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Based on Two and Three Dimensional Technology to quickly build a Virtual Battlefield

GAO Ying[1], MA Xiao-hui[1], JIANG Tao[1] XU Zhi-guo[2]

[1]Marine College of Northwestern Polytechnical University
Xi'an China
[2]91208 troops Qingdao China

Abstract

Virtual battlefield environment is the use of computer technology, graphics technology and virtual reality technology to the real battle space in the computer. As technology advances and development, virtual battlefield environment system has been applied more and more combat troops and combat command being. Virtual Battlefield Environment Simulation System is a system for the commander to provide a realistic battlefield environment to facilitate their understanding of the terrain, the battlefield awareness information. In this paper, two-dimensional battlefield maps based on MapObject structures and the construction of three-dimensional virtual battlefield environment problem, a second, three-dimensional virtual battlefield environment with the rapid construction techniques. Operational commanders can quickly build a virtual battlefield, not only from the macro real-time battlefield information and to grasp the battlefield situation, but also learned from the battlefield of detailed microscopic details.

Keywords-virtual environment;   visualization; virtual battlefield; rapid construction; Two and the three-dimensional combination; MapObject

1. Introduction

Battlefield Environment Simulation is an important part of combat simulation. Realistic battlefield environment simulation technology is the basis for combat simulation, it is war exercises, simulation training and operational evaluation test provides a realistic simulation platform, has become the new military revolution, the most important and one of the promising new technology [1]. In order to make timely battlefield commanders quickly build a virtual battlefield, we study two-dimensional and three-dimensional scene interactive virtual battlefield environment with the construction problem, a second, three-dimensional virtual battlefield environment to quickly build the technology. This thesis uses a two-dimensional battlefield MapObject map making, and then build three-dimensional virtual

battlefield environment, the last mentioned 2,3-D virtual battlefield environment will be combined to achieve the rapid construction of virtual battlefield, this could make two, three-dimensional virtual structures in the battlefield environment, staff interaction before, which can make the battlefield commanders from both the macro and micro situation in a comprehensive understanding of the battlefield [2].

2. System design and implementation

Second, the three-dimensional virtual battlefield system using virtual reality and computer graphics technology, constitute the appearance of weapons on the battlefield and the internal structure, work processes and principles, internal flow and related parameters of the virtual simulation environment for testing. Simulation environment including three-dimensional model constructed library design, virtual environment construction, scene design, special effects, it requires a realistic three-dimensional structure model and lifelike textures and special effects. Includes a scene-driven simulation-driven, model to mobilize processing, interactive control, it requires simulation environment reproduces high-speed, real-time response interaction [3].
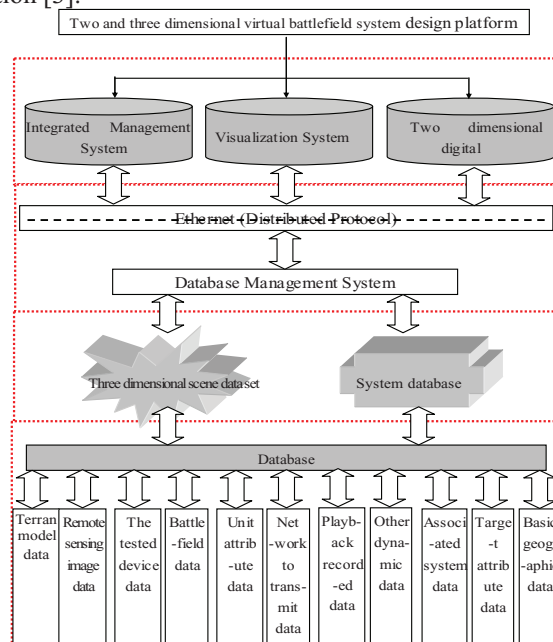

Figure 1. 2&3-dimensional virtual battlefield system block diagram

Using two-dimensional digital map technology, visualization technologies and distributed interactive simulation technology, according to reality or to construct a vivid imagination, the effect is real, intuitive three-dimensional virtual scene, so that users can roam among any, or even need to be changed according to the simulation scene. Combined with the use of database technology, multimedia technology, the battlefield information database can also be integrated into the three-dimensional virtual scene, the operator can in three-dimensional visualization environment for building complex battlefield environment, the operational capacity can be invisible visualization, will be visible visualize the physical equipment, interact on the target, query, analysis, statistics and supporting decision-making.

3. Two dimensional map based implementation mapobject

3.1 *MapObject Overview*

MapObject by the United States, ESRI (Environment System Research Institute) developed the component of today's popular GIS software development. MapObject is a set of mapping software components (ActiveX controls), using it in ordinary programming languages (such as VB, VC, Delphi) to achieve major geographic information system (electronic map which is the main function) function. MapObject referred to as the MO, by MapObjects you the flexibility to create a map for the user interface[4].

3.2 *The basic operation of MO*

1) Layer loading
Electronic map system display, operation, management and GIS development, first layer have ArcInfo GIS data file formats. MO can be used in the data file formats are Shapefile, Coverage, SDE, VFP and a variety of CAD files. This document focuses on the electronic map for the development of Shapefile.

