

DEVELOPMENT AND APPLICATION OF REMOTE SENSING INFORMATION SYSTEM IN CHANGLU SALT WORKS*

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Abstract: We build up an information system of Changlu salt works based on production process combining remote sensing technology with GIS technology. Firstly, the professional software are used to process the remote sensing images of Tianjin Bohai area, then the remote sensing images are processed digitizing and informatizing, and the production flow of Changlu salt works. Lastly, the remote sensing information system of Changlu salt works based on production process is built. Using the information system, we can put numeral supervision and searching information not only in the different process but also in the different stage.

Key words: Changlu salt works, Remote sensing, Information system

INTRODUCTION

Sea salt, obtained by the evaporation of seawater, is used in cooking and cosmetics. Historically called bay salt, its mineral content gives it a different taste from table salt, which is pure sodium chloride, usually refined from sea salt. However, it has not been readily obtainable and the alternative coastal source has also been exploited for thousands of years. The principle of the production is the evaporation of the water from the brine of the sea. So the planning and

In this paper, firstly the remote sensing images in Tianjin are processed through geometric correction, digital and information

management about sea salt production depended on the local land using status maps, which reducing the planning and management of scientific and feasibility. Remote sensing is a comprehensive detection technology which developed in 60's of the 20th century, with the amount of information, and access to information quickly, the characteristics of short update cycle for the analysis and study the development of environmental monitoring as well as the evolution of features provides the ways and means.

processing, then the most appropriate bands are used to analyze the sea salt fields in Changlu salt works to get the view of salt

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field information, lastly the remote sensing information systems are established based on salt production process and remote sensing information, in which we can measure the area in various production processes of the salt, realize the production of the state of intuitive visualization, and reach for the salt of information management, at the same time human and material resources and time had been saved.

PROCESSING OF REMOTE SENSING IMAGES

Remote sensing satellite images of the Landsat satellite TM are used for Bohai bay (TM image), the largest pixel recognition to 30.0m.

The salt field information is extracted from remote sensing images, in which the three bands of less relevant data were filtered to enhance processing and (false) color

composite, and strive to deal with image clarity, color coordination, moderate contrast, and visual effects good, easy to read. In this paper, we chose the 5 (red), 4 (Green), 3 (blue) band of TM images to compose the false color images, which combining with the characteristics of surface features (such as buildings, estuaries, etc.) the positioning of points on the remote sensing images to geometric correction and the coordinates of latitude and longitude appropriate division. The remote sensing registration image in Changlu salt works is used to establish some interest areas in order to distinguish the salt fields, green land and other features. The result of grid images is shown in figure 1.

DIGITIZATION OF REMOTE SENSING IMAGES IN CHANGLU SALT WORKS



Fig.1 The remote sensing images of Changlu salt works after image registration and geometric correction (April 7,2005)

We use the geographic information system software to digitize the main roads and area in salt field, combining with the site plans, plans and other information map. Then the production process and salt fields name are added to the digitization salt field images, at the same time the colors are labeled on the images according to the production process of salt and the corresponding legend.






Digitization of images

The grid images after processed will be prompted for the image registration to have the geographical coordinates using the MapInfo software. In order to establish expediently the salt statistical computing model of perimeter and area, the latitude and longitude model is used on the grid image registration.

Then the surface-like elements, such as salt fields and residents building, and the linear elements, such as the roads in salt fields were digitized, and the digitization images of salt fields are edited through plastic roads, styles, line-style so that the contour of salt regions and roads are accuracy. All the processes are divided into five parts

according to their different salinity, and the different colors are labeled in digitization images based on the relevant processes and salinity, show as in table 1.

Table 1 the relevant processes and salinity

NO	Salinity(°Be')	Process name	color
1	3.6-5.2	Primary halogen section	
2	5.8-7.5	Evaporation section	
3	8.0-11.0	halogen section	
4	11.0-16.0	Adjustor section	
5	16.0-28.0	Crystal section	

According to the above process, the whole salt field is classified, the result show as figure 2.

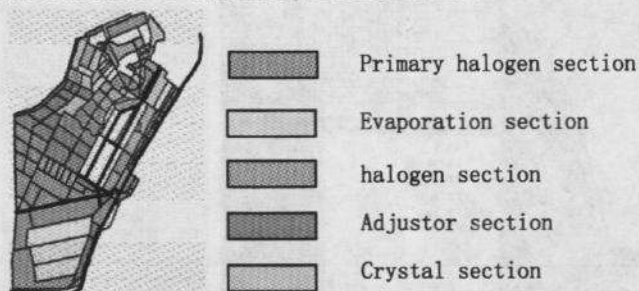


Fig.2 Classification result of remote sensing images in Changlu salt works

Add the corresponding map information

The corresponding map information, such as salt sections and roads information, is added to the digitization classification images referring to the ichnography of Changlu salt works by the information tool in MapInfo software. The basic information of salt field sections include name, salinity, area(km2)

and output(ton), etc, in which the area comes from the auto-compute of MapInfo software, which is shown in figure 3. Add is complete, save the form to the "digital salt" form. Using this method, the information of main trunk road in salt works is added to images, including the coastal highway, the data are saved to the "road salt" form.

