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Wei Deng
Editor

Future Control and Automation

Proceedings of the 2nd International Conference on Future Control and Automation (ICFCA 2012) - Volume 1

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Preface

2012 2nd International Conference on Future Control and Automation (ICFCA 2012) will be the most comprehensive conference focused on the various aspects of advances in Future Control and Automation. The goal of this conference is to bring together the researchers from academia and industry as well as practitioners to share ideas, problems and solutions relating to the multifaceted aspects of Future Control and Automation. It aims to create a forum for scientists and practicing engineers throughout the world to present the latest research findings and ideas in the areas of control and automation.

ICFCA 2012 will be held on July 1–2, 2012, Changsha, China. Changsha is the capital city of Hunan Province, situated in the river valley along the lower reaches of the Xiang River, a branch of the Yangtze River. The recorded history of Changsha can be traced back 3,000 years. Tomb relics from the primitive periods witnessing the earliest human activities have been discovered in this region. The village of Shaoshan, about 130 kilometers south-west of Changsha is the hometown of Chairman Mao Zedong. Today, the village has become a memorial place for Chinese people to remember this extraordinary man. People erected a statue of the Chairman and have preserved the houses he lived as a tourist site. The city is now a major port and a commercial and industrial center, is one of China's top 20 "economically advanced" cities.

ICFCA 2012 provides an interdisciplinary forum in which researchers and all professionals can share their knowledge, experience and report new advances on Control and Automation. It is a medium for promoting general and special purpose tools, which are very essential for the evolution of conversional and new subjects of Control and Automation.

Future control and automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Control and automation plays an increasingly important role in the world economy and in daily experience.

The editors were responsible for selection of reviewers for the papers, whom we thank for their promptitude and accurate work. The communication between authors and referees was managed by the editors. The organizing committee expresses its entire gratitude to all the authors who presented their works at ICFCA 2012 and contributed in this way to the success of this event. Special thanks are due to the authors from abroad for attending the conference and to the reviewers for their support in improving the quality of the papers and finally for the assurance the quality of this volume.

Wei Deng

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Monitoring and Analyzing for Overflowing Status of Hotan River in Summer Season Based on EOS/MODIS Data

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Abstract. By using visual interpretation combined with supervised classification in ENVI 4.5 and with the functions of localization, measurement, and layer overlay of ArcGIS 9.2, the summer season overflowing status in middle and lower reaches of Hotan River had been monitored and analyzed, the results of which shows that: firstly, the overflowing status in middle and lower reaches of Hotan River is fairly serious, at the same time, overflowing status of irrigation areas in oasis area has drawn much attention too. Secondly, compared with other reaches the amount of overflowing water of oasis edge in the middle reach is less, the area of which is below 35 km^2 in monitoring date with the percentage of 94.4%, and the overflowing trace is unavailable in 45% of the monitoring date; From Keshen Mishen on where 2 rivers join together to the crossroad of old river channel and Hotan River, the overflowing areas are all over 35 km^2 in 45% of the monitoring date except 5 August 2004 and 29 July 2008 with the monitoring area being 0; The overflowing status of the reach from the crossroad of the old river channel to Xiaota is heaviest, most of which is over 70km^2 with the maximum of 111km^2. Thirdly, on the whole basin 10 overflowing sites have been observed, among which 4 distribute on the left and right sides of the head reach areas of Hotan River respectively, coupling with a new floodplain on each side, and also a overflowing site on the left of Karakash River has been observed. It can also be found that, on the whole, the overflowing sites mainly distribute on the head reach of Hotan River.

Keywords: MODIS data, overflowing status, Monitoring and analyzing, Hotan River.

1 Introduction

Hotan River, as one of the 3 largest original rivers of Tarim River, whose inflows into Tarim River plays great importance on the Ecological Recovery Project. Researches had been done based on different approaches by scholars and experts at home and abroad, most of which focused on how the meteorological factors such as temperature, rainfall etc influenced the runoff [1-3], concretely speaking, some

