results with some discussion.

1.Introduction

An understanding of the trend of urbanization is important for city planning and land use planning. A number of investigators have used social and economic data or the map of land use in order to analyze it. However, the recent trend of urbanization has characteristics of large scale and interrelated relations between several regions. It is difficult to comprehend these changes using the approaches mentioned above. There is necessity to take a different approach toward evaluating the trend of urbanization. By using remote sensing method, we can understand land use more broadly and simultaneously. Furthermore, we can use the outcome from remote sensing to operate in GIS or other model. Therefore in this study, we adopt remote sensing to analyze the trend of urbanization in the suburbs of a large city. The research object of this study is Kaohsiung area in south Taiwan. The aim of this study is as follows :

(1). We try to capture the trend of urbanization in Kaohsiung area by Remote sensing approach.

(2). Using the outcome from remote sensing and some social and economic data, we investigate the cause of urbanization in Kaohsiung area and forecast its possible changes.

2.The urbanization in the Kaohsiung area

Kaohsiung area is located in the southern part of Taiwan. The area covers Kaohsiung city and Kaohsiung prefecture (see figure 1). Since the start of Taiwan's economic development, industry and commerce in Kaohsiung city had grown rapidly. Many people who lived in rural areas of south Taiwan had move to the city. Consequently, Kaohsiung city became the second largest city in Taiwan.

Figure 1: Koahsuing area

With continued growth in Kaohsiung city, the city space was not enough to construct and its living price became too high for some people. For these reasons, a part of population had moved out to the suburb area. Furthermore, the developments of transportation enable people to move speedily between downtown and suburb areas. Hence, the suburb areas became more prosperous than before. According to the census, there are 2,738,985 persons in the Kaohsiung area in 2002.

In this report, we choose Feng-Shan, Niao-Sung and Da-Lio from kaohsiung prefecture as the research objects. We will discuss the change in land use and differences in urbanization process of these three areas. Figure2 and Table 1 show the geographical locations and basic socioeconomic data of these three areas in 2000.

Table I: Major social indicator of Feng-Shan, Niao-Sung and Da-Lio area

	Feng-Shan			Niao-Sung			Da-Lio		
Area(km^2)	26.7451			24.5927			71.0437		
Population(persons)	321,707			38,782			115,692		
Population Density (persons/ km ^{2})	12028.63			1,577			1,682.46		
Employment	Agr.	Ind.	Ser.	Agr.	Ind.	Ser	Agr.	Ind.	Ser.
By industry(%)	6.4	39.3	54.3	17.2	34.9	47.9	26.7	37.3	36.0

Figure 2: Feng-San, Naio-Sung and Da-Lio area

3.Data description and methodology

Observe the change of land use in suburb area is an import issue to discuss the trend of urbanization. Therefore, this study will use satellite images to analyze the change of land use in Kaohsiung area.

(1) Data

The main data sources are Lansat TM satellite images. Other than that, we also use air navigation charts and GIS data to assist in knowledge based classification. Table2 shows the details of images data.

Table2: A list satellite images used in present study

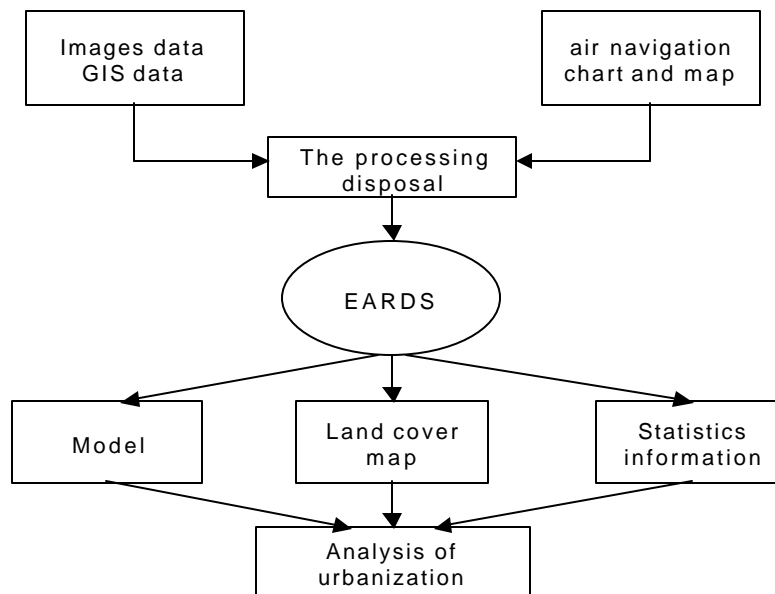| Mission	Sensor	Path-Row	Obs. Date
Lansat2	MSS	118/44	1Nov72
Lansat2	MSS	126/44	5Dec81
Lansat7	TM	118/44	21Jul90
Lansat7	TM	118/44	7Dec00

