

# STUDY ON THE PUBLICATION TECHNOLOGY OF INTEGRATED THEMATIC DIGITAL ATLAS BASED ON THE VISUALIZATION OF SPATIAL DATA

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## ABSTRACT:

By analyzing the characteristic of compiling the modern atlas, selecting thematic digital atlas as research object, this paper has brought forward the reflection and realization of the below-mentioned contents, which are the publication-oriented visualization of spatial data, the integrated method of compiling and publishing the digital thematic atlas, engineering pattern of production and the results export of multimedia of atlas. The purpose of this paper is to research and discuss the engineering production of publishing the modern thematic atlas, to develop the function of publishing the data in maps, to exploit and build the system of thematic atlas which is effectively related with atlas. The intention of this paper is to effectively promote the publication of major resource achievement and atlas.

## 1. BACKGROUND

With the increasing development of the mapping, information and digital technologies, based on the four-Dimensional productions and by using of GIS and multimedia technology, three kinds of the products is manufactured, which are the applied system of thematic information, the thematic map and the multimedia map. These products have had the trend of diversity and have taken on the characteristics of virtual, dynamic, interactive and networking. Consequently, the compilation and production pattern of thematic atlas are being changed. The digital cartography and printing in the two-dimensional papery plane are no longer the technique and final products of compiling atlas, and are farther linked with the spatial data, others thematic data resource and the applied system of major information, and become one part of achievement export. In the era of digital information, they have had the new function and use.

## 2. THE COMPILING CHARACTERISTIC OF THE MODERN THEMATIC ATLAS

### 2.1 The characteristic of data

Source material and data have the characteristics of multimedia multiplatform multi-scale, and digital map based on spatial data have become the main body of processing the data which are necessary to compile atlas.

In the modern society, the information is very developing, and the digital technology is being widely used. So the source materials are no longer limited with every kind of papery map and statistical documentation and so on, but are derived from the documents of digital information on the different system, media, spatial scale, temporal scale, such as map database, digital images of remote sensing, every kinds of office documents and the electronic documents from digital camera, video camera, website and so on. They are all the resource material of compiling map. Accordingly, it is one part of important contents that every kind of data is collected and

reorganized, the interface platform of data is designed, processed and transferred.

### 2.2 The characteristic of function

The map has represented the transfer from the front-end product to back-end one. It is not only the carrier of information, but also the innovation knowledge acquired by processing scientifically and further. The thematic atlas is gradually turned from the independent major dataset into one part of information achievements in the different frame of GIS and on the basis of major database, whose connotation and extension, function and formal have had new expansion and breakthrough.

The traditional thematic atlas is the major dataset with relatively independence, which has the storage integration of the graphics data in computer and papery printing and binding of map as the main form. In the frame of the major information system and on the base of the major database, the modern major atlas has gradually expended and become one part of the major digital information achievement. Its functions are turned from documentary into applied kind of results gather and comprehensive analysis. It has become the digital atlas of many issuing forms, such as papery, electronic, CD-ROM and WWW, also other public inquiry platform.

### 2.3 The characteristic of producing

The high development of digital technology has accelerated the mergence of techniques, and made the integration become the necessary trend of technique realization.

The mapping software and GIS software have merged in the function of compilation and publication, which will make GIS-oriented digital map and publication-oriented map incline to the integration in the different degree of data production.

With the development and application of the technique of digital mapping and printing, merge, simplification and combination of the techniques in the mid-sections of plate-making, printing and producing are caused effectively. That is,

the CTP system behind electronic publishing system and the plate-making of remote networking have realized the procedure of data from the computer to the printing plate. The numeral printing and the digital printing technique have made the data of map publication print directly, which has become the printing with alterable, dynamic, necessary in different region into reality, and have realized the integration before and after printing. Consequently, the digitalization in the total course of compiling and publishing map is finished. Ultimately, the production in the total digitalization environment has formed, the cost of publishing atlas is decreased, and the period is reduced.

#### 2.4 The characteristic of cognizing

The thematic atlas of publication-oriented and the extension of media-oriented have the different forms such as papery, electronic and online-issuing one. Their traditional vision cognizing pattern based on the representation of the plane graph is challenged. Several aspects are made rich such as the merge of multi-member information, the technique of many visualization, the analysis and measure of graph, the means and function of cognizing map.

At the same time, in the condition that the indication of spatial data and the technique of auto-comprehensive can not still fulfill the production and application entirely, there is the thematic atlas, whose characteristics are the full and accurate spatial database, the very rich data resource and being able to represent the contents of median-scale or small-scale maps. Especially, in the natural and degree maps of representing the spatial distributing rule, in order to ensure the integration and consistency of spatial data, the hi-fi map of large-scale data has more and more become the selection of the thematic map based on large-scale database. In making this map, the comprehensive method of artificial vision will be used.

