

Map Customization Service based on User Interest

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Abstract

As for the limitation of cartography technique, printing craft and network technique, map publishing information usually transmits in the unidirectional way, and the publishing cycle lasts long and users cannot participate in cartography, which cannot meet users' needs of individuation. In order to settle these problems, a new map publishing mode which is based on map customization service considering user interest is put forward. Corresponding techniques and solving strategies are discussed, including the manuscript database of map publishing and the application of multi-source data, user interest GIS analysis and disposal, cross-media map color control, the constitute of variable data and the optimal choice of digital printing site, etc. It provides important reference for the convert of map publishing mode from traditional one to map customization service mode based on User Interest. This mode comprehensively uses digital cartography technique, network publishing technique and digital printing technique, which lays emphasis on users' participation in the process of cartography and accords with the thought of individuation service for users.

1. Introduction

Traditional map publishing is making manuscripts through map editing, and then manuscripts are sent to printing house to print and publish at large amount. Users can purchase maps at shops. Since map design faces common people, when people choose maps, they can only choose maps that close to their own needs.



Fig.1 Traditional map publishing process

In the map publishing mode shown in Fig.1, since the limitation of cartography technique, printing craftwork and network technique, information stream flows from the front to the end in the single way, which cannot enable users to participate in map designing and making. This mode brings some problems. The first one is lagged information and low currency. Currently, China's economy develops smoothly, and it is more rapidly than maps' updating rate, which leads to the situation that some map information cannot match practical conditions. The second one is low individuality. Map publishing serves common people, each thematic map suits different needs, but they cannot meet the needs of individuality. The third one is satisfaction extent is not unified, which shows in two parts. (1) Map sheet division cannot meet individual needs. Several maps may be needed when a task is carried out. (2) Because of all elements cartography, information is labeled on the map, which causes information complex and massive and finally poor effect of user searching information.

In order to solve the problems above, this paper brings forward the map customization service mode based on user interest, which can make customized maps according to users' needs.

2. Map customization service mode and its critical technique

2.1 Map customization service mode

Map customization service mode accords with users' needs and takes advantage of the "customization first, and then production" mode. It makes full use of GIS technology, digital map cartography etc. to make digital manuscript. It uses advanced data processing system, digital printing system and network system to provide users with on demand, rapid, highly individual map information service, which combines map design, printing house, users together and set up the mode in which network is the ligament and serves users. It enables users to participate in the map design and making, which changes the traditional conception that map products are the center and forms the new thought of map customization publishing aiming at serving users.

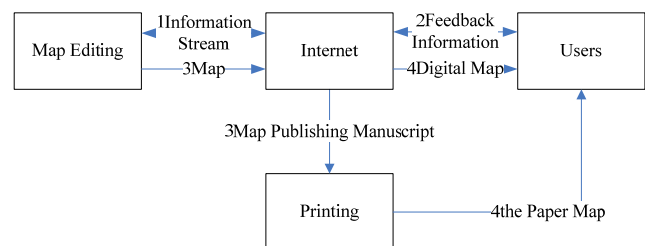


Fig.2 Map customization service mode

As Fig.2 shows, map compilers transmit each stage's information to users through the network. Users check this stage's information and feedback information through the network to map compilers, which offer suggestions on map products. Map compilers receive the feedback information and modify the last stage's map compiling results according to users needs. After modification, the results as well as this stage's results are sent to users to check. Users participate in the whole process of map design and making. Meanwhile, users can depend on their own conditions to decide the participation degree. After map making, user can make a proof and signature the proof, and then send map publishing manuscript to the printing house through the network. In the printing house, maps are printed according to users' needs and allocated to users, which ends the whole operation process.

2.2 Map customization service mode's critical technique and solution

2.2.1 The foundation of map publishing manuscript database

With the development of science, the software of digital map publishing manuscript tends to be mature. For example, MapGIS, MicroStation, etc. They can be used to make every digital map publishing manuscript. Currently, map publishing manuscripts have the characteristics of massive data. Usually, the data size of an EPS format relief map with 1:50000 scale is 100MB. It is transferred along with data searches and browsing from the database, which has low efficiency and not all the information can be grasped. Therefore, when store and organize this type of map publishing data, corresponding metadata are founded and stored while the digital publishing manuscript management system with the structure of client, application server and database server is set up, which makes data can be used and shared.