(2) Methodology

The procedure of this study is shown in Figure 3:

Figure 3: Flow chart of the study

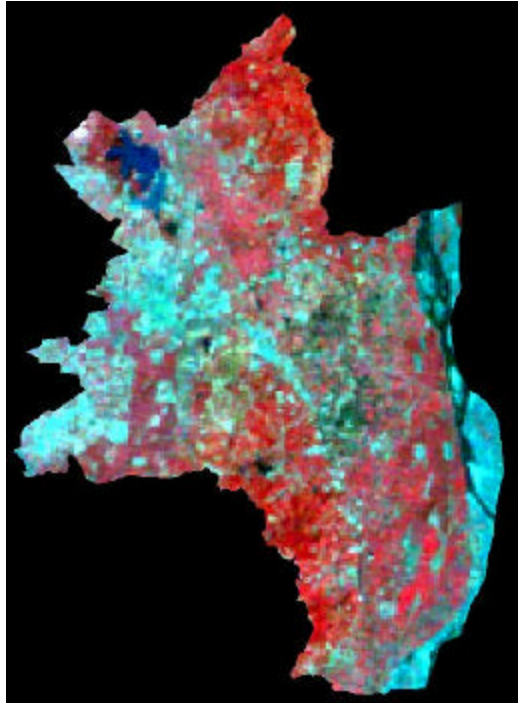**4.Analysis of urbanization in Kaohsiung area**

Figure4: Lansat1972_ Feng-San, Naio-Sung and Da-Lio area
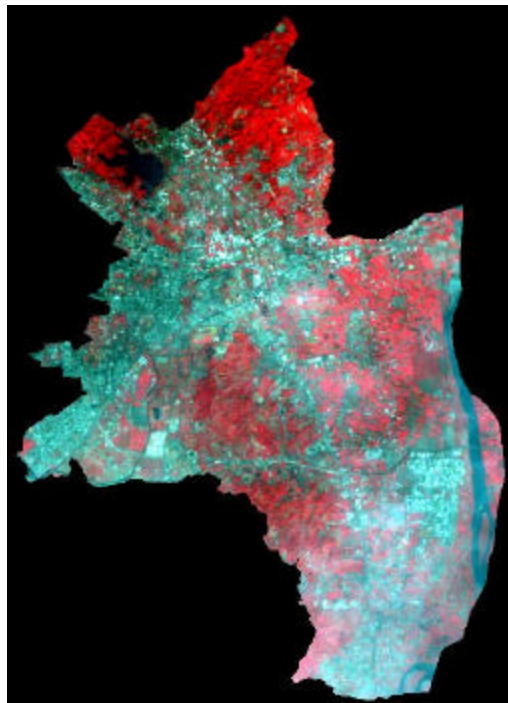

Figure5: Lansat2000_ Feng-San, Naio-Sung and Da-Lio area

In this study, the usages of lands are classified into water area, bare land, rice filed, residential area, forest and grass. We make cover land maps to compare changes in urban area from 1972 to 2000. Next,

we do a NDVI map to understand the changes in plants area . Finally, We use these outcomes to determine the trend of urbanization in Kaohsiung area. The results of the analysis will be given at the time of presentation.

5.Summary

This study use images data to analyze the trend of urbanization in the suburbs of Kaohsiung area in south Taiwan. In the future, we will try to design a precise model to explain the trend of urbanization. Furthermore, we hope that the change in land use cause of urbanization can serve as a reference for the developing countries.

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