### 3. THE CONSTRUCTION AND REALIZING METHOD OF THE SYSTEM OF INTEGRATED THEMATIC DIGITAL ATLAS

Based on the geography and major spatial data, supported by the publication-visual technique of spatial data, selected the compiling system of digital mapping and publishing as the core platform, the integrated thematic digital atlas has the below-mentioned exporting forms, such as papery printing plane, electronic CD-ROM, online-issuing and other platforms. It may be regarded as the other important form of comprehensively applying and extending the results of major information system. It is the extension and breakthrough of the function and form of traditional atlas, and it may be further extended to the major geographic information system. They represent the two aspects, there is the construction of system in chart 1

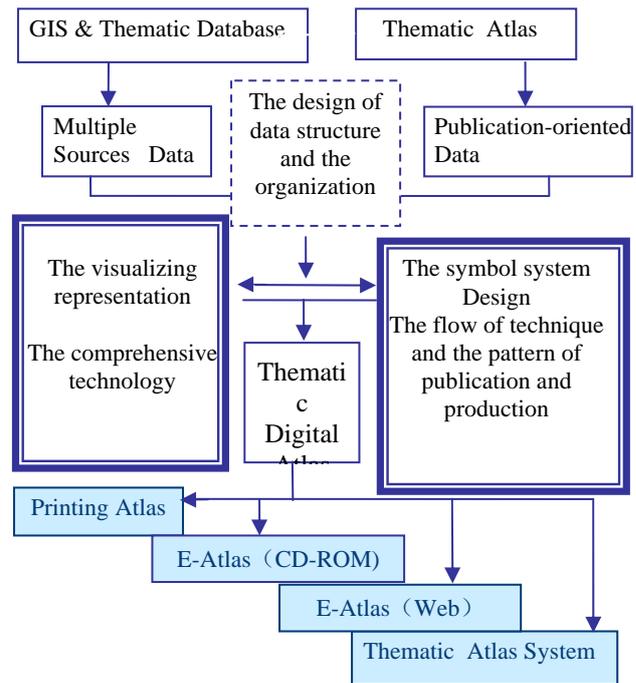


Figure1. The Construction of Thematic Digital Atlas System.

Firstly, the map data keeps the characteristic of spatial data: the result of spatial data's orienting publication visualization is to acquire the data of publication, which still reserves the attribute-characteristic and organizing form besides spatial characteristic of spatial data. The data of publication will be developed the major atlas system with GIS function in the comprehensive system of atlas.

Secondly, digital atlas has the form of representing multimedia vision, and the content of representing dynamic, visual and multi-dimensional major atlas. It extends the traditional atlas of static and analogical into the dynamic digital atlas which has analysis function of representing interactive ideas and many kinds of visualization methods.

#### 3.1 The design of data structure and the organization of data integrated with spatial data

The map data of publication-oriented and the spatial data have the different data structure and organization form. The vector and raster data structure of spatial data have the spatial and attribute characteristic and organize data according to the total structure of feature layer, feature and basic geometric object. According to the data standard of map publication, have the representation of vector geometric graph and symbol as the main purpose, the descriptive structure of data is constructed. According to the layer, feature and basic geometric objects, data is organized.

In the meaning of graph representation, the vector structure of spatial data has the characteristic of obviously locating spatially and implied attribute. One geometric object's attribute table includes in the many items of feature-symbolized contents, and the data's organization is simple. When the symbolized map data processes the complicated hierarchy relationship of among features, there will be the instance which one feature layer corresponds many layers. Besides, in the standard of grooming the layout of atlas and explaining, there are the contents of assistant features such as some words and pictures.

The map data of thematic digital atlas must preserve the characteristic of spatial data structure, and use feature-oriented form of organizing layers to represent the complicated overlapping relationship in the finite plane. So the feature layer of digital atlas's organizing data may include in the assistant contents of features which do not contain the characteristic of attribute. These contents may be selected according to the different usage, for example, the derived assistant feature may be deleted when the contents enter into database and GIS. In the data's organization, the construction of organizing map data contains the one of spatial data.

### **3.2 The visualizing representation of publication-oriented spatial data**

The visualization of spatial information is one of the important contents in the modern cartography and GIS research, from two-dimensional plane to three-dimensional cubic, from static analog to dynamic virtualization and from the traditional media to electronic screen. In the digital thematic atlas, based on the cartographic theory, the visualization representation of papery media-oriented is mainly realized by the mapping rule and publication rule. Based on the technique of computer, the multi-dimensional dynamic virtual visualization may convert the integrated data into the static image with many sequences which will represent in a plane, or it may be finished in the electronic map and further developed thematic map system.

In the atlas, the spatial data's visualization of publication-oriented selects map symbolization as the means of visualization in the effect of the related publication rule. In the visualization, the information of attribute will be extracted according to the different geometric data, and the related features will be symbolized and additionally processed according to the coding of feature. The process contains the related symbol, size, shape and color with the visualization extracted from the attribute information.

The related publication rule contains the two aspects; one is the design of symbolization system which affects sensor of plane vision, the other is the demand of map printing. There are the correlations in the aspect of visual experiment, that is, the relationship of contrasting the design of feature's symbol, Such as the difference of symbol's size, the one of color' light and shade, the one of shape and structure, the one of quantity, all of which directly affect the visual resolution and information load of layout.

