RESEARCH ON SPATIAL DATA MINING TECHNIQUE APPLIED IN LAND USE DYNAMIC MONITORING

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ABSTRACT:

The reasonable carry on the development and exploitations of the land are the guarantees for keeping on the development, how to use remote sensing data to carry on land use dynamic monitoring fast, accurately, in time and provide scientist bases and technique supports for the macroscopic decision of the all levels government have already become a universal problem of everyone concerning. Make use of the spatial data mining technique to detect the knowledge can raise the assistance decision function .The article discuss the concept, foundation of spatial data mining technique and spatial data mining technique applied in dynamic monitoring and applied from now on in dynamic monitoring what time suggestion.

1. PREFACE

In the last few years, our country carry on the land use dynamic monitoring continuously, Since the national territory resources department carried on land use dynamic monitoring to 100 point cities of whole country in 1997, throw in the very big funds to carry on investigating and renewal to the monitor data annually, and a lot of cities and places all built up the homologous land use dynamic monitoring system and dynamic monitoring databases. With the nation enlarging the dynamic monitoring strength to the land, the data of land use dynamic monitoring also is in the continuous increment .The data is in the inflation, but the knowledge is opposite to lack, so investigating a kind of reasonable method of on the foundation that makes use of the existing data well, carrying on the detection of knowledge will seem to be important for the accuracy, the exaltation of the efficiencies and cost lowers of the dynamic monitoring.

2. SPATIAL DATA MINING TECHNIQUE BRIEF INTRODUCTION

Spatial Data Mining is the branch course of Data Mining, but SDM differs from the general DM, and differs from the data mining of a database of business of the normal regulations, compared the general data mining to increase the space dimensions. Spatial Data Mining means to extract the existent knowledge, the space relation or other meaningful modes etc of the space database. Spatial Data Mining demand to mine the synthetical data and spatial database techniques.

It can used for the comprehension toward the spatial data, the detection of spatial relation and spaces relating to non- space, the structure of the spatial knowledge base, the administrative expense of spatial database and optimising spatial query. Because of the complexity of the space data, Spatial Data Mining differs from the general business data mining, it is like some characteristics: (1) the data source is very abundant, the data quantity is very huge, the data type is many, accessing method is complicated; (2) the applied realm is so extensive that the data related to space position can be excavated; (3) the excavating methods and the arithmetics are quite a few, and most of the arithmetics are very complicated and difficult; (4) The expressive method of the knowledge is diverse, and the comprehension and evaluation of knowledge depends on the person's cognitive degree to the objective world. Making use of the spatial data mining technique in the land use dynamic monitoring, whose function can tally up as follows.

(1) Raise the assistance decision function of the GIS applying in land use dynamic monitoring . The existing GIS has the strong function of data management, information search and spatial analysing, but it lacks or has not knowledge expression and obtaining method in the field of land use dynamic monitoring. Making DMKD (Data Mining and Knowledge Discovery) and SDMKD (Spatial data mining and knowledge discovery) techniques and land use dynamic monitoring database system combine together, discovering the implicit and general more knowledge rule of the connection regulation of various land variety and geographic main factor from a great deal of alterative data, which can provide powerful scientific bases for land use resources management and land use dynamic monitoring assistant decision.

(2) Raise the accuracy of Remote Sensing Imagery Understanding in land use dynamic monitoring . In land use dynamic monitoring Remote Sensing Imagery Understanding has very serious phenomenon of one spectrum with different bodies and one body with different spectrums.

How to apply the data of GIS in the Remote Sensing Imagery Understanding as assistant data, or how to obtain knowledge from GIS to support imagery classification, raise accuracy of imagery understanding and automatic degree, which is the problem of being researched in the field of remote sensing. When classifier request the data must have the certain statistical characteristic, regarding GIS data as method of the assistance data is not suitable for Spatial data mining can find the useful land classification rule from GIS database to raise the accuracy of classification.

3. THE FOUNDATION OF SPATIAL DATA MINING

3.1 The systematic structure of spatial data mining

The spatial data mining can be used to understand spatial data, discover the relation between space and the non- space data, set up the spatial knowledge base, excel the query, reorganize spatial database and obtain concise total characteristic etc.. The system structure of the spatial data mining can be divided into three layer structures mostly, such as the chart 1 show .The customer interface layer is mainly used for input and output, the miner layer is mainly used to manage data, select algorithm and storage the mined knowledge, the data source layer, which mainly includes the spatial database (camalig) and other related data and knowledge bases, is original data of the spatial data mining.

