Strategy of Map Rapid Guarantee Based on PDF Structure

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Abstract

Under the conditions of traditional printing technology, as influenced by long manufacturing period, inconsistence in cross-media visualization output effect as well as ignorance of safety issue, it's difficult for map products to reach users in the mode of service at first time. This article analyzed the problems of map guarantee in emergency of the rescue and relief work, and then brought forward the new strategy of map rapid guarantee based on PDF structure to account for various needs of rescue in emergency. This strategy not only ensure data quality but also shorten the work period, meanwhile, it plays an active role in the fields of application, transmission speed and safety control.

1. Preface

At the moment of sudden disasters such as earthquakes, floods etc., it is necessary to know about the conditions of disaster areas immediately and make rules rapidly for urgent rescue then carry them out effectively. In the whole process, maps are the indispensable tool in demand at first time after disasters. Although we have known conventional maps and been able to use them pretty well, yet it cannot meet the needs of guarantee in emergency as traditional methods call for long producing period. Therefore, a guarantee project of map printing for urgent rescue should be established beforehand. When needed, rescue work can be carried out right away. In the shortest time, map users can get access to map products which are of best quality.

2. Multi-source map data and its problems

2.1 Printing requirements for map data

In order to make sure the best map printing quality and realize the satisfying vision experience, rigid printing requirements for map data are needed, which include:

(1) To make sure the successful conversion from map data to preprint data, data structure should be reasonable, file content should be intact.

(2) To make sure the intactness of printing content, element content should be intact.

(3) Element relationship should be accurate, not only relationship among elements but also primary and secondary relationship of theme content elements should be considered.

(4) Color design should be reasonable and its application should be accurate. Color mode must merely be CMYK or spot color. It should not only consider the special needs of task as well as the objective demand of printing process, but also consider the needs of cartographic symbology, cognition (map readers' vision and psychology experience) etc.

2.2 The types and characters of multi-source map data

The diversification of current map data acquisition means, the described multi-semantic of space entity and the variety of storage format lead to the emergence of multi-source map data.

2.2.1 Current mapping software data

Current mapping softwares include CorelDraw, Illustrator, Freehand, AutoCAD etc. These soft wares, whose functions are sufficient and perfect, capabilities are stable while application is convenient, are widely used in current market. However, they are aimed at the needs of common digital mapping, neglecting the special characters of map making. Therefore, it cannot meet the needs of its specialization if these softwares are directly used in map compilation. From this aspect, they are fairly suitable for simple and rapid map printing work. The data of the software can be directly converted to preprinting data which is used in digital proof.

2.2.2 Special mapping software data

Special mapping softwares include MapGIS, Microstation, MapStar etc. They are well pertinent and open while easy to be updated and maintained. At present, some special map data come from these softwares, of which the digital mapping system based on Microstation is one of them. This type of software can almost directly convert data to preprinting data but some deferent data from certain software is limited to plate separation data. Some software may even lose information in the process of converting preprinting data.

2.2.3 GIS system data

In current market, prevalent GIS systems include ArcGIS, MapInfo etc. Many GIS systems are established on the ground of ArcGIS. Still, many other GIS systems, especially ones used in special fields, are directly developed from the bottom, such as MGIS, JJGIS etc. Nowadays, GIS system, whose interface is agreeable, operation is simple while price is low, is one of the vital approaches to get space data rapidly. As the function of GIS system mainly refers to the management, analysis and application of space data, this type of software seldom have the function of converting data directly to preprinting data.

2.3 The main problems of multi-source map data

As formats of map data produced by different mapping guarantee departments are not unified, it is difficult to realize the sharing of data resources and convert map data to preprinting data rapidly. It will seriously influence the process of digital map printing. Though the format of vector data is unified, yet as there are differences of software and hardware, disunion will frequently

emerge in the output images, paper maps etc. such as symbols, letterings, color discrepancies etc. which will directly lead to understanding deflection when using maps.

3. The advantages of maps based on PDF structure

From the analysis above, multi-source map data have obvious character of non-sharing, which makes rapid and effective conversion from map data to preprinting data impossible. As a result, rapid printing is hard to realize. In order to solve the problem of rapid conversion from multi-source map data to preprinting data, this paper put forward the technique of rapid printing which uses map data based on PDF structure. Map data based on PDF have the following advantages:

3.1 High efficient function of data compression

PDF, which is the compressed format of letters, figures and images, is one of the formats that have the highest compress efficiency. It uses many ways to compress original Postscript files. The storage space of files is tiny, which can usually be compressed by from one tenths to one hundredths. By using it to store map data, the space of hard disc can be saved largely. Especially for those who transmit files on line, the transmit speed is rather high.

3.2 Cross-media Character

PDF map data have the visualized output function of cross-platform (including windows, unix etc.), cross-media (including paper maps and desktop electronic maps, network maps) and independent to facilities.