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analysized the changing characteristic of runoff time series based on measured data from hydrological stations [4-9], others simulated the changing trend of runoff by constructing runoff model [10-11]. A great deal of control measures were put forward based on related researches, for instance, Wang Ranghui [12] applied remote sensing technology to the flood monitoring of Tarim River and, some other researchers pointed out that water overflowing was one of the most important reasons for runoff decrease of Tarim River [11], but more deeper related researches were unavailable. The existence of overflowing water in certain area can clearly be seen from the MODIS image of Tarim River in summer season, The trace of the residual overflowing water after flowing over desert and gobi with large osmosis demonstrates that the amount of overflowing water without effective utilization is comparatively large. The Hotan River covers so large a distance in Teklimakan desert from the mountain-pass to Tarim River that it is unrealistic to investigate the overflowing information including the positions of the overflowing outlets, overflowing areas and overflowing directions just on manpower, thus remote sensing technology is integrated into this research. Based on field investigation and by using 250-m MODIS data, the overflowing areas was monitored and estimated, the overflowing positions, the corresponding administrative districts and also the overflowing directions were all searched clearly, based on which reasonable countermeasures and suggestion were proposed with the purpose of providing scientific basis on sufficient utilization of the water resources in Hotan River and ecological control in Tarim River.

2 General Situation of Study Area

The main research object of this paper is the middle and lower reaches of Hotan River i.e. from the mountain-passes of Karakash River and Yurungkash River to Xiaojiake in Awat County, with a total length of 479km. The middle reaches of Hotan River whose total length is 160km is composed of Karakash River and Yurungkash River, from whose intersection Keshen Mishen to Xiaojiake is the lower reaches of Hotan River that is known as the head reach whose length is 310 km before it flows through the desert hinterland with the depth of 500-3000 m besides the maximum value of 4000 m.The river channel becomes narrow from the Xiaota hydrological station to the estuary with the depth of 150-300 m besides the maximum value of 500 m.

3 DATA and APPROACH

3.1 Data

Dynamic monitoring was conducted on hydrological regime of Hotan River by using MODIS data of 2009, the results showed that, approximately on 14 August, the water flowed down into Tarim River and, the water rich period was about 15 days from 18 August to the beginning of September, based on which the MODIS images of Hotan

River from the end of July to the end of August of 2002-2008 were selected and processed, the date of which were 24 July 2002, 07 August 2002, 16 August 2003, 05 August 2004, 07 August 2005, 24 July 2006, 30 July 2006, 01 August 2006, 04 August 2006, 10 August 2006, 18 August 2007, 24 July 2008, 04 August 2008, 07 August 2008, 15 August 2008, 20 August 2008 and 30 August 2008, respectively, combining with the water system vector data of Tarim River, dot file data of reservoirs and digital elevation model as auxiliary data.

3.2 Approach

By preprocessing the 0 level PDF data files received by receiving station of EOS/MODIS with the application programs of IMAPP, 3 different data files in HDF pattern includingMOD021KM.HDF,MOD02HKM.HDF,MOD02QKM.HDFand 1 calibration data file MOD03.HDF were obtained and, then the gained HDF data files were projected into local LD2 files who were conducted head file editing and imported into ENVI4.5 with the purpose of carrying out radiometric correction, geometrical precise correction, image enhancement and false color composite and, ultimately the Hotan River basin required in this paper was clipped out.

4 Results and Discussion

4.1 Monitoring and Analyzing of Overflowing Area of 2002-2008

It can be seen from the histogram a in Figure 4 that the overflowing area of oasis marginal zone in middle reach of Hotan River obviously exhibits a decrease trend from 2002 to 2008 with the maximum 78 km^2 in 2002 and, the overflowing status emerged intermittently in August 2006、July 2007 and August 2008, the overflowing areas of which were all less than 16 km^2. Analysis from histogram b in Figure 4 demonstrates that the overflowing areas of 2002-2008 the most serious period of which is 2005-2006, generally speaking, change in increase and decrease and are all in the range of 25-60 km^2 in most of years. Histogram c in Figure 4 shows, except the minimum 30 km^2 on 24 July and the maximum 111 km^2 on 10 August 2006, that the overflowing areas in reaches from the intersection of old river with Hotan River to Xiaota are all over 70 km^2. Conclusion can also be drawn from histogram d in Figure 4 that areas of overflowing water in the whole river basin of 2002 -2008, except 2004, are relatively larger with the maximum 186 km^2. From the analysis of satellite imagery and field investigation, it’s known that large scale of desert and gobi who possess large permeation distribute on peripheral areas of Hotan River banks and the large residual water areas strongly confirm that the overflowing status is significantly serious. The reaches from Keshen Mishen to the intersection of the old river channel with Hotan River and from the intersection of old river channel with Hotan River to Xiaojiake whose overflowing status was relatively serious in 2005 and 2006 should be governed as the key engineering section.

