Abstract:
Multimedia Atlas of Ecological Environment in Fujian reveals information on ecological environment using multimedia and visualization technology. This paper is a summary of authors’ theoretical study and development work of this atlas, providing an overview of design idea and the process of developing this multimedia atlas. There are two unique features in this multimedia atlas. One is its attractive user-centered interfaces, which are all in multimedia style but not in traditional like Windows forms, by using reasonably multimedia technologies. The other is its thematic web of ecological environment, in which many contents can be clearly organized. This paper is divided into three main sections. The first section introduces conceptions and background. The second section presents design ideas of this multimedia atlas, including the contents, framework, data manage mechanism, functions, and user interfaces design. The third section focuses on the implement process of the atlas.

1 BACKGROUND

With the development of electronic atlas, many new sorts of products emerged. Multimedia and other technologies used in electronic atlas brought new energy to it. Multimedia technology is such a technology that shows some contents through incorporating many single mediums on computer including picture, video, cartoon movie, audio and text. Cartographic Information System (CIS) is a digital visualized medium incorporating graphic user interface, geo-database, function modules, visual tools for depicting spatial phenomena and temporal processes, analytical as well as explorative functions for geo-data retrieval, knowledge construction and navigation through the information space.

This paper is a summary of authors’ theoretical study and development work on multimedia electronic atlas, and provides an overview of design idea and the process of developing the Multimedia Atlas of Ecological Environment in Fujian. The Multimedia Atlas of Ecological Environment in Fujian is a subsection of the project Ecological Environment Dynamic Monitoring and Management Information System in Fujian, which is one of the major application projects in Digital Fujian, China. There are several features in this multimedia atlas. One is the attractive and expressive interfaces using reasonably multimedia technologies, but not in traditional windows forms. Another one is the thematic web of ecological environment inside it, in which many multimedia information contents can be clearly organized. And the third one is the acceleration of multimedia response speed to the user.
2 DESIGN PRINCIPLES

2.1 Human-centered design
Multimedia electronic atlas is a tool for the users to operate, but not a book to make them have to study. Users maybe not always master enough cartographic knowledge, so we should adapt our product to extensive users, and every design should base on the theory of cognition.

2.2 Practicability and Maturity
Do best to add more functions to the electronic maps blindly but never think what the users really need is not true. In fact, not everyone wants too many functions. So, practicability is brought up here. Maturity asks the common tools must be laid following the custom of users. The practicability and the maturity is a couple of contradiction, however, the balance is up to the designers.

2.3 Interaction
Users will want to interact with the atlas when they operate it. Such functions must be designed at first. For example, if there are buttons of ahead, next, back to the main interface, and exit in every map pages, the mood of the user will be happy and relaxed.

2.4 Contrast
The change of contents should be hinted by the interface. The contrast exists in the back color and the fore color, in the difference of buttons and menus of different maps, in the state of buttons clicked over and down, etc.

2.5 Dynamic
Dynamic is the marked characters of electronic atlas. From the start movie to the buttons, the menus and the cover, it is applied everywhere. In particular, the flash movie is often used to describe the process of someplace changed or the trend of it tomorrow.

2.6 Coherence
The style of whole atlas should be designed at the beginning. Then, every step should be coherent with it. That includes the hue, the way of organization, the harmony of the multimedia, etc.

3 DESIGN METHODS

3.1 Content
The content of the Multimedia Atlas of Ecological Environment in Fujian can be divided into seven maps groups including the basic maps group, the ecological environment background maps group, the ecological resource maps group, the ecological environment pollution and destroy maps group, the ecological environment protect maps group, the ecological environment rebuild maps group, the ecological environment observation, research and estimation maps group, and an inside web named “Ecological Web of Digital Fujian”.

3.2 Structure
The framework of this atlas is hyper-media net structure. Maps are organized by different themes. Different maps in the same theme can link with each other. Whether map groups or multimedia contents are organized in the nodes and chains. Maps groups, main maps and other maps are three level nodes. Chains can be recognized as structure chain of “catalog - Maps Groups - Main maps - Other maps” and logical chain of “Coordinate Data - Attribute Data -
Multimedia Data”. Every node can be turned to the others freely by the linking menus and buttons. The whole framework of the Multimedia Atlas of Ecological Environment in Fujian include starting movie, themes selection page, main map pages, multimedia windows and back cover, which can be overviewed in the following Figure1.

3.3 Data Model
Under the general consideration of the bulky, the flexible and the transplantable ability of many current databases, the combo of RDBMS Database and Document Database are used to organize all kinds of map data and multimedia data in this atlas. In order to do this, we firstly choose RDBMS Database to save great capacity of coordinate data and attribute data of maps. Multimedia data are saved in the Document Database, and the rows of multimedia files information are added to the attribute database. There is the interface of multimedia query form in Figure2.
3.4 Functions
The Multimedia Atlas of Ecological Environment in Fujian not only has such usual electronic atlas functions as zoom in, zoom out, navigating preview window, refreshing, full map display, layers controlling, 3D flying, measure and attribute query, but also has multimedia information link from hot-point, hot-line or hot-area, so pictures, videos and texts can be shown when they are asked. The functions can be clearly shown in Figure3.

