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The Integration of Multimedia and Geographic Information System Using The Concept of HyperMap and Active-X MapObjects

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Abstract- **Multimedia and Geographic Information System (GIS), which may be categorized as information technology, are fast developing technologies. However, the main factor that differ the two technologies is on the capability of visualizing real world objects. Real world objects are usually dynamic in nature whereas the present capability of GIS technology is limited to only displaying static object. This paper reports the results of an effort to develop a software model called " Multimedia and GIS Integrator". The development of the integrator was based on the concept of hypermap and GIS within Multimedia approach . The study used ActiveX MapObjects, MS Visual Basic, MSHTML and MS Access to develop the Integrator. As such ActiveX MapObjects is used to manage map while MS Visual Basic was made as the programming language for the multimedia. To visualize multimedia elements from a particular map location, the study used the MSHTML. A database was developed using MS Access. The software model was tested using the coastal area of Larut Matang, Perak, Malaysia as a study area. The results showed that the integrator fulfills the requirements of a Multimedia GIS as well as capable of handling the relationship between maps, map layers and its coordinate system.**

Keywords- Multimedia, GIS, Hypermap

I. INTRODUCTION

Multimedia and Geographic Information System (GIS), which may be categorized as information technology, are fast developing technologies. However, the main factor that differ the two technologies is on the capability of visualizing real world objects. Real world objects are usually dynamic in nature whereas the present capability of GIS technology is limited to only displaying static object. The exploration on the capabilities of multimedia technology within the GIS technology involves two main issues: (1) the data sources used, and (2) the integration and accesses to different data within a common interface. On the first issue, Multimedia is seen as having the capability in integrating various data sources such as maps, alphanumeric, aerial photographs, texts, graphics, video and audio. However, it is the second issue that has received special attention among researchers [1], [2], [3], [4], [5], [6]. This issue concerns with the use of hypermedia data structure and the design for user interfaces. [1] classifies the integration process into two approach: GIS within Multimedia or Multimedia within GIS.

[7] has adopted a first approach in their study to develop a software model called Multimedia and GIS integrator (MGIS-Integrator). This paper reports the results of an effort to develop a software model called " Multimedia and GIS Integrator". The development of the integrator was based on the concept of hypermap and GIS within Multimedia approach .

II. BASIC THEORY

Multimedia GIS is the result of integration process of two technologies i.e. multimedia and Geographic Information System (GIS). [2] introduces a terminology called Multimedia HyperMap in the study to incorporate multimedia into GIS using the concept of Spatial Hypertext. The utilization of the concept makes maps highly interactive, alive and attractive in presenting hot links to intelligent information associated directly to a geographic feature [4]. The concept was also used to structure individual multimedia component with respect to each other and the map [5]. The structuring of the multimedia component allows user to navigate the database efficiently. While exact definition of Multimedia GIS is still debatable, [8] summarizes Multimedia GIS as the use of hypertext system to create webs of multimedia resources organized by theme or location. GIS technology is used for the purpose of georeferencing, structuring and analysis of data.

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[6] explores the concept of Hyper-Information in their effort to develop an integrator for the multimedia and GIS. Hyper-Information consists of hypertext, Hypermap, hypermedia and hyperdata. The integration method developed by [6] consists of three level: (1) Client-Server, (2) GIS System (see figure 1), and (3) Model.

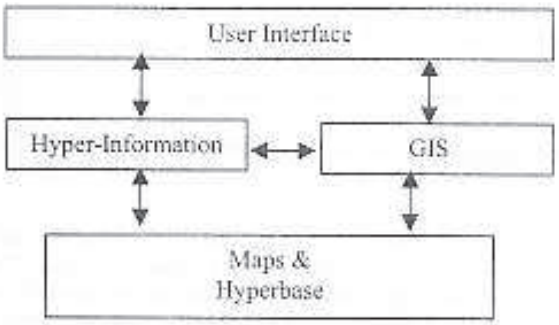

Fig. 1. GIS Sistem-Level [6]

III. DEVELOPMENT OF MGIS-INTEGRATOR

3.1 Logical Model

The logical model of the MGIS-INTEGRATOR is shown in figure 2. It consists of map, multimedia elements (text, picture, audio and video), ActiveX MapObjects and HyperMap. The inclusion of the concept of HyperMap into the model serves three purposes : (1) as an integrator, (2) as an interface tool, and (3) to make the model more dynamic and flexible. Maps and the multimedia elements are objects and their relationship is described in figure 3. Map objects are in raster and vector data model in order to facilitate the use of pictures and maps. Pictures are stored in the raster data model while map layers are in vector data model. These objects may be made as "hot spot" to form HyperMap. The concept of "hot spot" is that if it is activated, HyperMap will automatically potray other object or map.