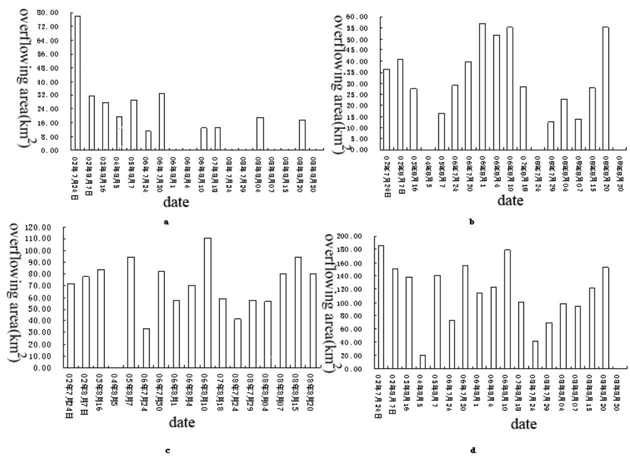

Fig. 1. Statistical and analyzing histograms for overflowing areas of 2002-2008
(a: histogram of oasis original zones in middle reaches of Hotan River; b: histogram of reachesfrom Keshen Mishen to the intersection of old river channel and Hotan River; c: histogram ofreaches from the intersection of old river and Hotan River to Xiaota; d: histogram of the totaloverflowing acreage in study area.)

4.2 Monitoring and Analyzing of Overflowing Outlets

By using the processed 17 MODIS satellite imagery, the latitude and longitude administrative regions and overflowing directions of overflowing outlets and also the dates on which the overflowing water was evidently identified out in satellite imagery were listed in Table 1. It can be seen from Table 1 that on both right and left sides of the head river channel of Hotan River, 4 overflowing outlets and 1 new water floodplain were observed, so far as to Karakash River is concerned, only 1 overflowing outlet on left of which was observed with the latitude and longitude of 80.086°E, 37.684°N. The overflowing outlets among which only 1 was observed on Karakash River and Yurungkash River whose latitude and longitude was 80.086°E, 37.684°N, mainly distributed on the head river channel with the approximate latitude and longitude of 80.086°E-80.919°E, 37.684°N-40.194°N. The whole basin of Hotan River locates in Awat county, Lop county, Karakax county and Hotan city and, the overflowing outlets of the reaches from the intersection of old river channel and Hotan River to Xiaota station were, more than other reaches, 4, accounting for 40% of the total overflowing outlets. Most of the basin of Hotan River locates in counties of Karakax and Lop and, the total number of overflowing outlets is 6. The overflowing outlets of 5,6,9 and 10 could clearly be seen in most of years, especially 6 and 10, which demonstrate that the status of overflowing water is extremely serious and much more attention should be attached on this.

5 Conclusions

Based on above-mentioned analyzing, conclusions have been drawn as follows:

Table 1. Form of investigation results of the overflowing status for Hotan River

No.	Dates on which overflowing outlets can be clearly identified	Name	Affiliated river banks	Affiliated administrative regions	Longitude (E)/ (degree)	Latitude (N)/ (degree)	Overflowing directions
1	24 July 2002 05 Aug 2004 07 Aug.2007 24 July 2006 18 Aug. 2008 07 Aug. 2008 20 Aug. 2008	Overflowing outlet	Left bank of Karakash River	Karakax county	80.086	37.684	Overflow from water channel to desert
2	All monitoring dates except 01 Aug. 2004	Overflowing outlet	Left bank of Hotan River	Karakax county	80.864	38.481	Reflow into the head river channel on point of 80.904°E, 38.561°N
3	04 Aug. 2008 20 Aug. 2008	Overflowing outlet	Left bank of Hotan River	Karakax county	80.891	39.084	Reflow into the head river channel on point of 0.889°E、39.251°N
4	30 July 2006 01 Aug. 2006 04 Aug. 2006 10 Aug. 2006 18 Aug. 2007 04 Aug. 2008	Overflowing outlet	Left bank of Hotan River	Awat county	80.794	39.991	Overflow along riverbed with less floodplain
5	07 Aug. 2005 24 July 2006 01 Aug. 2006 04 Aug. 2006 10 Aug. 2006 24 July 2008 04 Aug. 2008 07 Aug. 2008 15 Aug. 2008 20 Aug. 2008 30 Aug. 2008	Overflowing outlet	Left bank of Hotan River	Awat county	80.794	40.036	Overflow to desert
6	All monitoring dates except 01 Aug. 2004	New floodplain	Left bank of Hotan River	Awat county	80.741	40.194	to floodplain
7	04 Aug.2006	Overflowing outlet	Right bank of Hotan River	Lop county	80.894	38.941	Reflow into the head river channel on point of 80.914°E 39.061°N
8	16 Aug. 2003	Overflowing outlet	Right bank of Hotan River	Lop county	80.876	38.799	Reflow into the head river channel on point of 80.916°E 39.509°N

