

Research on Digital Governance of Rural Environment Based on Cesium for Unreal

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Abstract: Rural environmental governance is an important national development strategy, and with the application of network, informatization and digitization in agricultural and rural economic and social development, the digital governance of rural environment has become a research hotspot (Association I, MacLennan B L, Bergeron S J.2019). Therefore, this paper introduces cesium technology and UE4 technology into the digital governance of rural environment, in order to realize the combination of virtual and real, the virtual scene as a reference to the real scene, and the real scene transmits data to the virtual scene, so as to realize the real meaning of data-driven two-way interaction, so as to realize the digitization and visualization of rural environmental governance.

1 INTRODUCTION

The report of the 19th National Congress of the Communist Party of China clearly pointed out that the implementation of Rural Revitalization Strategy, and gradually realize the sustainable development of ecological civilization (Liu, Liu, Jing, et al. 2012). At the same time, "opinions on Rural Revitalization Strategy" and "Rural Revitalization strategic planning (2018-2020)" also put forward that Rural Revitalization Strategy should be implemented, and rural environmental governance is the only way to implement Rural Revitalization Strategy (Ren 2021), and good environment is an important foundation and guarantee for the development of rural economy (Du 2021). The comprehensive governance of rural ecological environment is the only way to realize the green agricultural production and low-carbon agricultural life, and then realize the transformation of rural economic development (Gao 2018). The environmental governance of hometown village is an important national development strategy, and accompanied by the application of network, informatization and digitization in the development of rural economy and society, Digital governance of rural environment has become the focus of current research (M A, Zhang, Liu 2019).

Therefore, this paper first introduces the latest

digital technology of 3D scene representation, namely cesium for unreal, which combines the 3D geospatial function of cesium with the high fidelity rendering ability of virtual engine 4 (UE4). The combination of cesium technology and virtual engine 4 technology realizes the creation of 3D environment from real to digital. Then, the digital and visual construction of rural environment is realized by using cesium for unreal technology. The construction results of this paper will help policy makers intuitively and comprehensively understand the situation of rural environmental governance, quickly grasp the overall situation of the target area, and be conducive to the digital governance of rural environment.

2 MATERIALS AND METHODS

2.1 Cesium

Cesium is a world-class JavaScript open source product for 3D Earth and maps (Peng Xiang. 2021). Used to render 3D Earth, 2D area maps, and a variety of GIS elements. It provides a development kit based on JavaScript language, which makes it convenient for users to quickly build a zero-plug-in virtual earth Web application, and has a high quality guarantee in

performance, accuracy, rendering quality, multi-platform and ease of use.

Use Cesium to quickly load all kinds of base maps, including WMS service, xyz format base map, arcgis server, load single picture, load sky map image, load sky map electronic map, load Gaud image, load Google image map, etc.; at the same time, you can also use Cesium to quickly realize length measurement, area measurement, dimension line drawing, dimension surface drawing; set roaming path; rain and snow weather effect; split screen effect; illumination simulation. Simulated demolition and other functions. Using Cesium, we can quickly stack artificial models and all kinds of vector data. As an open source 3D display technology, Cesium provides a display engine for digital rural construction.

2.2 UE4

UE4 is a popular game development engine all over the world (Tian 2021). The Unreal engine is a complete set of integrated tools for building games, simulation and visualization, with sufficient flexibility to meet the needs of development teams of different sizes (Wang 2021). Unreal engine is the most open and advanced real-time 3D creation platform in the world. After continuous improvement, it is not only a temple-level game engine, but also brings unlimited creative freedom and unprecedented control to professionals in various industries. Whether it's cutting-edge content, interactive experiences, or immersive virtual worlds, it's all in the illusory engine.

The Unreal engine is a palace-level real-time engine and editor, with photo-level realistic rendering functions, dynamic physics and effects, lifelike animation, robust data conversion interface and so on. It is an open and extensible platform that can bring you unlimited creative freedom.

With the unprecedented demand for real-time 3D technology in digital countryside, learning illusory engine has become the best way to expand digital countryside.

2.3 Cesium for Unreal

Cesium for Unrea, which was officially released in 2021-03-30, is a 3D Earth plug-in tailored by Cesium for the illusory engine, which makes the unreal engine have the ability of Google Earth and opens a new door for simulating the real world. Cesium for Unreal, based on open standards and API, combines the 3D geospatial capabilities of Cesium with the high-fidelity rendering capabilities of Unreal engines

to open the 3D geospatial ecosystem for game engines. Cesium for Unreal enables you to create a digital world from real-world 3D content, and use Cesium for Unreal to create a digital world with real-world scale and 3D content.

3 RESEARCH ON DIGITAL CONSTRUCTION OF RURAL ENVIRONMENT BASED ON CESIUM FOR UNREAL

Based on cesium for unreal, the research of rural environment digital construction is realized by designing a three-dimensional visualization system (Wang, Li, Zhang, Chen, Yang, Yu 2021). The design idea of the system, first of all, the rural environment big scene data collection and important facilities refinement model, and then data format conversion, using the cesium for unreal import data, combined with blueprint interactive function and front-end display function, realize the digital display of rural environment (Wang, Li, Fan 2020). Finally, through the collected sensor data and scene digital information, based on the principle of Bryson collaborative governance model, the environmental governance function is developed, the factors of the effectiveness of the target rural environmental governance are extracted, and the governance strategies are formulated through human-computer interaction to provide the basis for environmental governance.