Meanwhile, multi-source data should be the supplement of map publishing manuscript. Since the diversification of information obtaining, many semantic of space entity description and diversification of different software storing format, map information production is diverse. The diversification of multi-source data can describe maps from different points of view. Meanwhile, because of the characteristics of multi-source data updating in time, diversification and convenience, it is propitious to describe and update the data of map publishing database. Through the data structure mapping of map publishing manuscript database and multi-source database, the two are connected as an integrated GISpatial database. This offers map customization service abundant information source, which helps users to make decision and make needed maps.

2.2.2 Interest analysis and process

Interest point is defined as the area which draws users' attention. Tobler (1970) has ever pointed out that geography's first law is any objects are relevant to other ones, while near object's relativity is stronger than the faraway one. The spatial autocorrelation of interest point and surrounding objects shows that they have potential dependency. When users scan maps, they make interest point (group) as the center, and search information which surrounds the center, and then gradually enlarge the range. Meanwhile, they pay more attention to the information obtaining in this area. This process accords with people's psychology cognizing principle. Users firstly starts to scan maps usually scan the center. Basing on the center, the map center point will be given more attention time and attention extent. Therefore, in the map customization service, interest point (group) should be set as the center.

Metadata (coordinates information, surface features types, etc.) is picked up in the map publishing manuscript database. Based on the interest point (group), some wide and range buffer zone polygon is set up. Primary and secondary radiation range is obtained by multiple proximity analysis. According to users' needs and the interest point (group) and radiation range's distribution conditions, metadata's relevant map publishing manuscript is searched. The interest point is the center. Through the process of map remaking (data updating, meeting, and cutting, etc.), analysis and process on demand in real time is realized. Specialist wizard mode based on model or adaptive mode is used to make maps rapidly.