Table 1. (*continued)*

9	24 July 2002 07 Aug. 2002 24 July 2006 30 July 2006 01 Aug. 2006 04 Aug. 2006 18 Aug. 2007 04 Aug. 2008 15 Aug. 2008 20 Aug. 2008 30 Aug. 2008	Overflowing outlet	Right bank of Hotan River	Lop county	80.919	39.384	Reflow into the head river channel on point of 80.854°E 38.991°N
10	All monitoring dates except 01 Aug. 2004	New floodplain	Right bank of Hotan River	Awat county	80.891	40.151	Overflow to floodplain along river bank

First, the overflowing water of Hotan River locating in the most southern Xinjiang is relatively large and, the overflowing outlets with large area mostly distributes on the head river channel, at the same time, the status of overflowing water in the oasis marginal zone is serious too.

Second, the overflowing area in summer season of 2002-2008 of Hotan River basin exhibits a trend of fluctuating changes, whose overflowing areas are over 100 km^2 in 55.6% of the monitoring date except 5 August 2004 without trace of overflowing water. Overflowing water of oasis marginal zone comes from the out flowing of farmland irrigation water originated from Hotan River and, the amount of overflowing water is relatively less compared with other reaches, the overflowing areas of which are all below 35 km^2 in 94.4% of the monitoring date. Overflowing water from the intersection on where 2 rivers meet together to the intersection of old river channel and Hotan River is less compared with the reaches below the old river channel and, the overflowing areas are all above 35 km^2 in 45% of the monitoring date, belonging to relatively serious overflowing regions. Overflowing status from the old river channel to the intersection of Hotan River with Xiaota station is most serious and, in water rich period, many flaky water areas usually with the area of above 20 km^2 take up, meanwhile, large scale of overflowing areas appear with the area of over 70 km^2.

Third, totally, 10 overflowing outlets appear on Hotan River channel, among which 4 and 1 new floodplain emerge on both right and left sides of Hotan River channel. As far as Karakash River is concerned, there is only 1 overflowing outlet on left side of river channel. With regard to Yurungkash River, overflowing outlet is unavailable. On the whole, the overflowing outlet mainly distribute on the head river channel.

6 Countermeasures and Proposal

On basis of the monitoring and analysis results of overflowing status of Hotan River, following countermeasures and proposal have been given:

First, some engineering control countermeasures should be taken to overflowing outlets of Hotan River basin especially reaches from Keshen Mishen to the intersection of old river channel with Hotan River and from the intersection of the old river channel with Hotan River to Xiaota hydrological station.

Second, in middle reach of Hotan River,biggish bund should be built so as to prevent the water from out flowing from farmland and make sufficient and effective use of irrigation water. Phenomenon of unconcentrated flow generally exist in this region with the reason of disrepair for a long time, so it's highly necessary and urgent to renovate old water channels、construct new ones、conduct water saving reform and reasonable planning in order to reduce the loss of water conveyance in irrigation regions.

Third, controlling the expanding scale of oasis is also one of effective measures of preventing excessive utilization on water resources.

Because of the existing conditions and technology bottleneck, related researches are not highly deep going, thus, for further research on related monitoring and analysis, satellite imagery of high temporal resolution and high spatial resolution should be combined together.

Acknowledgment. Sincere Thanks Should be expressed, first, to my tutor — prof. hongwu chen, research fellows lei wang and zhimin feng who gave much help and suggestion on satellite imagery processing and, then to the support of the national supporting plan subject—key technology study on monitoring 、 detection and prediction for main extreme weather and climate events and great meteorological disaster in china (2007bac29b02), and also the subject of satellite remote sensing invetigation for river channel and shunting water of hotan river.

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Research on Landscape Characteristics of Tibet Landuse

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Abstract. Since Tibet plateau environment shows fragile characteristics, it has important significance for disclosing the evolution mechanism of Tibetan eco-environment under condition of global climate changes by applying remote sensing and GIS to monitoring Tibet landuse characteristics. TM and CBERS images are applied to landuse interpretation of Tibet on the platform of Erdas software in this study. And then Tibet landuse spatial database is established on the platform of ArcGIS software. And the spatial distribution characteristics of Tibet landuse are analyzed based on Landscape Ecology theory. The results show that: (1) the dominant landscape of Tibet are unutilized land and grassland respectively occupied 38.42% and 37.22% of whole Tibetan area; (2) farmland, woodland, grassland, water area, urban land and unutilized land show characteristics of typical regionality in spatial distribution; (3) The patches of urban land and farmland are simple and regular, while the patches of unutilized land and grassland are relatively complex and concentrative in spatial distribution; (4) in spite of high correlation between landscape indexes, they have different meanings in disclosing the landscape functions actually, which should not be neglected.