3.2 The Implementation

Microsoft Visual Basic 6.0 was employed as the implementation environment of the model. The design of the user interface for the MGIS-Integrator (see figure 4) was directly made using the programming language. Based on the figure the HyperMap is located to the left of the window. User may click a mouse on any "hot spot" on the map and the system will then provide information pertaining to the selected "hot spot". The information provides by the system may be in the form of Text and video or all of the multimedia element. Figure 5 presents the logical diagram of the HyperMap processing system.

Map and multimedia elements are handled by a data model (figure 6). This data model is the database for the MGIS-INTEGRATOR in which objects spatial relationship are stored [6]. The database was developed using Microsoft Access and the purpose is to activate spatial entities to be hyper-node. For the MapObjects, MGIS-INTEGRATOR need s two additional fields i.e. ID (text, length 5) and SeqNo (text, length 5). These fields are directly related to the MGIS-INTEGRATOR.

The working system of HyperMap are :

1. Input for HyperMap originates from MapObjects. User may interact with MapObjects. Next the MapObjects will determine the coordinates whre mouse is clicked. It will then make the HyperMap system active.
2. When the HyperMap system is in active mode, this system will receive the coordinate for the position of the cursor. Based on this coordinates, HyperMap system will direct MapObjects to search the object selected by the user from map layers in the database. When the objects is found the HyperMap will retrieve the object contents. From here, the HyperMap system will call the map activation process and the Microsoft HTML Library. It is the Microsoft HTML Library that activates texts field containing HTML commands for the multimedia elements.

3.3 Testing of the MGIS-INTEGRATOR

Figure 7 shows the result of the test. When the MGIS-INTEGRATOR was executed, the user will be presented with a display as shown in figure 4 (The Map shows the state of Perak, Malaysia. On this map there is "hot spot" for Larut Matang, the area shown in the figure 7). The window in the figure 7 presents one of the multimedia elements i.e text. Other multimedia elements may also be presented provided that such data are available in the database.

IV. CONCLUSIONS

The result of the study is the MGIS-INTEGRATOR module. The integrator developed in the study consists of user interface, HyperMap processing system and a database. The user interface requires two object pictures for the map and the HTML web browser. The development of the database is very critical and the database should have the capability to relate information about maps, HTML Texts and map files with the MapObjects.

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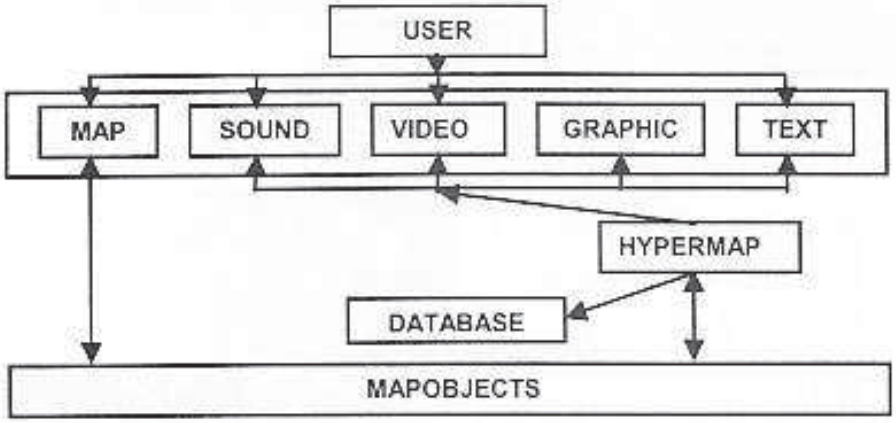

Fig. 2. Multimedia and GIS Integrator Component.

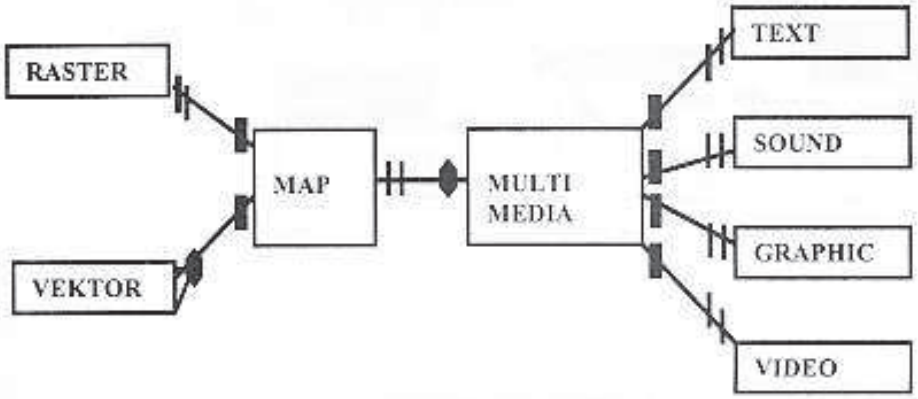

Fig. 3. Map and Multimedia object relation.