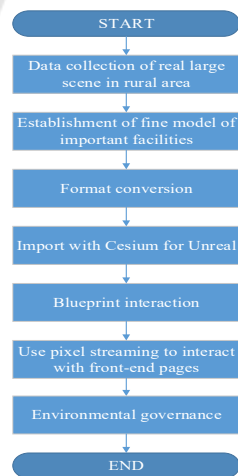


Figure 1: 3D Visualization process of Digital Countryside.

3.1 Data Collection of Real Large Scene in Rural Area

The real scene in the rural area shown in this paper is collected by UAV in Chuntan Street, Anlong County, Qianxinan Prefecture, Guizhou Province. Some of the collected data are as follows.



Figure 2: Tilt photography data.

3.2 Establishment of Fine Model of Important Facilities

Digital governance of rural environment is inseparable from fine model. Based on 3DMAX software, this paper carries out fine modeling of important facilities in the area where sensors have been installed. The content of fine modeling mainly includes weather station, ecological breeding plant, public toilet, garbage can, camera, etc., so as to realize the fine modeling in the system by clicking on the model (Fig. 3), The real-time monitoring data and images of the facilities can be displayed intuitively.

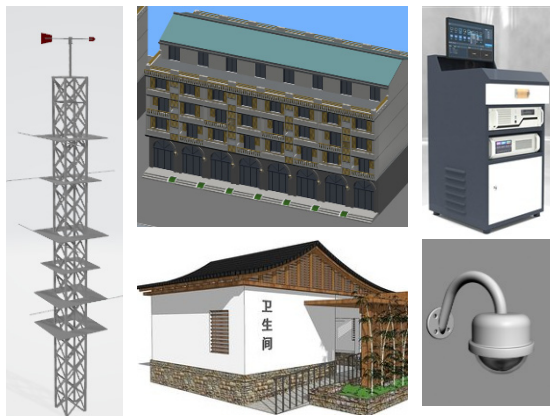


Figure 3: Partial refinement model effect.

3.3 Format Conversion

The conversion interface is shown in figure 4 below. According to the data format supported by the system (Fig. 4), the format of Orthophoto data, terrain data vector data, tilt data, artificial model data, point cloud data, etc. is converted, and the converted data is stored in the system database for viewing and calling(Zhao 2021).

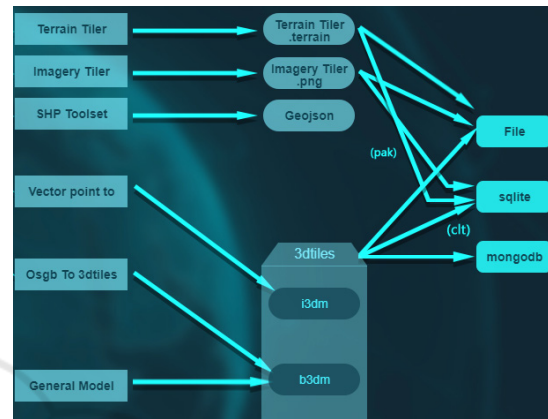


Figure 4: Cesium Lab supports common data format conversion.

3.4 Using Cesium for Unreal to Import

Cesium for Unreal is a free plug-in on Unreal engine Mall that installs and activates plug-ins. Use the Cesium for Unreal plug-in to import the converted oblique photography model and fine model into UE4.

3.5 Blueprint Interaction

Blueprints are a special class of asset that can be used to create logic in an intuitive, node-based way, or to set up some variable data. Planners can create custom Actor, Event, functions, etc., and do Gameplay iterations quickly without writing any code.

The blueprint can also choose to inherit the C++ class, get the variables defined in C++, call the functions defined in C++, or implement the event defined in C++. The interaction between scenes is realized by using the blueprint function.

3.6 Use Pixel Streaming to Interact with the Front-End Page

The implementation of pixel streaming is to put the computing that can only run on the terminal in the cloud, and call powerful high-end computing resources (CPU/GPU/ memory, etc.) in the cloud to

calculate. The end user uses a standard web browser to connect to the application, of course, it can also send a variety of control signals (mouse, keyboard, touch, etc.) to the cloud computing node, and push the calculated picture back to the terminal after processing (Zhang, Zhou, Shen, et al. 2019). Pixel streaming plug-in is integrated in UE4, and the interaction between front-end Web interface and 3D scene can be realized by using this plug-in. The effect is shown in figure 5.



Figure 5: Front-end display interface.

3.7 Realization of Environmental Governance Function

Through the collected sensor data and scene digital information, based on the principle of Bryson collaborative governance model, the environmental governance function is developed, the factors of the effectiveness of the target rural environmental governance are extracted, and the governance strategies are formulated through human-computer interaction to provide the basis for environmental governance (Zhou, LI, Wang, et al. 2018).

4 SUMMARY

This paper first studies cesium for unreal, and finds that this technology combines the 3D geospatial function of cesium with the high fidelity rendering ability of virtual engine 4 (UE4). The combination of cesium technology and virtual engine 4 technology can realize the creation of 3D environment from real to digital. Furthermore, based on the research of digital construction of rural environment of cesium for unreal, the digital and visual construction of rural environment is realized, which provides a scientific basis for environmental governance. If we want to achieve more accurate environmental governance

function, we need to further improve the environmental model.

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