The adapted-printing quality of symbol is the other important aspect in the publication visualization of spatial data. Whether the line and the construction of symbol and color in the map are copied and deoxidized accurately is subjected with the technique of map compiling and printing and the condition of machine. The high-level printing machine is able to deoxidize the minor difference so as to improve the representation of map. There are others publication rules, such as the normalized representation of the important signal.

### **3.3 The comprehensive technology of compiling and publishing map based on thematic database**

The spatial data's visualization need be realized by use of generalization. Differing from the GIS and database, according to whether geographic base map or thematic contents, the spatial information data is only designed and represented in the

finite two-dimensional plane media, so the ability of user's visual identification and the load capability of layout must be considered. By generalizing the contents of map, classifying the indexes of quantity, sorting and merging the characteristic of quality and simplifying the shape of graph, the thematic contents of atlas will be emphatically represented.

In the existing situation, when the multi-scale represent of spatial data and the technique of auto-comprehensive are not still able to fulfill the condition of application, generalization must still be finished by use of the manual intervention method. The generalization of geographic base map is rather easy, which may be finished by mapper according to a serious of the different scales of standard base map, but to the generalization of major data, the consistency with the thematic contents and the geographic feature has the better specialty and big difficulty, which is unfit for common mapper. In the more and more small-scale thematic map, the rich and complicated data of database

### **3.4 The symbol system design of plane visualization of publication-oriented atlas**

According to The map of pure graph, the map can not measure up the publication which is acquired after symbolizing the digital map or spatial data. The map representing method of publication-oriented must create the visual effect of spatial level and sequence in the finite plane, by use of arranging in pairs or groups and handling the map language features such as color, shape, size, direction, light and shade, thickness, density and construction change, and considering the importance of contents represented by map thematic.

At the same time, in digital mapping and the mapping environment of GIS software, the application of new techniques has effectively extend the sphere of designing map, improving the representation of map, such as the color sphere of quantity and the technique of printing may deoxidize the richer color level. The accurate CTP overprint has realized the color design of precious line, enriched the transparence of overlapped polygon features, extended the representing sphere of features, and made the rich contents impress the more sequential level in two dimensions, so as to give convenience to reader's reading, comprehending and using.

### **3.5 The flow of technique and the pattern of publication and production**

Having the publication system of both GIS function and CAD function as the main body, based on the total digital publication technique flow, the pattern have realized the integrated production of spatial data and publication data. In the process of finishing atlas, the conversion is feasible between GIS data and publication data, at the same time, in the basis of the traditional media printing, the publication data may be exported by use of electronic mapping platform, and may be issued from the media such as CD-ROM and networking to other media by the form of electronic atlas. There is compiling and technique of atlas in Figure2.

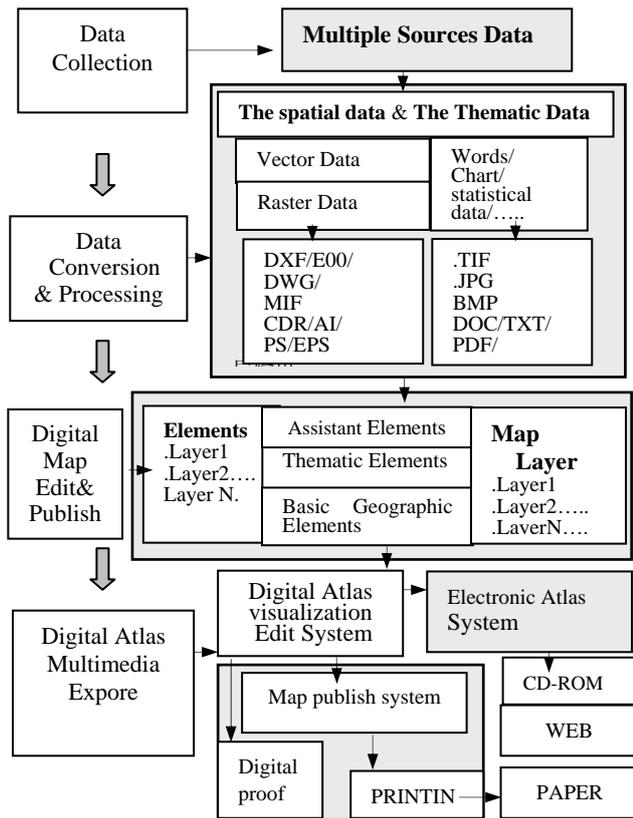


Figure2. The digital thematic atlas process chart

#### 4. CONCLUSION

With the related major information system and database, thematic digital atlas in some means is also the collection and integration of major research achievements. In the numerical environment, when we compile thematic atlas, we are able to make full use of the spatial data resource from many pass. In the basis of reserving the spatial and attribute information, the publication and complication are finished according to the organizing pattern of spatial data, and the graph data of publication-oriented is converted into digital map data. The integrated production will be realized by use of many media and issuing ways and embodying many techniques of visualization.

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