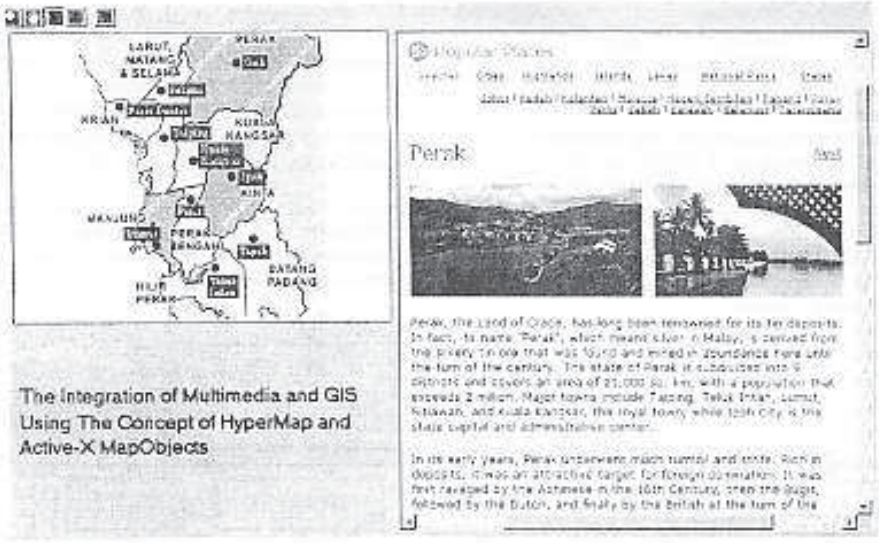

Fig. 4. User Interface.

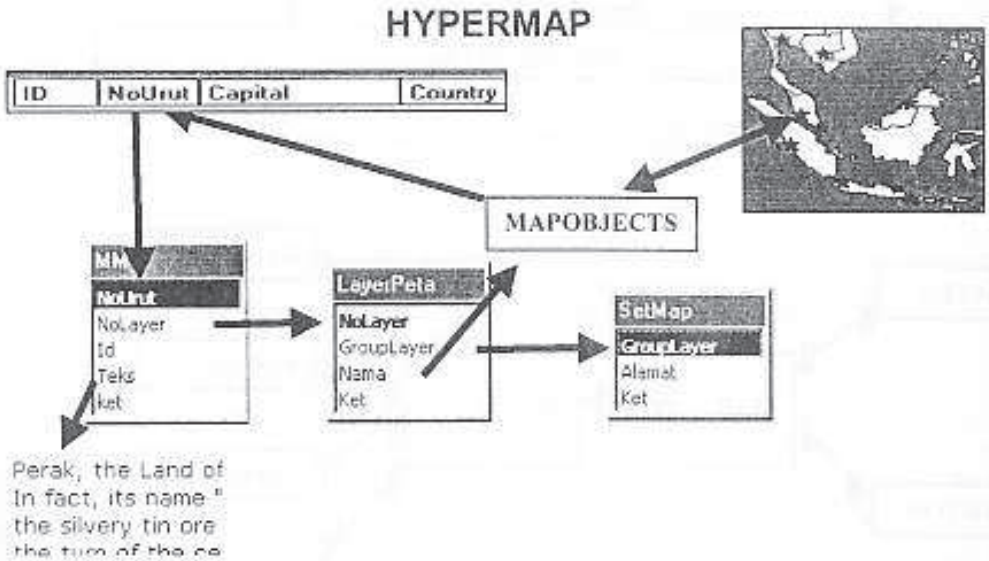

Fig. 5. HyperMap system processing.

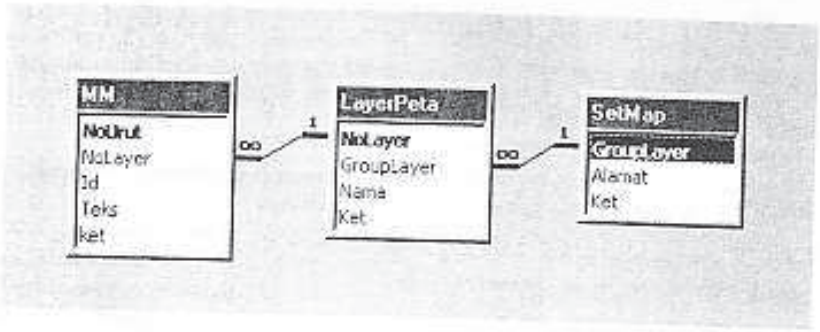

Fig. 6. Database relationship

Fig. 7. Larut Matang