A STUDY AND APPLICATION OF INTERACTIVE GRAPHICS TECHNIQUES IN TOUR INFORMATION IN TAIWAN AREA

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ABSTRACT

The integrated techniques in the field of interactive computer graphics are highly developed. Meanwhile, tourism is widely broadcasted in Taiwan, Republic of CHINA. As we can realize that, in the near future, tour map will become a very common information and widely used for tourist in here.

This paper explains how CMS introduced interactive graphics techniques in tour map making. The topics in this paper include:

-- Understanding the recent computer-aided graphics system
-- Constructing the suitable database for digital map
-- Graphics information entry
-- Non-graphics information entry
-- Association of graphics and non-graphics information
-- Application of graphics and non-graphics information

PREFACE

Taiwan, as everybody knows, is an Island Province of the Republic of CHINA. 40 years ago, Taiwan was outlined below:

-- Pool resources
-- Island is covered by mountains
-- Traffic network system is unconvenience
-- Tourism is undeveloped

After 40 years economic and administrative construction, Taiwan is so far on the way to a developed country. There are more than 1,000,000 tourists each year enjoy their holidays here. Under this circumstance, rendering a quicker and convenience service to tourists has consequently become a leading topic in Taiwan. Tour map supporting is also one of that service.

Tour map contains very useful information for a tourist who is travelling around a certain area. The information on the map provides details to tourists as to how interesting a place can be. The more tour information the tour map support, the more convenience the tourist feel.

The CMS is to be responsible to the job of map production. In order to fulfill the demand from the tourist, we use digital techniques to produce the tour map.
INTRODUCTION

A digital map includes a large amounts of digital datas to Represent the Earth details. In order to enhance the capability of data processing effectively, we use computer as a tool to handle this complicated work.

The advantage of using computer-aided interactive graphics techniques are that:
1. it can store quite a lot of attribute information in a database which conventional mapping techniques can not.
2. it is easy to update to reflect changes quickly.
3. it supports multiple selection of map information for users.
4. it provides fast data access and manipulation.

Tour map is one of the thematic map. It includes the following characteristics:
1. smaller scale
2. less graphics information
3. more non-graphics information
4. widely used by all people in any time at any place

UNDERSTANDING THE RECENT COMPUTER-AIDED GRAPHICS SYSTEM

Figure 1 simply shows a configuration of recent computer-aided graphics system.

Fig. 1 SYSTEM CONFIGURATION

--- W. H. CHEN ---
3 March 1988
Digital mapping uses computer to deal with the job of data processing. As we mentioned above, a digital map includes a large amount of data in storage media like tapes and diskettes. In order to facilitate this process, the host computer should have the following characteristics:
-- sufficient memory for acceptable data processing speed.
-- fast processing
-- high reliability

**CONSTRUCTING THE SUITABLE DATABASE FOR DIGITAL MAPS**

The database in mapping fields may be defined as a systematical structure used in organizing data. The CMS emphasis on both information extraction and data storage. For flexible data manipulation, it contains GRAPHIC and NON-GRAPHIC databases.

**GRAPHIC DATABASE**

Graphic database is used to store graphic data information for further operation. In CMS, we construct the graphic database for tour map by considering the following things:
* map scale
* types of features to store

Figure 2 is an example of graphic database structure.

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** TOUR MAP IN TAIWAN AREA R.O.C. SCALE: 1:1,400,000 **

TOUR MAP

traffic water boundary interesting place

rail road lake river scenic
way spot harbor airport others

highway coach

hot spring beach resort light tower

Fig. 2 SAMPLE OF GRAPHIC DATABASE STRUCTURE
-- W. H. CHEN --
4 March 1988
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**NON-GRAPHIC DATABASE**

Non-graphic database is used to store non-graphic(attribute) data in order to represent the part of reality that graphic doesn't e.g. hotel information, interesting place information etc. In order to reduce the duplicate data in storage, we use the concepts of the relational database as a rule to define data field systematically. Both domain 1 and 2, shown on the following, contain 2 different types of attribute data with a same data field called city-name which is relatively independent. When it is necessary to organize data field from
different domains in order to create a user's need domain. Then we can easily achieve it by using the concepts mentioned above. The domain we created is called "dummy domain" which share the existed data from both domain 1 and 2. For instance, to find out the scenic spots in city= TAIPEI and print out CITY_NAME, AREA, SCENIC_SPOT_NAME and ADDRESS. Then, we can easily achieve it by creating a dummy domain 3 to include the data field mentioned above in it with CITY_NAME(key field) equal to TAIPEI.