Keywords: Tibet plateau, landuse, landscape, remote sensing, GIS.

1 Introduction

Tibet plateau is the main body of qinghai-tibetan plateau with names of “World Ridge” and “The Third Pole of World” owing to its typical environmental units on the earth. Since the terrain of Tibet varies obviously, and the type of geomorphology is quite complex, the diversity characteristics of Tibetan ecosystem are extremely prominent so that it nearly contains all ecosystems except sea ecosystem. That means Tibet is one zone of the richest diversity of species with hereditary gene of China. Those ecosystems of grassland, farmland, grub-grassland, water area play important roles in the environmental safety of Tibetan plateau, China and even to Eastern Asia. Landscape pattern is the most direct demonstration of landscape traits, and also is the key content of Landscape Ecology researches [1].The landscape indexes are simple quantitative indexes that compress the landscape pattern information, and reflect the structure composition of spatial allocation [2~5]. Remote sensing, geographic information system and Landscape Ecology compose the typical research mode on

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large scale landscape. And quantitative research of spatial pattern by means of landscape indexes is the basic contents of this mode [6~9].

The remote sensing images of TM and CBERS are applied as main data source to study the Tibet plateau landuse in this study. There are 116 images are interpreted into six types of landuse according to national landuse classification [10~11]. Then the spatial pattern analysis methods of Landscape Ecology theory are combined to study the distribution of Tibet landuse in order to disclose the spatial distribution and evolution characteristics of land resources.

2 Study Area

Tibet is located in south-western China between 78°25′ ~99°06′E and 26°44′~36°32′ N with the area of 120 square kilometers, and with an average altitude of 4000 meters and population density of 2.21 people per square kilometer. There are one municipality (Lhasa), six zones (Chamdo, Nyingchi, Nagqu, Ngari, Xigaze, Lhoka) and 73 counties in Tibet. The Tibetan topography is complex, which can be classified as northern Tibet plateau, southern Tibet valley and eastern Tibet mountain gorge. There are more than 20 rivers with area of larger than 10000 square kilometers. Tibet plateau is not only the largest lakes concentrated region of China, but also the widest plateau lakes region with most lakes and lake of the highest altitude. There are rare air, abundant sunshine, lower average annual temperature of 8 degrees, and less precipitation with uneven distribution in different seasons. And dry and rainy seasons are very clear boundaries with more night rain.

3 Data Processing

Remote sensing and field check techniques are combined to accomplish the Tibet land ecosystem interpretation. There are 116 TM and CBERS images covering whole Tibet between year of 2006 and 2007 to be selected in this study. After some preprocessing including binds composition, geometric rectification, image enhancement, mosaic at the ERDAS platform and so on, and field investigation for establishing interpretation symbols, Tibet landuse landscape spatial database are constructed. The national land classification system of China is used in this study to classify the landuse types. The first level classification of it is applied, which classifies the land into six classes including farmland, woodland, grassland, water area, urban land and unutilized land.

To improve the interpretation accuracy, spatial grid investigation method considering Tibetan traffic distribution condition are designed. 862 check points are completed in Tibet including grassland, farmland, rocks, bare soil, and woodland. And the investigation contents contain: (1) selecting typical landuse type to verify the image interpretation accuracy; (2) checking the accuracy of patches edge; (3) relative ecosystem investigation; (4) investigating typical regions.

After construction of Tibetan landuse spatial vector database (**Figure. 1**), the areas and perimeters of each landscape patches are calculated at platform of ArcGIS, and

Fragstats3.3 software is applied to analyzing the landscape indexes of Tibetan landuse. Those landscape indexes of Average Patch Size(MPS), Mean Patch Fractal Dimension(MPFD), Mean Perimeter-Area Ratio(MPAR), Mean Shape Index(MSI), Edge Density(ED), Mean Patch Edge(MFE), Patch Size Coefficient of Variance (PSCoV), Patch Size Standard Deviation(PSSD), Shannon's Diversity Index(SDI) and Shannon's Evanness Index(SEI) are selected for landuse vector database in order to analyze the Tibetan landscape characteristics. [12~13]

