

Database Management to Support Automatic Placement of 3D Building Models to A Simulated Scene

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Abstract— To create a scene in a virtual world as close as possible to a real world counterpart requires a lot of manual work. In order to reduce the steps and time above, geo databases with the spatial extension combining with a customized data management application shown here can be used. Combining this application with other applications such as image comparison applications, can help achieve the automation of the process of placing model such as military buildings into a scene. This application was developed as web application using geo spatial open source software and tools such as Openlayer and Geoserver. It operates on vector data stored in PostGIS database. Scene developers can use the application to search for different GIS-layers' data of an area. Search arguments can be a key word or coordinates, which need the spatial processing ability of the PostGIS DBMS to find results. The search results are mapped with the matched models. This helps reducing the scene developing time. In this paper, the focus is on how the aforementioned application and database design help ease the process of automated placing matched 3D models into scenes based on vector data of GIS Layers in the database and how this application is developed. With continual improvement of GIS open source software, a spatial database management program can be easily built. Moreover, the use of these open source software can reduce the cost of virtual world products. DTI as a research organization can and will benefit from this.

Keywords—Automatic Placement; GIS Military Application; Military Simulation and Training; Geo Spatial Open source Software

I. INTRODUCTION

Because of an increasing demand of Thai military simulation and training using virtual scenes, time needed to develop simulations is a significant factor to achieve the goal of DTI, which is to serve the Royal Thai Armed Forces as much as possible. The application shown in this paper will help ease simulation developers in the process of searching and placing models in a virtual scene and hence saving the simulation development time. The idea of automated scene creation based on raster and vector maps is widely implemented now [1]. Commercial products such as ArcGIS platform can automate the ingestion of 2D GIS data and LiDAR to create 3D data for

large geographic areas. Open source platforms such as 3DCityDB based on CityGML datasets [2], which stores GIS data and 3D models data in Geo spatial Databases such as PostGIS database [3], has the ability to create a 3D city scene with 5 levels of detail as shown in the figure 1. These 5 levels are based on geometric precision and thematic refinement [4].

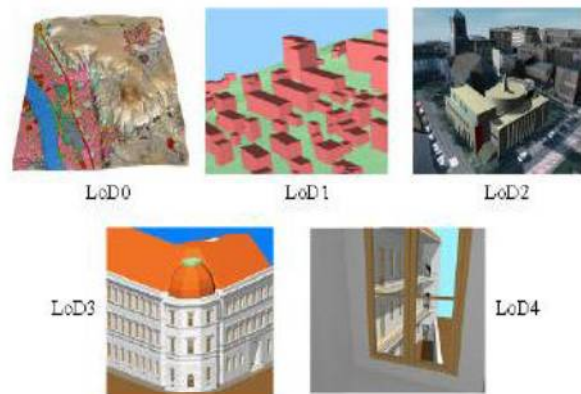


Figure 1. The five levels of detail (LoD) defined by CityGML [4]

Comparing the ARCGIS tools with the 3D CityModel platform, the latter has clear advantages in term of a license fee and benefits gained from DBMS's features such as indexing, transaction control, scalability etc. The 3D CityModel Platform provides functionalities and database schema to combine the GIS data and 3D models, hence 3D CityModel is a very good platform to build models of cities and it is quite easy to build such virtual cities or scenes in a relatively short time. Due to differences between the building's schema and the other schemata provided by 3D CityModel and the detail and data of the military building layer (and other layers) previously collected by Defence Technology Institute (DTI), which suit local infrastructure and terrain more (i.e. Thai infrastructure and terrain), the whole application to search for scenes and place models into the scenes' map is however developed without using the 3DCity