<table>
<thead>
<tr>
<th>CITY NAME&lt;key&gt;</th>
<th>AREA</th>
<th>CITY NAME&lt;key&gt;</th>
<th>SCENIC SPOT NAME&lt;key&gt;</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAIPEI</td>
<td></td>
<td>AAAA</td>
<td>TAIPEI</td>
<td></td>
</tr>
<tr>
<td>TAICHUNG</td>
<td></td>
<td>BBBB</td>
<td>TAIPEI</td>
<td></td>
</tr>
<tr>
<td>KAOHSIUNG</td>
<td></td>
<td>CCCD</td>
<td>TAICHUNG</td>
<td></td>
</tr>
<tr>
<td>CHIA-I</td>
<td></td>
<td>DDDD</td>
<td>TAIPEI</td>
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<tr>
<td></td>
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<td>EEEE</td>
<td>TAIPEI</td>
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<tr>
<td>HUALIEN</td>
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</tbody>
</table>

DOMAIN 1: CITY INFORMATION  
DOMAIN 2: SCENIC SPOT INFORMATION

After processing, the following data will be included into dummy domain 3:

<table>
<thead>
<tr>
<th>CITY NAME&lt;key&gt;</th>
<th>AREA</th>
<th>SCENIC SPOT NAME&lt;key&gt;</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAIPEI</td>
<td></td>
<td>AAAA</td>
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</tr>
<tr>
<td>TAIPEI</td>
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<td>BBBB</td>
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</tbody>
</table>

DUMMY DOMAIN 3: SCENIC SPOT INFORMATION IN TAIPEI

Some keywords are described as follows:
* key: an attribute used to located a record.
* attribute: the smallest unit of data that has meaning to user. (data item)
* record: a group of attributes; usually describing one type of item. (a car, a road)
* domain: a group of records; usually describing a set of data with a finite set of attributes.

The hierarchy of non-graphic data structure can be shown as follows:
In order to make the data entrying easier, we collect the equivalent layers in the same sheet shown as follows:

- Blue color: contains coast line, river, lake and reservoir
- Black color: contains railway network, grid system and administrative boundary line
- Brown color: contain roads suitable for coach
- Red color: contains highway network

In the part of non-graphic data entry, system flow chart is shown as follows:

1. Attribute data collection
2. Database designing
3. Data entering
4. Data storing
5. Data editing

ASSOCIATION OF GRAPHICS AND NON-GRAPHICS INFORMATION

Two independent databases are only meaningful by linking both together to produce interpreted information. For instance:

- Find the location of object according to the existed attribute data
- Find the attribute data when user detect its real place

The CMS uses the so called "integrated techniques" to handle the work. A briefly concept is shown behind.
The integrated techniques can be explained as an interface to link both graphic and non-graphic databases. The method includes the following things:

1. Define objects on graphics and give their meaningful identifier names e.g. cityname.

2. Write a linking procedure to implement the work. For instance, a procedure to list all scenic spots in a city and then, locate its city on graphics. The procedure should be simple and dynamic; easy to change.

3. Define objects and their attributes in the non-graphic database with object name as the identifiers similar to 1. Each object identifier is used as a key to match 1.

**APPLICATION OF GRAPHICS AND NON-GRAPHICS INFORMATION**

The following result can easily show how computer-aided graphics techniques used in CMS tour map production. Appendix 1 is the final result from the printing plate which data resource is coming from the graphic database. The symbol (object), shown on the map was manual defined as a key in order to connect with its attribute data. By doing this, we create a set of procedure to handle this job with flexible searching criteria to suit user's application and data manipulation needs. The procedure include the following things:

1. Ready both database in order to perform linking
2. Find the object which you want to see its information
3. Using user-written procedures to link them together
4. Print the information on printer or screen

The CMS create a menu to suit people application e.g. data extraction. The menu can guide users to get the information which the system support. People can also handle it easily at any tour center or station around this Island.

**CONCLUSION**

This paper simply shows how CMS introduced interactive graphics techniques in tour map production. The reason why we select this method is that it is easy for users to extract the information from both databases either separately or simultaneously. The whole system is so far in the testing status. We are trying to enhance the system capability e.g. add more attribute data into non-graphic database etc.. Also, after testing complete, the data information will support to the tour center around this Island to suit the user's need. That is our way.

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REFERENCE