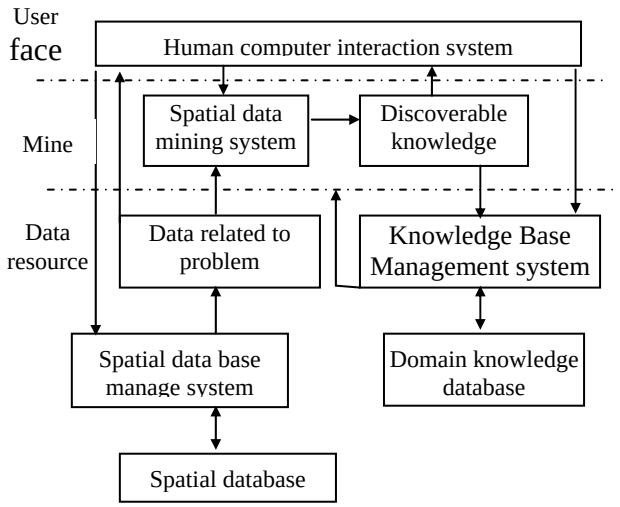

Figure 1 The systematic structure of spatial data mining

3.2 The method of spatial data mining

The spatial data mining is newly arisen edge course when computer technique, database applied technique and management decision support technique etc. develop the certain stage. The spatial data mining gathered productions that come from machine learning, pattern recognition, database, statistics, artificial intelligence and management information system etc. According to different theories, put forward the different methods of spatial data mining, such as methods in statistics, proof theories, rule inductive, association rules, cluster analysis, spatial analysis, fuzzy sets, cloud theories, rough sets, neural network, decision tree and spatial data mining technique based on information entropy etc..

4. SPATIAL DATA MINING TECHNIQUE IS APPLIED IN LAND USE DYNAMIC MONITORING

The mass data storaged in spatial database includes spatial topological, nospatial properties and objects appearing variety on the time .The main knowledge types that can be discovered in the spatial database are: general geometric knowledge, spatial distribution rules, spatial association rules, spatial clustering rules, spatial characteristic rules, spatial discriminate rules, spatial evolution rules etc.. For land use dynamic monitoring, according to the knowledge mined in the spatial database, there are following several applications:

4.1 Make prediction of land variety

According to geographic location, soil characters, geologic circumstance, prevent or control flood information, transportation circumstance etc. of the land, Making use of the spatial distribution rules, spatial clustering rules, spatial characteristic rules, spatial discriminate rules to analyze can get the distributing and the future development of the land.

4.2 Provide decision support for the city planning

Spatial data mining technique makes use of general geometric knowledge, spatial distribution rules, spatial association rules, spatial evolution rules to get many factors about terrain, prevent or control flood, preventive pollution during the city planning for providing good data environment in city construction.

4.3Valid management and analysis of remote sensing monitoring result

According to algorithm of spatial data mining, based on knowledge discovery, it can validly output various statistical charts, images, query result and analysis result for decision.

5. SEVERAL ADVICES

5.1 Develop land use automatic classification system of remote sensing.

Based on spatial data mining technique, we can combine background database to develop computer automatic image identification technique to identify various land use, wetland plant, crop and to get area data and spatial distribution information.

5.2 Develop land use variation monitoring and current forecasting technique.

Under the support of GIS we can monitor dynamic changes of land use through spatial data mining, and we can study and analyse influencing factors between nature and man-made to forecast dynamic changes of land use.

5.3 Research the new algorithm of spatial data mining to raise the applied efficiency and accuracy of spatial data mining in land use dynamic monitoring.

REFERENCES

References from Journals:

Lianying Sun ,Suping Peng,Dezheng Zhang .Spatial data mining based on supermap model[J]. Computer engineering and
applications, 2002,(11).30- 32.

Haiyan Zhou,Jiayao Wang,Sheng Wu .Spatial data mining technique and application [J]. Bulletin of surveying and mapping, 2002,(2).11- 13.

Deren Li,Shuliang Wang,Deyi Li et al. Theories and Technologies of Spatial data mining and knowledge Discovery[J]. Geomatics and Information Science of Wuhan Universtity, 2002,6.221- 233.

Clementini E,Di Frlice P,KopersKi K .Mining Multiple-level Spatial Association Rules for Objects With a Broad

Boundary[J].Data & Knowledge Engineering,2000,34.251 - 270.
Ladnee R,Petry F E ,Cobb M A .Fuzzy Set Approaches to Spatial Data Mining of Association Rules[J].Transin GIS, 2003,7(1).123-138.

ZhouChenghu,ZhangJianting .Entropy-Based Model for Geo-Data Mining[J].JournalofImageandGraphics,1999,11.:946- 951.

LiuYu,QuBo,ZhuZhongying,ShiSongjiao. A Study on Theory and Methodology of Spatial Data Mining [J]. MicrocomputerApplications, 2000,8.15 -18.