As PDF can encapsulate letters, word types, formats, colors as well as figures and images which are independent to facilities and resolution. Its output is not confined by operating system, network environment and application edition etc. As long as users have Adobe Acrobat Reader (provided free by Adobe corporation), they can read PDF files conveniently and efficiently as average files at any place and any time.

3.3 Rapid and convenient function of data searches

In one district there may be many data resources. When we search the data of a map, we usually manage it by former experience. But now, if we set up corresponding PDF data searches for the data from different data resources, data acquisition will be more convenient.

3.4 Rapid and convenient function of network transmission

PDF is one of the most prevalent file formats used in network transmission. As long as network communication goes well, space data based on PDF format can be transmitted between two end points conveniently. At present, Peking University Founder Group long-distance plate-transmitting service is a typical application of network communication.

3.5 Powerful copyright protection function

PDF data allow password set and own many other protecting methods so as to prevent illegal use. For instance, users must use password to read, print, copy, interpret or modify the content. This function provides a dependable way to protect the copyright of map data.

3.6 Seamless link to digital printing system, rapid printing output

PDF format is the NO.1 choice for digital printing system. Having received the map data of PDF format, the system can directly go into the step of page make-up and RIP interpreter. Presswork can be available instantly.

4. Strategy of map rapid guarantee based on PDF structure

4.1 Create self-contained data acquisition methods

4.1.1 Direct acquisition based on GIS host software

Direct acquisition based on GIS host software is based on the software itself, and it expands data output function by making program code, which enables it to export corresponding PDF data. This method should be the most effective and reasonable one, which can realize the free recombination of PDF data structure. But in the process of realization, original code of GIS host or secondary developed interface should be obtained. Therefore, it is widely used in the self-developed GIS system.

4.1.2 Indirect acquisition based on middleware technique

The operation of converting map data to PDF data by using middleware technique is designed to single middleware. Each GIS platform corresponds to one middleware. Each middleware has uniform data operation interface with different methods. Middleware is supervised by data middleware manager. In actual situation, the manager uses corresponding middleware to realize the conversion from map data to PDF data according to the information of GIS platform. Nowadays, as a majority of GIS systems especially some self-developed mini GIS systems seldom have the function of exporting PDF directly while have no secondary-developed interface, this method is the main approach to realize the conversion from map data to PDF data.

4.1.3 Rapid acquisition based on virtual printer

PDF virtual printer is like real printer, which can intercept and capture printing operations of all Windows programs then create a PDF data file on hard disc. As long as GIS system has the printing function, it can make PDF files by using PDF virtual printer. The operation of the method is simple and easy to realize, which can export PDF files that have the same display effect as the GIS system under the condition of not knowing the map data structure. It is one of the effective ways to get PDF data.

What should be demonstrated at last is that direct acquisition based on GIS host software and indirect acquisition based on middleware technique both work on the ground of following basic PDF structure and grammar. Meanwhile, it reasonably organizes and optimizes file content. Therefore, in the process of application, it can realize many operations conveniently and rapidly. For instance, average display control, and the control like average GIS system with the function of layer-separation, query and search. As the map data got from virtual printer is exported on the basis of plot operation encapsulated in the virtual printer, the obtained data

organization way is externally encapsulated and unknowable. Other than the average display control, other self-defined operation functions can hardly be realized. In actual application, it's better to use the former two methods to get map data.

4.2 Set up the integrated service guarantee mode based on network

The mode of service guarantee based on traditional GIS system is mainly the desktop system. Although part of the system has realized the function of long-distance service based on network, yet these map data commonly have the problems of long updating period, difficulty of cross-system operation and cross-media without integrated output etc. Whereas the GIS system based on PDF structure can set up the service guarantee mode which integrate desktop electronic map, network map, hard copy output as well as traditional printing merely through a single process of data production work. What's more, it has the advantages over any former GIS system on aspects of data updating and transmission. If the system, which gathers network and hard copy output service, is used in the rapid map guarantee, a brand new, intact and more effective way will be opened for current mapping guarantee in emergency. This mode will definitely provide accurate and dependable space information service which has the same visualization effect as common mapping products for rescue and relief work at first time.

5. Conclusion

Currently, in some large-scale rescue and relief work, traditional mapping guarantee mostly retains the mode of common mapping guarantee, which may easily bungle the opportunity for work. This paper analyzes the problems emerged in the mapping guarantee of the rescue and relief work, and then brings forward the strategy of rapid map guarantee based on PDF structure. It uses many techniques to convert map data created by various mapping systems to map data based on PDF structure. Supported by network, it seamlessly connects digital printing system. With the electronic map and paper map guarantee system, it realizes the system of rapid map guarantee. The application of the strategy can not only ensure the data quality while shorten work period, but also plays an active role in the application range, transmitting speed as well as safety control etc.

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Dr. Shi Ruizhi, a supervisor for doctoral candidate, works as a professor in Zhengzhou Institute of Surveying and Mapping. She devotes herself to the research on original processing and publishing theory and technique in the fields of surveying and mapping as well as printing.

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