Application of Digital Twin Technology in Water Conservancy: A Review

Shipeng Jin ,Yongbing Xu,Shandong Survey and Design Institute of Water Conservancy CO.,LTD

Objectives

This paper presents a comprehensive review of digital twin technology applications in water conservancy, emphasizing its integration with the Unreal Engine. The Unreal Engine, a cross-platform game engine, can also be utilized for digital twin engineering applications.

Figure 1 One of the four flood control interfaces of the digital twin Denglou pumping station.

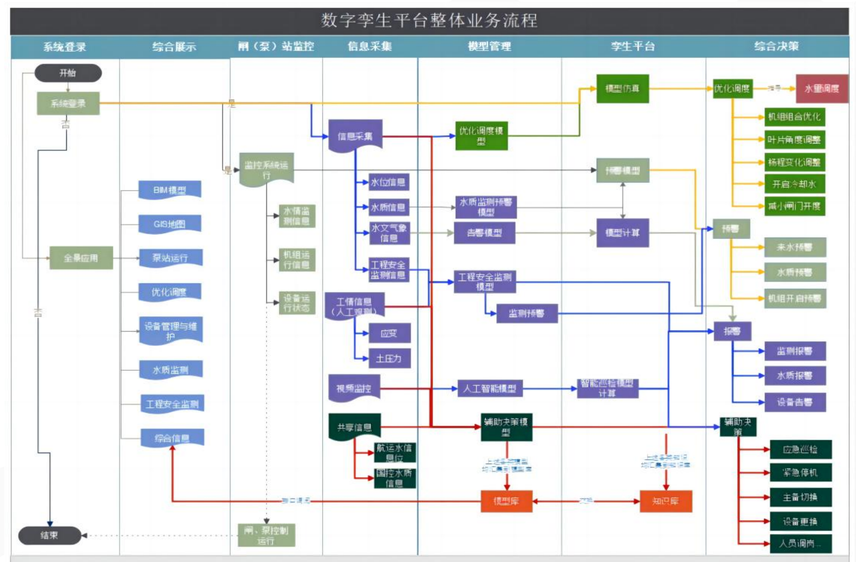

Figure 2 The overall business process of the digital twin platform for Denglou Pumping Station.

Methods

1.Introduce the concept of digital twin technology and its primary features, including the capability to simulate and analyze real-world systems in virtual environments.
2.Discuss the advantages of employing digital twin technology in water conservancy, such as enhanced decision-making, reduced maintenance costs, and increased safety.
3.Explore the application of digital twin technology in three distinct water conservancy scenarios: flood control, water quality monitoring, and irrigation system management.
4.Examine the benefits of incorporating the Unreal Engine into digital twin technology, encompassing its real-time rendering capabilities and immersive user experience.

Results

1.In each water conservancy scenario (flood control, water quality monitoring, and irrigation system management), the utilization of digital twin technology for system simulation and analysis is described, along with the manner in which the results can contribute to improved water management.
2.The combination of digital twin technology and the Unreal Engine is shown to provide decision-makers with a realistic and interactive virtual environment for visualizing and analyzing complex water systems.

Conclusions

Challenges and limitations of digital twin technology in water conservancy are identified, such as the necessity for accurate and reliable data and the difficulty in ensuring model accuracy. Future research directions are proposed, including enhancing data integration and model calibration techniques, to address these challenges and further improve the application of digital twin technology in water conservancy.

Figure 3 UE animation scene built based on the oblique photography model and Fluid Flux plugin.