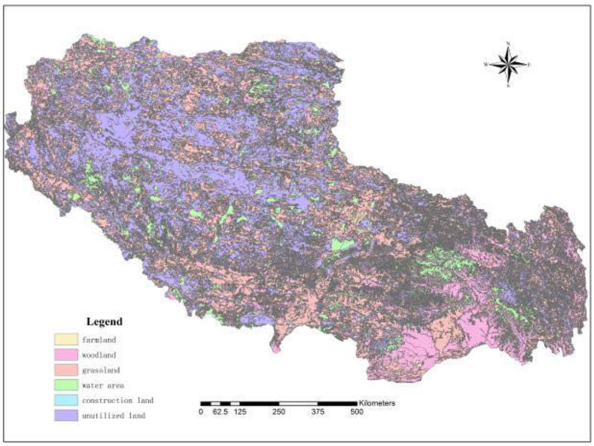

Fig. 1. Spatial distribution of Tibet landuse

4 Results

4.1 Field Checks

Among the 862 check points of field investigation **(Figure.2)**, there are 109 points are not consistent with the interpretation results. So the interpretation accuracy rate is about 87.35%. It is concluded that the causes of inconsistency between interpretation and field investigation results include: (1) insufficient experience of interpretation and investigation staff; (2) location errors of GPS; (3) errors of image rectification; (4) farmland interpretation errors resulting from lower resolution of images in some area; (5) different dates of multi-source images.

4.2 Spatial Characteristics of Tibetan Landuse

Farmland area is about 7561.25km^2, which is 0.63 percent of whole area. Woodland area with 165541.36 km^2 is about 13.80 percent of whole Tibet area. Grassland with 446455.99 km^2 is about 37.22 percent of whole Tibet area. Water area with 118940.75 km^2 is about 9.92 percent of whole Tibet area. Urban land with 198.86 km^2 is about 0.02 percent of whole Tibet area. And unutilized land with 460847.68 km^2 is about 38.42 percent of whole Tibet area.

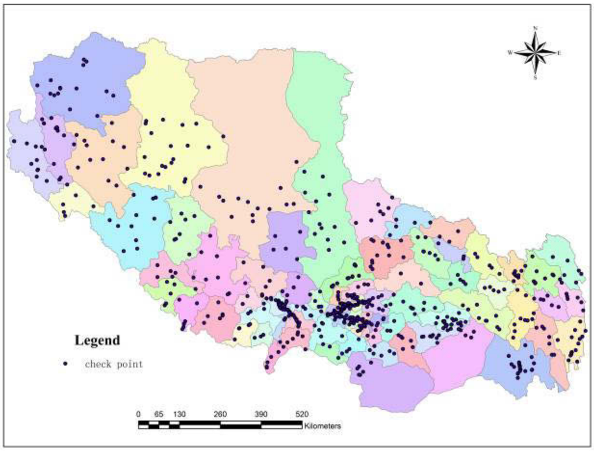

Fig. 2. Check points distribution of Tibet landuse

Zaya County of Nyingchi and Lhorong County of Qamdo have larger woodland areas comparing to other five regions. And Gongbo’gyamda County of Nyingchi, Mangkang, Gongjo, Palbar Counties of Qamdo region have less woodlands. While northern and western Tibet barely have woodland because of the higher elevation. High coverage grasslands are rare in Tibet, which are distributed in some southern counties of Tibet, such as Xigaze, Nyemo, Lhongzi, Naidong, Yatung, Gyantse and Renbu counties. Lakes are main distributed in northern and western Tibet including Nangzarze, Damxung, Xainza, Baqen, Tsochen, Purang. There are fewer lakes in eastern and southern Tibet. As for unutilized lands, bare lands are mainly distributed in northern and western Tibet mostly resulting from degraded grassland. Unutilized lands are relatively less in southern and eastern areas of Tibet with better ecosystems. But there still exists different extents of grassland degradation.

4.3 Regional Characteristics of Landuse

As shown in Table 1, seven prefectures of Tibet have their own characteristics obviously. The results show that landuse patches of Lhasa and Chamdo are simpler, more regular and symmetrical distribution. While landscape patches of Nagri are more diverse and unsymmetrical. This can be explained that Lhasa is the economic and politic centre of Tibet with less area and more concentrated human interferences, which affect the spatial landuse pattern. Complex topography of Chamdo and large area farmlands make its patches like that. While the terrain of Nagri is flatter, and population density is much lower to make it that.

