

## The Application of 3D Web GIS In Land Administration - 3D Building Model System

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### ABSTRACT

Land is an important part for urban planning and implementing public works for the government. Land Administration affairs, the primary of all municipal constructions, are very significant to provide prompt and useful land information on the community, industry, economy, and urban planning. These years, the Internet has developed rapidly and widely. To offer efficient information service for the public, the government has actively and systematically established "e-Government". Land Department of Taipei City has been in accordance with the government's policy towards electric and network environment. Although, the data have been transformed overall, if the data can be effectively integrated, analyzed and gathered statistic, the value and whole applied fields will be more than it is. Buildings possess spatial data; however, general WEB technology with 2D GIS cannot display the building's real appearance. The 3D Building Model provides 3D visualization and represents the whole urban planning. Moreover, the 3D Building Model can also connect with the land database and completely display land together with building information. After integrating the Internet, geographic information systems, and virtual reality model, the WEB 3D GIS can be utilized to manage buildings. Therefore, we have integrated GIS, attributes of building information, land information, and terrain maps to develop the WEB 3D.

The authorities can get full information that depends on decision maker's demand by means of classified 3D Building Model. Besides, people can query the information on the Web. This way will expand the system's application and enhance the diversification of information.

**KEY WORDS:** GIS (Geographic Information Systems), WEB 3D GIS, VRML (Virtual Reality Modeling Language)

### 1. Introduction

The Land is the most important foundation when the government proceeds to every urban plans and constructions, and land administration is the basis of all urban constructions. Therefore, nowadays, how to offer every construction, which concerns the community, the property and the urban plans, a thorough resource, is the most critical topic. Within the next few years, due to the highly development of the Internet, the e-government that will provide citizens a convenient and efficacious information has been established. The Land Department of Taipei City has also constructively cooperated the government's policy, that is, to deal with every affair by using the computers and the Internet.

Facing the rapid expansion of the information, Land Administration Affairs has gradually paid many attentions to unify the diverse data and improve the technique of the management. The convenience is not only to considerate the electricalization of the data in all respects, but also to evoke the value of the data by integrating, analyzing and compiling statistics. Due to the 3D characteristics of the buildings, we could only use the general WEB GIS technique to show its geographic data, not able to show its real appearance. If we could combine the WEB GIS technique with the GIS system, we would integrate the data of the buildings, the data of the lands with the digital terrain maps all together, and then the 3D appearance of the building could be visualized completely. By this method, we could not only show the full urban plan, but also establish the whole land database on the Internet. Henceforth, citizens could conveniently access the data on the web. All of these works could not only promote the efficiency and the applicability of the system, but also improve the diversification and the value of the data..

For these reasons, the 3D-buildings Administrative System is devoted to instantly integrate the Internet, the GIS and the VRML technique. To make use of this method to the management of the buildings is a great progress in this field. The most remarkable difference between this method and the general GIS is the representation of the real spatial property, and the effect in visualization and solidification.

## **2. The Frame of the System**

The establishment of the 3D-buildings Administrative System that can show the essential 3D information of the buildings is the supplement of the usual 2D plan. The 3D-Buildings Model can supply us a visualized result to completely represent the whole planning of the city.

The 3D-buildings Administrative System which is devoted to instantly integrate the internet, the GIS and the VRML technique could be made use to manage the buildings, and provide functions of exhibition, storage, control, analysis and decision making. It could not only display the data in every respect, but also provide adequate information to the management unit, which could then decide a policy. In other words, the system could make a more comprehensive survey to the administrator.

### **2.1 The framework of the system**

The system is a typically 3-Tier framework, which could improve the system's efficiency and stability. The framework of its hardware could divide into three parts at present. That is, the Land Database of the Taipei Government, the resulting website of the 3D Buildings and the users' part (Figure 1).