3.5 User Interfaces
3.5.1 Whole Style
The Multimedia Atlas of Ecological Environment in Fujian breaks from custom interface such as Windows 9X including dragging menus and view trees, but in overall multimedia style. It has friendly interfaces and multimedia technologies are fully used in design. The flash menus and buttons on the dark background show both vivid and mysterious characters. Buttons linking to other map pages, turning forward, backward, to the start and the end are
3.5.2 Starting movie
Starting movie in 10 seconds is made in Flash software. We try our best to make it vivid and beautiful to catch the attention of users at the beginning. A rotational earth moves from far to vicinity, changing from 3D globe to 2D panorama map of China in the dark background. Then, it moves from right to the left, changing from China map to the panorama map of Fujian province. At the bottom of whole page, characteristic scenery pictures of Fujian are shown continuously, just like cinefilms. In all of the changing period, graceful music goes with it.

3.5.3 Map pages
The map pages are composed of map showing block, information querying block, layer controlling block, and common tools block, etc. Red tool buttons made in Flash with 3D dynamic and revolving effect, having tips when the mouse wandering about, are listed in a line at the bottom. Menus linking to other maps in the same group are in popping style listed in a row at the right of them. Green buttons at the bottom of the right make users can go backward, forward or exit freely at any time (Figure 4).

![Figure 4. One of the map pages in the Multimedia Atlas of Ecological Environment in Fujian](image)

3.5.4 Back cover
Back cover is laid in the end of the whole atlas. It is in dark background also. White texts move from the bottom to the top slowly, including contents of designers, timetable, department, address, etc. Extraordinarily, several white cranes fly from the top of the right to the top of the center, brings pleasure to the users.

3.5.5 Web pages inside
The web inside called “Ecological web of Digital Fujian” is a feature of this atlas. There are laws, maps, introductions, typical animals and plants on ecological environment in the web. A great deal of data on ecological environment is organized in the web, so that every kind of data can be divided and managed ring upon ring with reason. Music design is indispensable and the audio player we designed in it can be controlled by the users self (Figure 5).
3.5.6 Match of multimedia
All kinds of multimedia are made to get on well with each other to the best of our abilities, such as cartoons and music, videos and explanations, buttons and sounds, pictures and texts, etc. Pictures enrich the content of the atlas. Audios act the hint of themes and mouse actions. Videos can show around the environment panorama intuitively. Flash movies give a method to review the change process, preview the future change trend and contrast the past and current situation of the same area.

4 IMPLEMENTATION

4.1 Hardware and Software Platform
Hardware Platform: Intel, Pentium 4 CPU 2.40GHz 256MB EMS Memory
Software Platform: Windows XP Professional SP1 System, Microsoft Visual Basic 6.0

4.2 Data Management
The system consists of maps and multimedia contents coming from the first-hand field survey. Maps data include maps in raster or in rector format with different scales, DEM satellite images, etc. Raster or rector maps are handled in the software MapInfo Professional 7.0, at last saved in the *.Tab format and other default formats. DEM satellite images are made into AVI videos in the Erdas software. And multimedia data consist of videos, audios, cartoon movies, pictures and texts. They are all handled in the professional software, such as pictures in BMP, JPG or GIF format are handled in the Photoshop software, audios in MP3 or MIDI format are processed in the Hero Audio software, videos in AVI format are made in the Ulead VideoStudio software, Flash movies released in the SWF format are produced in the Flash software, texts can be beautified in the Cool 3D software and Fireworks, Dreamwaver and other software mentioned above are synthetically used to make web inside.

4.3 Functions Realization
The system is developed in Visual Basic based on the MapInfo MapX functional widget. Map functions can be realized by using the MapX interface statements, such as “Map1.CurrentTool = miZoomInTool”, ”Map1.CurrentTool = miZoomOutTool”, etc. Hitting the multimedia information query button can turn on multimedia functional windows. When such tools are used, the media files can be found through the path and the name saved in the multimedia information row of the record in the attribute database.
4.4 System Integration
After the processes all above, the whole system can be integrated in the Visual Basic software, including the maps group partition, the interfaces design, the relations buildup, the map pages link, etc.

5 CONCLUSIONS

The purpose of the Multimedia Atlas of Ecological Environment in Fujian is to show the ecological environment of Fujian by reasonably using multimedia technologies: pictures, videos, sounds, cartoon movies and texts. In order to do this, the conceptions, the design methods and the implement of it are researched in the three main parts. The main character of this multimedia atlas exists in its good interaction, rich expressive force and the inside web design.

REFERENCE

The biography of the presenting author

The presenting author is a master student of Zhengzhou Institute of Surveying and Mapping, China, who is 25 years old, and has been working on the multimedia electronic atlas research since undergraduate graduation.