Table 1. Landscape indexes of Landuse in different Tibetan prefectures（Unit: meters）

Prefecture	MPS (km^2)	MPFD	MPAR	MSI	ED	MPE	PSCoV	PSSD	SDI	SEI
Lhasa	17.84	1.29	0.02	2.32	0.00005	34817.94	806.86	143932972.12	1.32	0.74
Xigaz	15.68	1.28	0.02	2.07	0.00025	26819.10	1398.87	219355360.36	1.20	0.67
Nagri	24.87	1.27	0.02	2.00	0.00035	31402.90	3419.74	850437822.64	1.01	0.56
Nagq	13.45	1.30	0.03	2.15	0.00052	23775.20	2534.93	340968437.25	1.08	0.60
Lhoka	18.50	1.28	0.05	2.08	0.00010	26995.92	1974.21	365198619.76	1.30	0.73
Nyingchi	17.67	1.28	0.02	2.15	0.00016	30322.00	1451.75	256563302.59	1.29	0.72
Chamdo	8.27	1.29	0.03	2.14	0.00024	21515.40	1141.48	94384783.43	1.33	0.74

4.4 Landscape Indexes of Landuse

As for landscape indexes of whole Tibetan landuse (shown as Table 2), the results show that patches of urban land and farmland interfered by human activities are simpler, more regular, and more even distribution. While patches of unutilized lands and grasslands with less human interferences are more complex, more different in patch size and more concentrated distribution.

Table 2. Landscape indexes of different Tibetan Landuse（Unit: meters）

landuse	MPS (m^2)	MPFD	MPAR	MSI	ED	MPE	PSCoV	PSSD	SDI	SEI
farmland	185.1661	1.2882	152.7371	1.9312	0.2782	8176.8497	419.5752	776.9109	6.70	0.81
Woodland	1009.6802	1.2889	175.9094	2.0791	2.3423	18202.4602	1964.5957	19836.1330	5.72	0.59
Grassland	2292.6671	1.2810	234.1360	2.1963	6.1160	36873.1079	1292.5690	29634.3034	6.42	0.65
Water area	741.7461	1.2894	380.4529	2.0714	2.4962	18704.2198	999.0696	7410.5595	6.54	0.68
Urban land	62.3246	1.2592	131.1721	1.3767	0.0080	2999.0450	418.9236	261.0926	4.08	0.71
nutilized land	2318.4207	1.2860	287.1369	2.1645	5.4867	33097.1379	3363.9998	77991.6657	5.41	0.55

4.5 Fragstats Indexes Analysis

There are many landscape indexes in Fragstats module. And some researches show that some indexes have strong correlations. This correlation of landscape indexes are calculated in this study shown as Table. 3. The results show that: (1) the correlation of MPAR and SDI is 0.908; (2) the correlation of MPS and SDI is 0.898. So those three indexes have higher correlations. However, the three indexes represent different meanings in ecosystem functions. And they will affect the compare results. For example, SDI index shows in Table. 2: farmland> water area> grassland> woodland> unutilized land> urban land. MPAR index shows: water area>unutilized land> grassland> woodland>farmland> urban land. While MPS shows: unutilized land> woodland>water area>farmland>urban land. Thereby different indexes can not be substituted for each other despite of their high correlations. That will deny the concrete meaning of each landscape index.

Table 3. Landscape indexes correlation coefficients of Tibet landuse

Indexes	MPS	MPFD	MPAR	MSI	ED	MPE	PSCoV	PSSD	SDI	SEI
MPS	1.000	-0.087	-0.820	0.301	-0.608	0.483	0.340	0.856	-0.898	-0.024
MPFD	-0.087	1.000	0.070	0.728	0.113	0.218	0.078	-0.224	0.055	-0.008
MPAR	-0.820	0.070	1.000	-0.096	0.762	-0.171	-0.067	-0.610	0.908	-0.214
MSI	0.301	0.728	-0.096	1.000	0.254	0.793	0.310	0.100	-0.183	-0.150
ED	-0.608	0.113	0.762	0.254	1.000	0.356	0.243	-0.453	0.688	-0.458
MPE	0.483	0.218	-0.171	0.793	0.356	1.000	0.516	0.355	-0.332	-0.385
PSCoV	0.340	0.078	-0.067	0.310	0.243	0.516	1.000	0.584	-0.241	-0.844
PSSD	0.856	-0.224	-0.610	0.100	-0.453	0.355	0.584	1.000	-0.685	-0.314
SDI	-0.898	0.055	0.908	-0.183	0.688	-0.332	-0.241	-0.685	1.000	-0.026
SEI	-0.024	-0.008	-0.214	-0.150	-0.458	-0.385	-0.844	-0.314	-0.026	1.000

5 Conclusions

Remote sensing images analysis and field investigation are applied in this study to establishing spatial Tibetan landuse database. Based on the Landscape Ecology theory, the dominant landscape can be analyzed. And characteristics of different regions can also be compared to disclose the evolution between different landscape types. It is considered that dynamic comparisons for multi-time images combined remote sensing with Landscape Ecology theory based on both vector and grid data formats are getting more and more attention and application.

