Sharing and Distributed Service of Remote Sensing Data via Internet

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SUMMARY

The Remote Sensing data is important data for people to research in GIS, which is used as background data. But because of the large amount of RS data, it is difficult for people to describing, searching, using, sharing and serving to public, especially as time eclipse, the amount of RS data will be larger and larger and so that people will be more and more difficult to use them. In order to easily provide these important data to public, we use RS data metadata standard to get the metadata for every piece of RS data, so that we can use it to describe it to other people such as the data's origin, resolution and so on. We also using database technology to manage and store the RS data through split and compress it in order to put in the commercial database, which can easily realize the query, browsing and analyzing of any data; through the publishing metadata of RS data to realize the publishing of RS data through internet, which can make full use of RS data; using ontology to realize the interoperability of the RS data and make possible for the sharing of whole public.

SUMMARY IN CHINESE

通过较为先进的数据库技术进行影像数据的存储与管理，便于数据的查询、浏览、分析等功能的实现，并为影像数据的发布与共享提供条件；利用遥感影像元数据实现遥感数据的网络发布与共享，从而使稀缺的影像数据能够得到充分合理的利用；同时采用本体技术，可以有效的实现影像数据的互操作，从而为实现影像数据的全社会范围的共享提供基础与条件。

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1. FORWARD

As the fast developing of space information technology, the data mining and using of it has been the most aspect of people's research work, especially for the remote sensing data (RS data). For the RS data has many advantages such as easily got, short period, large information in it, it has been the more important part of space information data. But because of the large amount of quantity in RS data, and for some secret and rare characters, all of these limit the sufficient using of RS data, so it is ergent to need a very effective way to management, saveing, orgnization and sharing these data.
According to solve the problem above, we put forward a new way to sharing the remote sensing data via internet. We use the remote sensing metedata, modern database technology to management remote sensing data, then using XML technology to realize the remote sensing metadata and remote sensing data's publishing which will let the user to query, finding and access these data, this has been the fundamental for the RS data's sharing. In the end, according to the information ontology's researching, put forward the establishing of remote sensing information ontology, which will help to realize the RS data's web service.

2. DATA'S MANAGEMENT

2.1 Metadata's management

Metadata is an efficient means to the management and sharing of spatial data. Through the metadata information, user can get the data's information without real data. So it gives the impossible to the data's sharing and using. As now, we have the vector spatial data's metadata standard which has been the National Standard, but we didn't have an efficient remote sensing data metadata standard which has been accept by universal. In order to realize the RS data's sharing, according to the ISO 19115-3- remote sensing metadata standard, revised according to the Chinese situation, we establish a remote sensing metadata standard (Draft). In this standard, it include 7 metadata datasets, 6 public data types and 15 coding tables.
The datasets' relationship and logical structure is shown as the following figure.

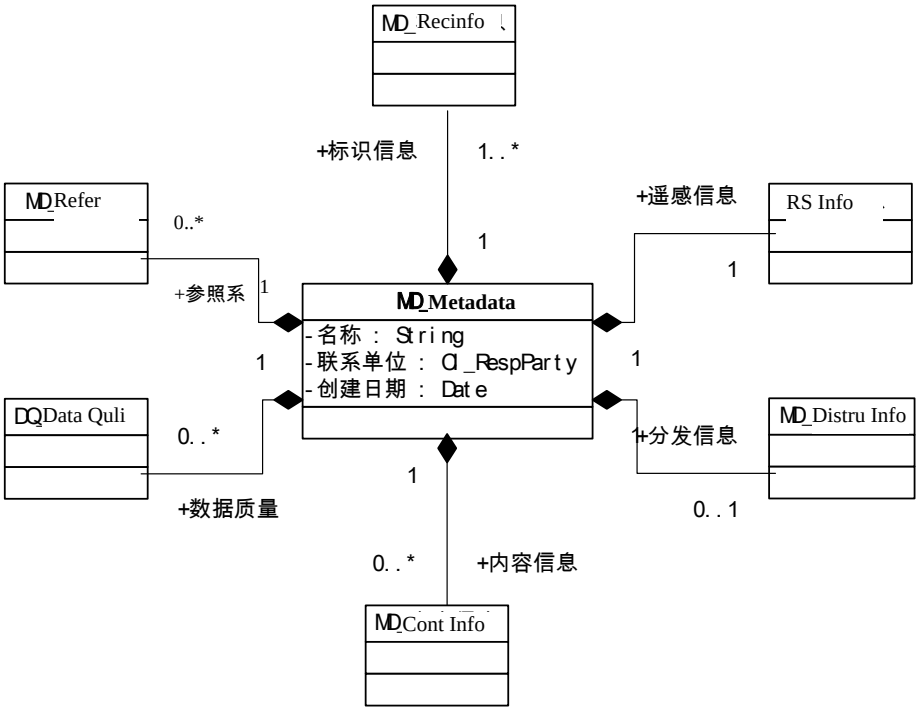

Fig. 1 remote sensing metadata static UML structure figure

2.2 Remote sensing data's management

For the huge data amount of the remote sensing data, it is difficult for us to save it directly and thus is the obstruct for the following data processing, accessing and browsing. So we should need to pre-processing the data. It includes desampling, data compression and data cutting.