Dot layer is divided into layers, line and area layers Layer 3 class, make the point, when loading layers like layer at the top layer in the middle of linear, planar layers in the bottom, or surface-like layer will punctuate and linear layers are overwritten. Note that in MO, the first loaded in the following, and finally loaded on it.

2) Add Map Controls

3) Hand-loaded layers: The layer file attributes control

4) Loaded layers: the use of dc.Database = "file path" set the layer file directory, which, dc.Database = app.path there to set the folder with the program the same directory. MapObject formed by a series of paper maps the process of the formation vector. Production is divided into topography professional software production and production of two ways. Topography which is the use of special production equipment for the production map digitizer. As follows:

1) Get a map from the first, with the scanner into a grid map (BMP).

2) Use specialized software to open BMP maps, depicting the required topography, vegetation, water, transport, culture and other basic topographic data, the formation of the initial vector data.

3) Processing software using a professional a professional symbol map conversion. Open the original vector data, through the transformation, will display a variety of terrain for military symbols. Such as roads, bridges, rivers, etc., in accordance with military standard symbols for display processing.

Can be achieved using MapObject battlefield commanders quickly build two-dimensional map.

4. Visual simulation battlefields the way to achieve

4.1 Virtual battlefield environment, scene management and real-time rendering

Battlefield situation based on three-dimensional virtual environment requirements in the function demand analysis, three-dimensional scene in order to ensure seamless high-speed fluid level display, three-dimensional virtual tour, jitter and other phenomena, modeling software to the following requirements:

1) Easy to use can achieve some of the simple model, 3D model interchange format for the *. X.

2) All models must be able to support the file format *. flt format.

3) Can achieve a mass-based remote sensing image data to establish true three-dimensional geographical simulation environment.

Three-dimensional environment of virtual battlefield scene management and rendering the following main aspects:

1) Battlefield data organization and management: the premise of real-time rendering, control the number of polygons drawn each frame, checking the physical characteristics of the scene, and management network throughput, this is the scene of the organization and management. A scene can be divided into several spaces, each space with dozens of objects, each object by the thousands of triangles, the triangle number of the whole scene reached a few million.

2) Construction of a virtual battlefield scenario: a virtual battlefield simulation platform through the file I/O components, data files transferred to the virtual scene, three-dimensional model files can be transferred to the terrain file and the status of matching files. Through the scene graph structure, the creation of the corresponding type of node, and according to their organizational structure, at different levels transferred to the scene, the same process to record the scene necessary to draw the global state information, such as light, the initial point of view other state, save in the scene graph.

3) The virtual battlefield scene state management: using of a virtual battlefield simulation platform for virtual scene generated by the global state management, its operation or eliminates the opening of a state, the state value changes. The main designs are for light, fog, view and other aspects of management.

4) The management of the virtual battlefield scene objects: a scene object management mainly on the basis of the scene graph data format corresponding to the scene objects in the scene graph nodes and child nodes to manage. Including add or delete a scene object the maintenance of property information, including the location of the object, motion-style management.

5) Draw the virtual battlefield scene: scene rendering capabilities, including access to the current virtual scene data to achieve the current virtual scene rendering. Drawing on the scene scene graph need to follow the scene graph structure to achieve the level of the display of the scene.
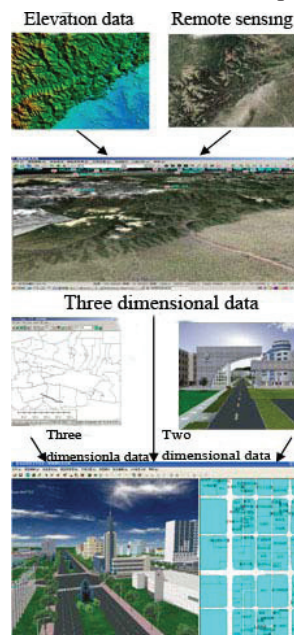

Figure2. Generate second and three dimensional battlefield environment and implementation of technical line

4.2   Making the battlefield three-dimensional scene

The generation of three-dimensional scene is the original satellite remote sensing remote sensing data obtained through the precision correction, optical image fusion between the data mosaic, orthorectified get is a series of operations such as landscape photography data. Then be approximated with three-dimensional landscape rendering image data.

Figure 2 shows the overall battlefield environment to the second, three-dimensional battlefield environment and implementation of the technology generated route.

4.3 Production of three-dimensional battlefield data

Three-dimensional battlefield, the establishment of the database, most with Multigen Creator, Multigen Creator is an outstanding real-time three-dimensional modeling tool, it has real-time applications optimized for the Open Flight data format, powerful polygon modeling, vector model, accurate terrain generated a large area function, and a variety of professional options and plug-ins that can efficiently optimize the database to generate real-time three-dimensional (RT3D), and real-time simulation software and follow closely, in the visual simulation, simulation training, urban simulation, interactive games and projects applications, scientific visualization and other real-time simulation of a world leader in the field [5]. Bulk data modeling by Multigen Creator 3 shows the Figure3.