2.2.3 Cross-media map color command

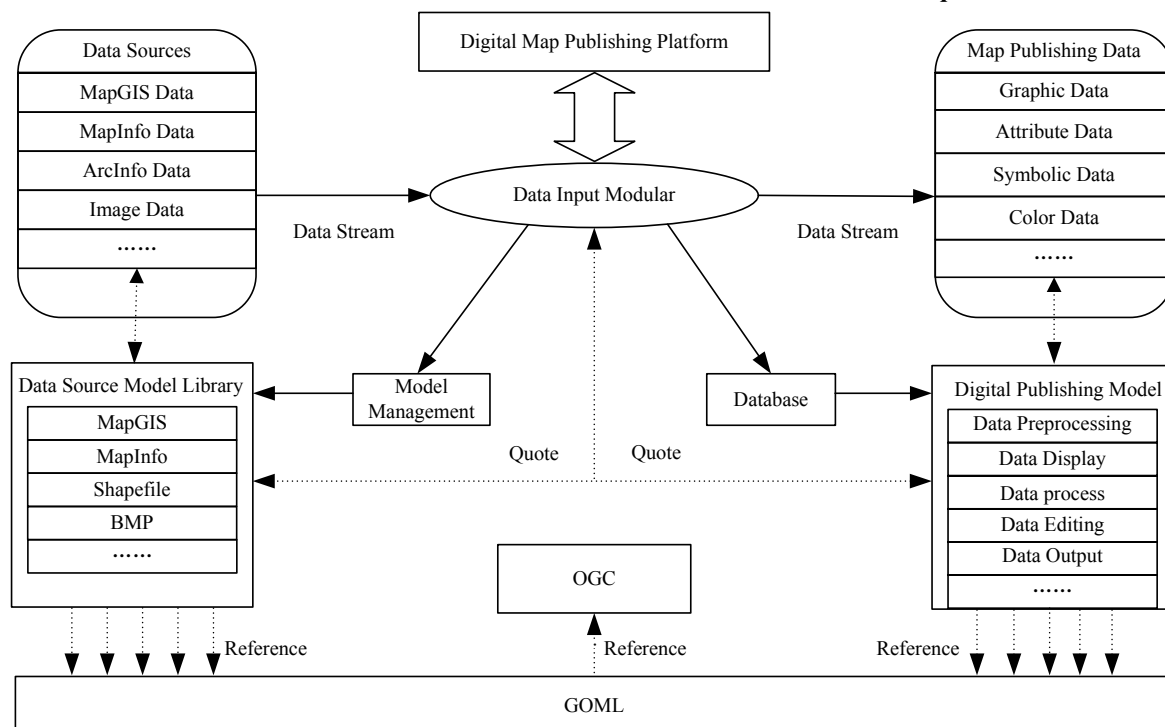


Fig.3 The application of multi-data source

Digital map cartography technique enormously cut down the map making cycle, but it brings some problems, too. Since RGB color mode is used in the stage of map design, while CMYK color mode is used in the stage of printing, the difference of the two color modes in expression form leads to some uncertain factors in the process of color transfer. These uncertain factors is caused partly by device's color expression capability and device-dependence features, and partly by color looks phenomenon raised by different observation conditions.

Because of the uncertainty of manuscript usage and manuscript's sheet division and making, maps of users' needs may involve two or more border ones. Map publishing manuscript may be made on different devices, which can lead to the situation that border map publishing manuscripts' color displays are different and influences users to use maps. Therefore, in the process of map remaking, color appearance model and suitable color management software should be used to adjust the color differences between the two maps, and realize the aim of what you see is what you get.

2.2.4 Variable data printing

Variable data printing is the main attribute and function. The combination of variable data printing and network technology accelerates the new printing industry centered as client, which takes the place of the traditional printing mode centered as product. Simply, variable data printing uses digital printing technique to connect printing engine with database. Data met the needs will be analyzed, processed and printed when it works. Compared with traditional printing mode, digital printing makes information on each space of a whole page different, which realizes printing starts from one sheet. It is not limited by the printing amount, while can realize the special printing mode of printing on both sides.

Map customization service can apply multi-layer mode, which is base map adding variable information map layer. Base map is defined as map printing manuscript or the map layer made by map remaking. Variable information map layer is defined as user's individual data or updated data. Usually, individual information is some decision, road layout or corresponding figure symbols made by users with some aims. When users communicate messages and knowledge concerned space, they are accustomed to draw sketches of surface features and their relative locations while modify and extend on the sketches at any moment. The value of these sketches is not on the design quality, but on that their information and content can be updated and extended. This information can help users carry out map making according to the project. As base map information lags, it is difficult to illustrate the development situation of corresponding area in reality. Therefore, multi-source data is used to update data, and deleting old area, cover methods, etc. is used to replace base map information. Finally, base map data, updated data and individual data are covered from top to bottom to form the variable printing data. These data can be altered even prior one minute before printing, which offers more time to consider for users.

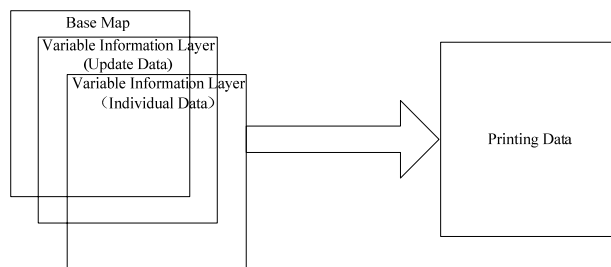


Fig.4 The organization method of Variable Printing Data

2.2.5 Self-choosing of printing spots

Users can make use of different encrypting ways and transferring ways according to different data source and practical needs. Meanwhile, according to the factors of printing amount (low printing amount, high printing amount), printing spots' location and capability, printing spots' facility (traditional printing machines, digital printing machines), printing modes (traditional printing, digital printing, digital proof), users can choose suitable printing spot. Through network transmitting, long-distance printing service can be realized.

3. Conclusion

Map customization service is different from traditional map publishing in publishing concept. It uses the mode of user centered to replace the mode of product centered, in which users participate more. It pays more attention to analyzing users' needs and emphasizes users' participation. According to users' real-time needs, printing work is carried out in real time, which accords with users' individual needs. This publishing mode is the comprehensive application of digital map cartography, network technology, digital safety technology, database technology, digital printing technology and logistics technology, etc. It advances the map's up-to-date state and individuality and changes traditional map's features. With the development of society, the needs of individual service and self-help service on special map demand and individual map demand will be advanced. Map customization service deems to be a developing field in map publishing.

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