Data cutting means to cut the remote sensing data into different tiles according to the same rows and columns. The tile is the smallest unit to save as one record. When people want to access the data, the system only give several tiles to the user. So it optimize the data's saving, transmit and browsing.

In order to lower the transmit data amount and optimize the displaying performance in the browser, we use the desampling method to establishing remote sensing image pyramid. In the pyramid it can be divided into different image levels, each level saved alone and has the index mechanism with the other. The common image desampling has bilinear margin and cubic convolution.

For the huge amount of the image data, in order to drop the saving space, we should use different compression method to compress the image data. The common image compression method has JPEG and LZ77.

The remote sensing data management structure is shown as following figure.

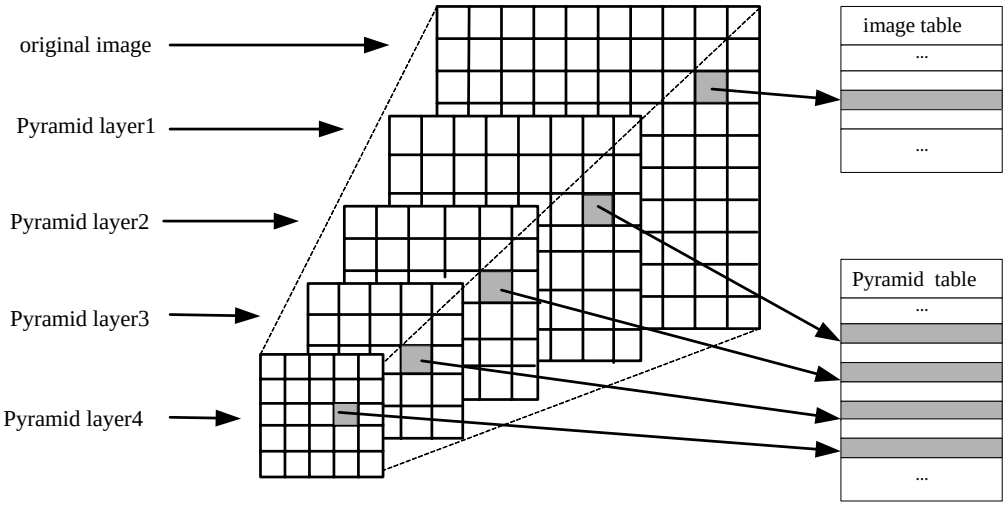

Fig. 2 remote sensing data management modal

2.3 The designation of image database structure

The remote sensing database can be divided into two parts: image metadata database and image database. The image metadata database used to save and manage the metadata while the image database used to save and manage the remote sensing data. The metadata is connect with the image data closely which ensure the corresponding of the metadata and image data. The structure is shown as following:

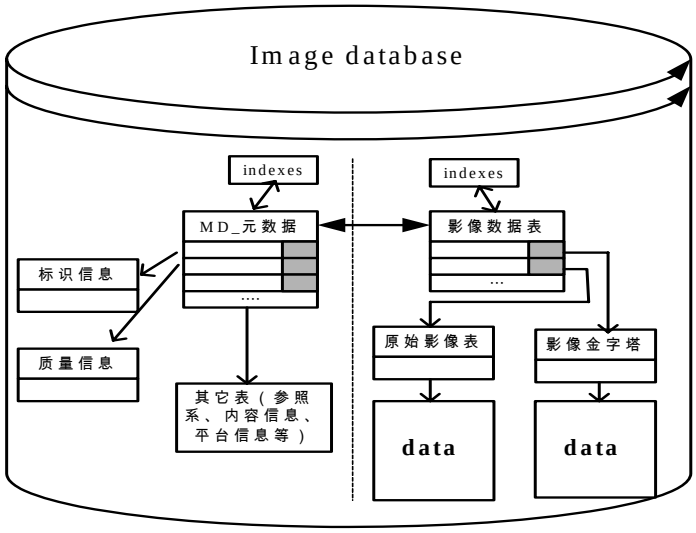

Fig. 3 image database structure figure

3. THE WEB SHARING AND SERVICE OF THE IMAGE DATA

3.1 The image data publishing and sharing based on metadata

The main aim of the construction of image metadata is to realize the remote sensing data publishing and sharing via internet. So the metadata's publishing is the basic of the image data sharing.