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A New Evaluation Model to Evaluation of Water Resources Renewability Ability

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Abstract. The water resources renew ability integration evaluation is the ssystems engineering which is influenced by multi-factor, nonlinear relations, and complicated uncertainty. The set pair analysis has been developed by the concepts of the main same, supper same, assimilation degree and the new grades law. The multi-factors degree set pair analysis fuzzy evaluation model (MFSPAFM) has been established and been applied to evaluate the water resources renew ability of Yellow River basin. And the result is compare with the results of the routine set pair analysis evaluation model, fuzzy variable set, and so on evaluation models. It is showed that the MFSPAFM is structure simple, calculation easy, result practical and reasonable, and method feasible and reliable and is fit for water resources renewability ability integration evaluation.

Keywords: surrounding rock stability, Set Pair Analysis, Multi-factors degree Fuzzy Evaluation.

1 Introduction

The water resources renew ability refers to the ability of a basin or regional water environment to recycle water resources, under the support of the existing or recent scientific technology and socio-economic capacity, through the natural circulation of water and social regeneration [1].There're many factors affecting the water resources renew ability, and the relationships between various factors are complex, the water resources renew ability integration evaluation is the systems engineering which is a multi-index and comprehensive evaluation. In order to scientifically evaluate the water resources renew ability of the Yellow River Basin, Shen Zhenyao et al [2] established the evaluation index system of the Yellow River Basin's water resources renew ability and used gray relational analysis method and fuzzy comprehensive evaluation method to evaluate it; Yang Xiaohua et al [3,4] respectively proposed

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genetic projection pursuit method, genetic-weighted matter-element model of the water resources renew ability integration evaluation; Chen Shouyu et al [1] applied the variable fuzzy evaluation method [3] to comprehensively evaluate examples. The evaluation criteria of the water resources renew ability is not a point value form but a range form. Most of the evaluation method deal with the evaluation criteria by a point value form, it erred on the scientific nature of evaluation results, although the variable fuzzy theory can well solve the evaluation identifying problem that evaluation index criteria is of range form, but the variable fuzzy evaluation method requires according to physical analysis or experience of actual issues in structuring relative differences degree to determine the scope of the variable attraction domain and the variable range domain and point value matrix whose subjection degree in the variable attraction domain is one, the calculation process is more complex. The set pair analysis theory can not only solve the evaluation identifying problem that evaluation index criteria is of range form, but also eliminates the complex calculation process of determining the scope of the variable attraction domain and the variable range domain and point value matrix whose subjection degree in the variable attraction domain is one. In this paper, based on the set pair analysis theory, a new evaluation model of basin water resources renew ability— the multi-factors degree set pair analysis fuzzy evaluation model (MFSPAFM) has been established, and it is applied to evaluate the water resources renew ability of the Yellow River basin and typical provinces on its upper, middle and lower reaches ,and the result is compare with the results of other comprehensive evaluation method.

2 Multi-factor Degree Set Pair Analysis Fuzzy Evaluation Model

2.1 SPA Theory

The Set Pair Analysis method is a identity-discrepancy-contrary(IDC) quantitative analysis method about certain-uncertain system [5], it can realize complete and effective portray the unification of opposite relation of certain-uncertain system and the most basic concepts are set pair and connection degree. Set pair is that a whole object which formed by two related sets. If given two sets A and B, then the set pair formed by two sets can be showed as H=(A, B), the function type of certain-uncertain fuzzy structure on the sense of information is :

$$u = (A, B) = a + bi + cj \tag{1}$$

where a, b and c satisfy the normalization, namely: $a + b + c = 1$; i is the coefficient of difference uncertain degree and valued in [-1,1], it is deterministic when i is -1 and 1, when i changing between -1 and 1, with $i \to 0$, the uncertainty will increase obviously; j is contrary degree coefficient and constant value is 1. This kind of delineation is a quantitative description to determinacy and uncertain, St. a and c are relatively certain, while b is relatively uncertain.