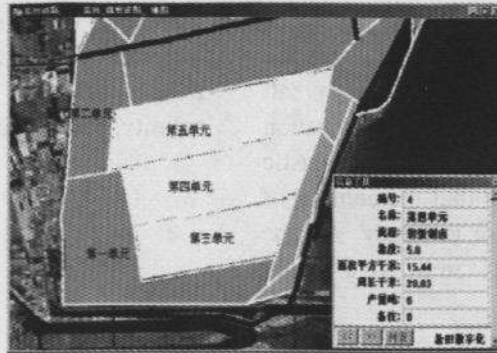


Fig.3 Adding map information by the information tool in MapInfo software

Map information query

After adding the map information, we can update information, delete, and query.

When the inquiries are conducted, we can find the corresponding figures using the datasheets. Concrete steps are:

① Selecting "File → Open Table" command to open the information table of salt;

② Selecting "window → new browser window" command;

③ electing the each small box before records, the map displayed by the browser window to select the corresponding location recorded in the chart, the mobile "browser window" to see it, which is shown in Figure 4.

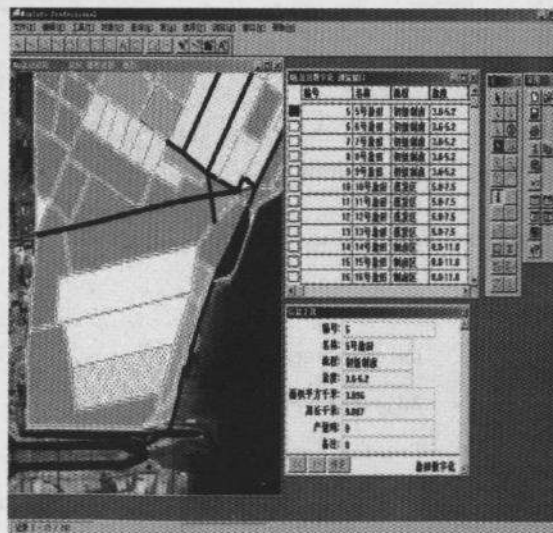


Fig.4 Find the corresponding figures using the datasheets

DIGIZATION SALT SECTION SYSTEM RELEASE BSAED ON THE WEBGIS MODEL

The digitization salt section system is promulgated using network pages through

IMS information system based on Apache and JAVA. Because of the local release form, the database and publishing server are running on the local computer, we can start the publishing server and the corresponding web services (HTTP-GIS), then enter

http://127.0.0.1/changlu . jap in any browser address bar, the network pages of remote sensing information system in Changlu salt

works can be opened in a browser, show as figure 5.

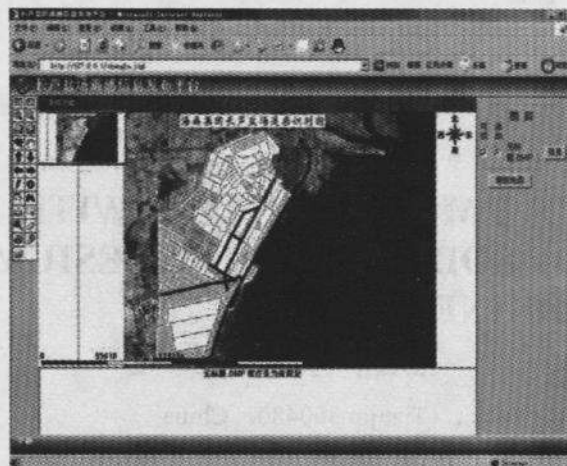


Fig.5 Digitization salt section system release based on the WebGIS model

In the publishing platform, we can carry out the following operations: the arbitrary image scaling and translation, query the known features of information (location, etc.), information query based on the information layers, the data retrieval based on data table, the line and plane (the length and the area)query based on map, graphics / retrieve data to print.

CONCLUSION

In this paper, the model of information query is established through digital processing of remote sensing images, at the same time, the information management system is established based on production process. The information, such as salt sections area and output, can be retrieved in the system model, which is accurate, efficient and intuitive.

References

Kemp, z., Oxborrow, E., 1992. An Object Model for Distributed Multimedia Geo-graphic Data, Proc. Of EGIS '92. T-hird European Conference on

Geographic Information System, Munich, Germany, PP.1294-1303.

Sui, D.Z., 1998. GIS-based urban modeling: practices, prob-
lems , and prospects. *International Journal of Geographical Information Science*, 12(7):651-671.

Ma, L.B., 2006. Tutorial of principle and methods about Web-GIS. Science publishing,

V. Lum, P. Dadam, et al. 1984. *Designing DBMS Support for the Temporal Dimension, Proceedings SIGMOD'84 Conference*, Boston, USA SIGMOD Record,14(2): 115-130.

Z. Kemp & E. Oxborrow, 1992. An Object Model for Distributed Multimedia Geo-graphic Data, Proc. of EGIS '92, *Third European Conference on Geographic Information System* , Munich, Germany, PP.1294-1303.

Sui DZ.1998. GIS-based urban modeling: practices, problems, and prospects. *International Journal of Geographical Information Science*, 12(7):651-671.