This approach can be achieved in accordance with three-dimensional virtual battlefield commander of the rapid construction scene.
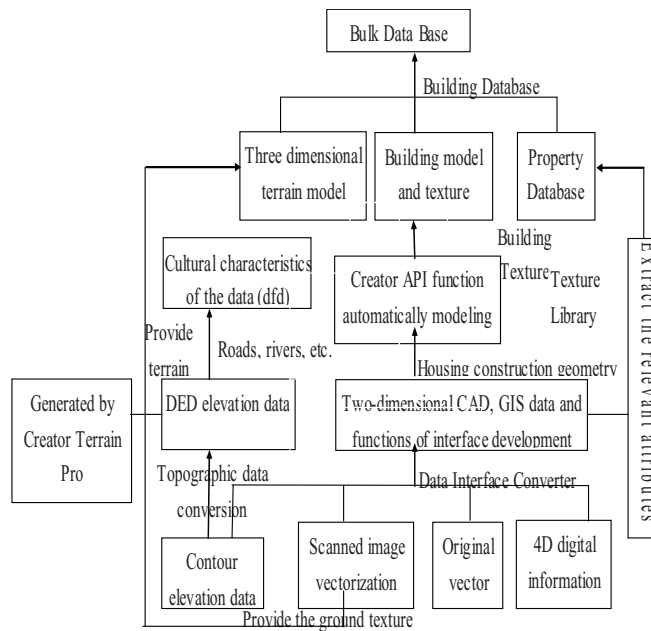

Figure3. By Multigen Creator bulk data follow modeling

5. Fast ways battle scene

5.1 Military standard-based three-dimensional database

Common symbol library designed to provide easy to use symbols library expansion feature, refer to the relevant national industry standards, providing a variety of industries symbol library three-dimensional model [6]. Military standard library schematic three-dimensional model shown in Figure 4:

Figure4. Three-dimensional model of military standard library

Simulation system can be expanded according to the relevant standard military symbol library three-dimensional, three-dimensional military standard library can be marked with the traditional two-dimensional correspondence between the military, the war in the system unit properties to create a database library that supports the design and the properties of input-related equipment.

Figure5. Second and three dimensional model corresponding to Figure military standard library

5.2 Based on the battlefield scene quickly build script

In the virtual reality platform, completed the establishment and roaming scenarios, the need for persistent state scene preservation, the way the optional formatted text, images and video. Formatting text output system uses a similar Vega LynX described in the text output file mode, file describes the parameters of the scene information related modules, including the model, light, fog and point parameters such information [7]. If you use a real DEM terrain, DEM files and texture should also include the path, the sky box configuration. The following is the text saved in part:

```
......
_channel{
    channel_name    default
    viewport    -1.000000  1.000000   -1.000000  1.000000
    erase_mode       CHN_ERASE_MODE_ON
    erase_color0.000000   0.000000   0.000000   1.0
    Border           G_ON
    Doubule_Buffing        G_ON
    Far_Clipping     250000.000000
```

```
    Near_Clipping    0.100000
    }
_object  city {
    file   honda_city.flt
    pos   0.000000   0.000000   0.000000
    rot    0.000000   0.000000   0.000000
    overscalling        1.000000
    }
......
```

Parameter when loading the file under the header of each block to find the appropriate content, and then read the parameter information within the braces to set parameters.

bool CaptureGLBufferToPNG(CString filename，int x，int y，int width，int height)；// The screen capture to *. PNG format bool CaptureGLBufferToBMP(CString filename，int x，int y，int width，int height)；// The screen capture to *. BMP format int WriteBitmapFile(CString filename， int width，int height，unsigned char *imageData)；// To capture the image written to the file Through these functions to achieve the rendered image output. Under this method commanders can quickly build a virtual battlefield.

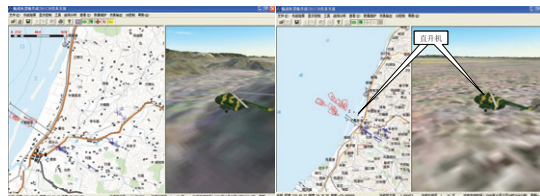## 6.   Second and the three dimensional virtual battlefield simulation example

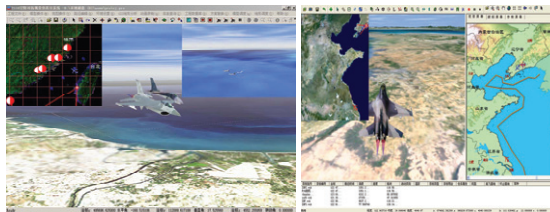Figure6. Second and three-dimensional virtual battlefield

Figure7. Second and three-dimensional virtual battlefield

7.   Conclusions

In this paper, two three-dimensional virtual battlefield environments with visualization techniques in a preliminary study, and to achieve a combination of two three-dimensional virtual battlefields quickly build, as well as the virtual battlefield visualization were achieved.

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