The staffs of the Department of the Land Administration of the Taipei Government could set the 3D-buildings Model up by using the 3D-buildings Administrative System, and upload the files to the resulting website of the 3D Buildings. Users could then easily inquire about the Land Database on the web, if the VRML Plug-in has been downloaded and installed by them.

### **2.2 The Managing Module of the System**

The 3D-buildings Managing Module could provide users to establish the files for any specific areas separately. As a result, the efficiency of the system could then be improved, and the system could get rid of the huge data stream. At the same time, in order to connect with the data of the Land Integrated System on the end of the server, the Managing Module supplies connecting function to the Land Integrated System. For the sake of safety, the users must provide their account and password, if they want to log in the system.

### **2.3 The Managing Module of the 2D Figure**

Land Administration provides users to cover a stack of figures, which might belong to different departments or distinct systems. And it could also supply interactive inquiring function between space and attribute. Users themselves could do this. They need only draw a polygon on any area they want of the map, and by way of linking Land Database to find the data of land-number, buildings, and address. The data of the 2D figures of land or buildings could then be found. Users could also request the pictorial data of the lands via district, land number, building number, address, etc.. Besides, a variety of layers of the figures could also be provided by the function of setting legends of the figures, and provides single symbol, unique symbol, Classes symbol, three displaying kinds. The 3D-buildings Model could then be developed dynamically based on these 2D figures. In other words, the figure when users look down at the 3D Building is as same as the 2D figure.

### **2.4 The Managing Module of the 3D-buildings Model**

The 3D figures Administration could provide users the data of the 3D- buildings model based on the recent data of the 2D figures. The generated 3D-buildings models still have associated attributes, which could be used to request the land database of lands or buildings. Besides, it could link the data of the attributes of the exterior of the building. The files of the 3D models are coded by VRML language. The users those who want to use this system via the web browser must download and install the VRML Plug-in.

### **2.5 Land Ievied Model**

In order to help the staffs in the Land Department of Taipei City to deal with levying jobs about private or public lands more convenient, the system has also designed the module of Land Ievied. The module provides the administrators to inquire about the statistics and analysis of the buildings located within the levied range. Users need only to draw or cover the area, which they want to understand, the system will link to the Land Database automatically. And then it will provide them the statistical data.

### **2.6 Statistical Analysis Model**

For the different requirements of the departments of the Land Department of Taipei City, the system provides the module of statistical analysis to analyze the distributed of land price, the distributed of land's owner type (public or private), the distributed of building registered, the distributed of land type, the distributed of land

area, the distributed of land use, and so on. The system could display different kind of figures by different colors base on the analysis of the module. Then, users could understand the distributions by different kind of statistical data. For example, If users want to understand the distributed of land price, the system will connect to the Land Database, and then the system will show the different figures of different grade in different color. As a result, users could understand the distribution of the land price clearly.

### 3. Conclusion

The address of the resulting website of the 3D Buildings is <http://210.241.73.241/>. To show the 3D full view of Taipei and to inquire data of the buildings are the principal functions of this website. The citizens of Taipei need no longer to image the landscape of Taipei. They need only surf on the web, and connect to the website, they can then see the great eyeshot of Taipei and put themselves in it. On the same time, they can also inquire the data of the interested buildings to know any associated attributes about the house number, the number of floors, the purpose of the building, the building materials, the area of the building, and so on. Besides, the website also provides the survey of the buildings, floor plans, etc. Those data can help users to get further understanding about the constructions and configurations of the buildings. The website has made a great progress on the requirement of inquiring the land data. It has entirely changed the old method based on characters and 2D figures. Moreover, the interface of the website is friendlier and more convenient.

