Analysis of rural landscape pattern based on GIS in Yanqing, Beijing

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Abstract. In recent years, as the process of urbanization in china become fast,the new rural construction has a great impact on the original rural landscape pattern and appearance all over the country.How to protect the rural landscape in the new rural construction is the most concern of scholars.

Introduction

In the suburbs of Beijing City, rural areas are in the process of transforming from traditional agricultural landscape to modern agricultural landscape, and the rural landscape construction is facing a new opportunity.Such as, rural natural landscape and cultural landscape, from the suburbs to the outer suburbs, and Tazono Kanhikaru, orchard, forest tourism, "peasant music", folk culture, rural tourism develop rapidly.This is not only an effective way to promote the adjustment of local rural industrial structure, economic development and farmers to get rich, but also on the outskirts of the city of rural development has a strong impact.

Therefore, the research and analysis of landscape pattern of Yanqing Sihai Town, can provide reference for the new rural development and planning.

The forest resources of Sihai Town are abundant, the vegetation is lush, the forest cover rate is 79.42%.The average temperature of Sihai Town is 4 degrees, annual rainfall is 700 - 550 mm.Fresh air, pleasant climate, it is a place for summer holidays and leisure tourism.

Image Data Processing

Image data include 2004 SPOT 5 and 2010 GeoEye 1 satellite remote sensing image data, 2005 Landse data, DEM data, Contour distribution data and national basic geographic data (including road, traffic, water system, residents, etc.) .

Based on 10 m spatial resolution DEM data,through selecting some ground control points in the image,using the digital elevation model(DEM), correction of tilt correction and projection correction carried on to the image.Sampling the image into a normal shot. Mosaic multiple image into one.Through color balance, in a certain range of cutting out of the image is a positive image.

Through image fusion, ortho rectification, image registration and image mosaic, Image preprocessing is done. Through setting points, lines, and planes,the vector of the image is completed. Choose a reasonable color scheme,according to the method of visual interpretation, the distribution map of land use types was obtained by correlation analysis.

At last field survey and precision verification must be done. According to the distribution of sampling points, design sampling route, Land use types recorded at sampling points, through GPS positioning, according to field survey data on land use types verificate accuracy.According to land use types, Landscape is classificated .

Landscape Index Calculation

Using FRAGSTATS 4.2 software, the main elements of rural landscape types is calculated.It is including CA,PLAND,LPI,LSI,PLADJ.

Table1 The numerical value of landscape elements in Sihai

（2004，2010）

Index	Year	Cultivated land landscappe	Garden landscape	Woodland landscape	Grassland landscape	Water landscape	Settlement landscape	Road landscape	Unused land landscape
CA	2004	1456.1848	1.5834	7626.0545	654.7138	108.4825	161.3766	78.3074	34.3643
	2010	1451.8519	48.0239	7428.0636	797.9613	95.2861	165.1633	115.6721	19.7598
PLAND	2004	14.3877	0.0156	75.3483	6.4688	1.0718	1.5945	0.7737	0.3395
	2010	14.3438	0.4745	73.3869	7.8836	0.9414	1.6318	1.1428	0.1952
LPI	2004	1.7743	0.0051	47.1919	1.0718	0.1765	0.6054	0.4818	0.1074
	2010	1.7374	0.1924	19.5036	1.2588	0.1641	0.6053	0.8358	0.0245
LSI	2004	24.5051	2.5952	11.4122	13.7247	12.6761	21.4136	54.0305	8.26
	2010	24.5136	6.1414	12.0738	15.6715	13.5346	22.7764	54.027	10.4427
PLADJ	2004	99.3578	97.9348	99.8693	99.4636	98.7824	98.3141	93.8937	98.5903
	2010	99.3566	99.1138	99.8599	99.4452	98.613	98.2273	94.9743	97.6483

Area analysis of landscape element type

From 2004-2010, the landscape, road landscape and grassland landscape increased significantly,Woodland landscape and water landscape decreased slightly,Not using the landscape significantly decreased.In all landscape types, forest landscape has always been in the dominant position.

Analysis of shape features of landscape elements

In 2004 and 2010, the largest of LSI is the road landscape.The shape of the road landscape is the most complex.Due to the continuous construction of roads, the road landscape is also the largest interference intensity.Next is the cultivated land landscape; the shape is relatively simple, the low level of disturbance is the garden landscape.

Analysis on the aggregation and distribution of landscape elements

In 2004 and 2010, the minimum PLADJ value is the road landscape, the largest is the forest landscape, the larger is the grassland landscape and farmland landscape.It showed that the forest landscape connectivity, centralized distribution, high degree of aggregation.The grassland landscape and farmland landscape is connectivity, distribution is relatively concentrated, high aggregation degree.The road landscape is poor connectivity, mainly composed of small patches.

Summary

Through the FRAGSTATS 4.2, Sihai town in Yanqing rural landscape pattern index, the patch degree, the degree of spread, the Shannon diversity index, the Shannon index, the degree of polymerization index value are computed.

Table2 Regional landscape pattern index of Sihai（2004、2010）

YEAR	COHESION	CONTAG	SHDI	SHEI
2004	99.9587	79.2064	0.8422	0.405
2010	99.9383	77.6302	0.9056	0.4355

Landscape connectivity analysis

In 2004 and 2010, the landscape types of the COHESION values remained stable and slightly decreased.In each period, the patch of the forest landscape was higher, the landscape connectivity was better, and it has a large proportion in the landscape,

Landscape equilibrium analysis

In 2004 and 2010, the CONTAG index values were 79.2064 and 77.6302, respectively, and the spatial distribution of the landscape types in 2010 and 2004 was the general trend of Yu Junheng, but a little discrete.

Landscape diversity analysis

2004 and 2010 SHDI were 0.8422 and 0.9056, respectively, SHEI were 0.405 and 0.4355, SHDI and SHEI were increased.The diversity of the study area is basically maintained, the distribution of the landscape types is basically uniform, and the number of landscape patches is small.However, the degree of fragmentation of the landscape has a rising trend, the degree of landscape heterogeneity increased slightly.

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References

[1]S.Hattori,K.Akimoto,C.Fraser,H.Imoto.Automated procedures with coded targets in industuial vision metrology. Photo grammetric engineering and remote sensing [J],2002.68(5),PP441-446.

[2]Wu Lun, Zhang Jing, Liu Yu. Principles and Methods of Geographic Information System[M]. Beijing: Science Press, 2002. (in Chinese)

[3]Chai Hejun. The rock mass structure model and engineering application research of Xiluodu hydroelectric power station of Jinsha river[D].Chengdu: Chengdu University of Technology, 1999. (in Chinese)

[4]WuJianGuo.Landscape ecology: pattern, process, scale and grade [M].Beijing: Higher Education Press,2000.

[5]CCGIS V4.0 Enterprise Edition Description[D].GeoStar Communication, 2002, 39, unpublished. (in Chinese)

[6]LiuBinY．Modern landscape planning and design[M].Nanjing:Southeast University press,1999.

[7]FuBoJie,etc.Principle and application of landscape ecology[M].Beijing:Science Press,2001.

[8]XuHui,WangJiaJi.Theory and application of landscape ecology[M].Beijing: Environmental Science Press,1993.

[9]ZhaoYi，LiYueHui.Practical landscape ecology[M].Beijing:Science Press,2001.

[10]YuanFei.Application of GIS in urban landscape planning and design[D]. Northwest Agriculture and Forestry University,2012.