Now the metadata publishing technology is mainly used XML. In this paper, we also use XML to realize the metadata publishing function. Using XML, with the help of the XML schema or DTD, we can easily descript and encapsulate the data into XML files. Because the data is divided with the display in the XML file, so it can be easily encoding and display correctly by different browsers such as Netscape Navigator and Microsoft Internet Explorer and it is very easily to transfer the data between different operation via internet. So we use XML technology to transmit and publishing these data.

Users can get the remote sensing data's context information according to the metadata which has been published via internet and then according to the metadata's navigation, they can realize the querying , browsing and even searching these image data which they need. The remote sensing data publishing structure can be shown as following:

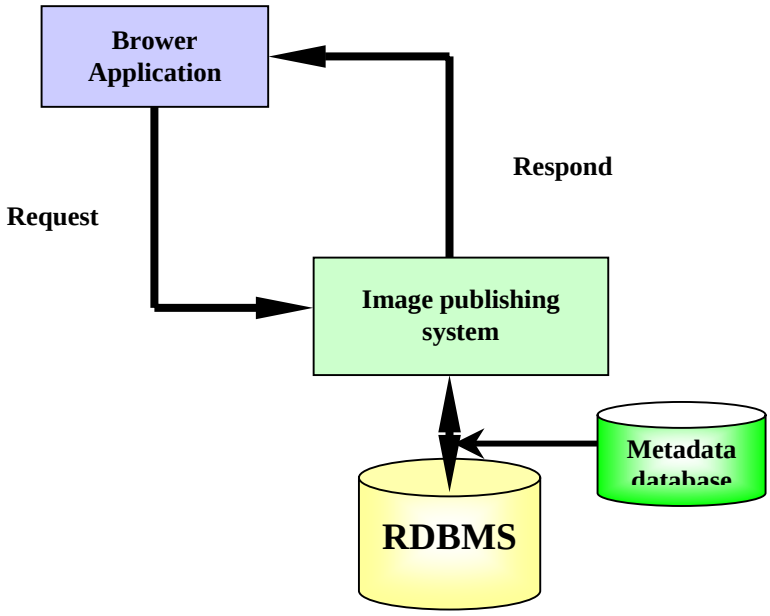

Fig. 4 remote sensing image data publishing structure

3.2 Image data web service based on the ontology technology

The word ontology seems to generate a lot of controversy in discussions about AI. It has a long history in philosophy, in which it refers to the subject of existence. Ontology is the embranchment of philosophic; its name comes from the Ontology in the metaphysics. It is

also often confused with epistemology, which is about knowledge and knowing. Ontology is mainly focus on the essence of the things which is comparatively with the Epistemology. It is focus on the exists while the Epistemology focus on the subjective cognize.
In the context of knowledge sharing, we use the term ontology to mean a specification of a conceptualization (Gruber, 1993). That is, an ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents. This definition is consistent with the usage of ontology as set-of-concept-definitions, but more general. And it is certainly a different sense of the word than its use in philosophy.
In this paper, we just definition the image ontology into two parts, one is the well structured glossary and the other is the different relationship between these words. Because the ontology is aimed at the understand by the computer, so it needs accurate formal language, syntax and even definite semantic to explain it. How to do these specific and technical process upon present technology is the main research work for us.
Using the remote sensing field ontology, we can easily realize the remote sensing knowledge's sharing and reuse, and realize the remote sensing data sharing and web service.

4. CONCLUSION

Through the modern database technology, we can easily realize the huge amount remote sensing image data's saving and management, which will efficient to provide the users to query and search the needed RS data via internet. Using the image metadata to construct the RS data publishing and sharing network is an efficient way to make good use of the rarely RS data's sharing and reuse. In the last of this paper, we just talk about the ontology in briefly, as for the detail on the remote sensing field ontology will be discuss on the other paper.

REFERENCES

1. ISO/TC 211, ISO/DIS 19115, Geographic information — Metadata, 2000.12
2. Jingtong JIANG and Jianbang HE, Geographic information international standards handbook, Chinese Standard Press, 2004.2
3.National Geomatics Center of China, Chinese sustainable development information sharing metadata standard, 2001.12
4. Tom Barclay, Jim Gray, Don Slutz, Microsoft TerraServer: A Spatial Data Warehouse, http://www.TerraServer.com, 2002.2
5. Managing Geographic Raster Data Using GeoRaster, An Oracle Technical White Paper, 2003,11
6. Charles F.Goldfarb, The XML Handbook（Fifth Edition），Prentice Hall，2003，12

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