### REFERENCES

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Figure 1. The Framework of the 3D Building Model System



Figure 2. The Website of the 3D Building

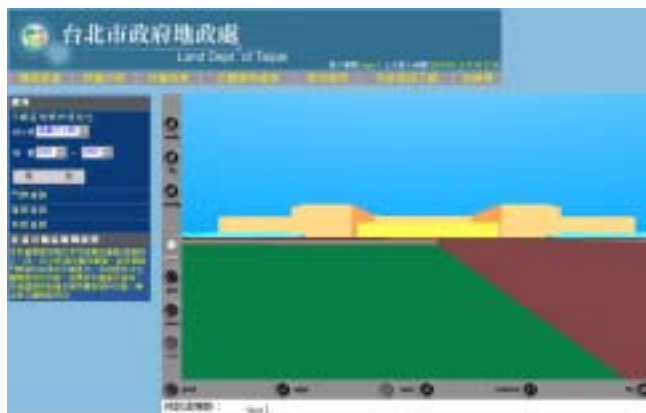


Figure 3. The Result of 3D Model

地籍圖樣式平面圖資料查詢										
土地權別										
地籍圖號	地籍區	地籍段	地籍小段	地籍宗地	地籍宗地	地籍宗地	地籍宗地	地籍宗地	地籍宗地	地籍宗地
10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
土地所有權人										
姓名	身分證號碼	戶籍地址	土地所有權	土地所有權	土地所有權	土地所有權	土地所有權	土地所有權	土地所有權	土地所有權
張三	123456789	台北市中山路	所有權	所有權	所有權	所有權	所有權	所有權	所有權	所有權
建物資料										
建物圖號	建物區	建物段	建物小段	建物宗地	建物宗地	建物宗地	建物宗地	建物宗地	建物宗地	建物宗地
10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
建物所有權人										
姓名	身分證號碼	戶籍地址	建物所有權	建物所有權	建物所有權	建物所有權	建物所有權	建物所有權	建物所有權	建物所有權
張三	123456789	台北市中山路	所有權	所有權	所有權	所有權	所有權	所有權	所有權	所有權

Figure 4. The Result of Land Property and Building Property

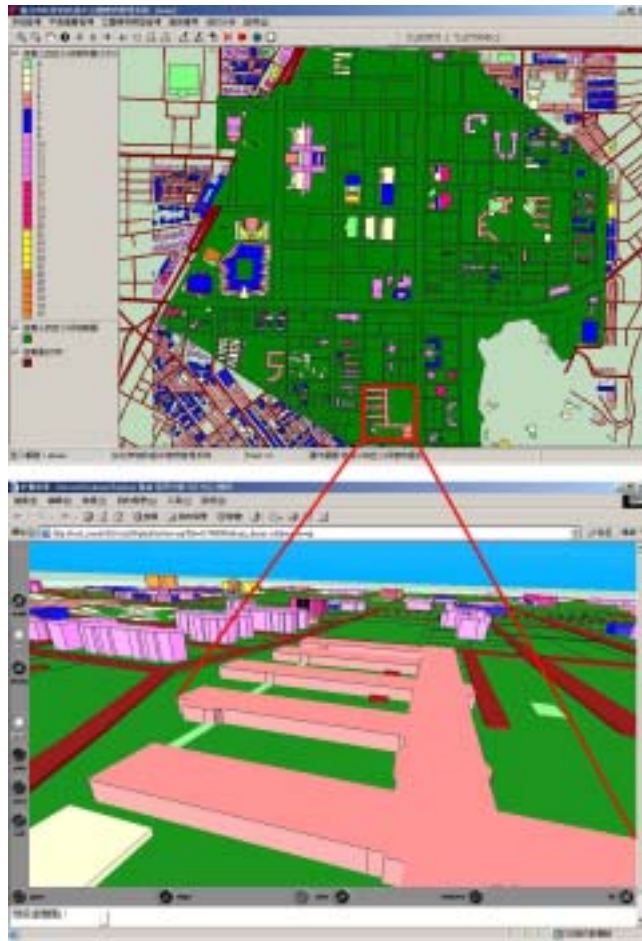


Figure 5. 2D GIS vs. 3D in 3D Building Model System