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Application of 3 D digital technology in transmission line engineering and waste soil disposal mechanization construction

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Abstract: Under the background of the innovation in the field of construction engineering toward the direction of intelligence and digitalization, the three-dimensional digital design means with the digital information model as the core has gradually become the main content of the industry discussion in the new era. According to the cumulative experience of transmission line construction in recent years in our country, three-dimensional digital technology can simulate and arrange the construction link comprehensively during the construction of the project, and shorten the construction period and reduce the cost. Therefore, on the basis of understanding the current situation of transmission line engineering and the mechanized construction of residual soil disposal, this paper deeply discusses how to apply three-dimensional digital technology in the mechanized construction of transmission line engineering and residual soil disposal according to the research situation of three-dimensional digital technology at home and abroad. The final experimental results show that the 3D digital technology has a good application effect during the project construction, which is helpful to guide the high-quality development of power design industry in the new era.

Keywords: 3D digital technology; Transmission line; Disposal of residual soil; mechanization

1. Introduction

In the innovation and development of computer technology, scholars from all over the world have put forward the theory of 3D digital technology in empirical studies and applied it to many industries. Since the 1980s, the manufacturing industry, especially the aerospace field, has been the first to use digital technology, such as virtual manufacturing and simulation, which can not only reduce the production cycle of products, but also effectively control costs. In the development of modern society construction, digital design and manufacturing is a key technology of large equipment machinery manufacturing, and the digital research and design method is generally used in ships, high-speed railways, and automobiles developed by our country. According to Made in China 2025, the penetration rate of digital R&D and design tools has increased from 52% to 84%. Building information model technology is also gradually developing, forming an integrated mode, and put forward the advanced concept of the whole life cycle, in the municipal, electric power, transportation and other infrastructure industries, three-dimensional digital technology has shown a positive role. For example, nuclear power, thermal power, hydropower and so on can use three-dimensional digital technology for comprehensive layout; For railway and highway, spatial simulation and geographic information system can be used for line selection analysis.[1.2]

According to the concept of ecological civilization construction in our country and enterprise green development strategy needs, clear transmission line engineering of fish soil treatment and relevant protective measures, put forward in accordance with Gao Tieshen excavation substation engineering slope and arid zone lines Kentucky slope vegetation restoration technology of soil and water conservation system, system specification processing power transmission and transformation engineering of the soil, improve the efficiency and quality of the soil disposal work, It can increase the coverage rate and survival rate of vegetation, reduce the intensity of soil and water loss, and provide technical support for improving the technical level of soil and water conservation of power

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transmission and transformation project and the green development of power grid. Therefore, during the construction and management of the project, the construction unit must do the following research: first, study the quantity of residual soil eradication of the power transformation project and the line project under different topographic and geomorphic conditions and different design schemes, the status quo of the treatment work, and the prevention and treatment of soil and water loss; Secondly, the basic principles, operation steps and processing technology of residual soil disposal are clarified by combining different types of projects. Thirdly, the technical method and construction technology of typical abandoned soil site selection, safety and stability design, soil and water conservation protection measures, duty measures design and so on are studied. Fourthly, the comprehensive technical scheme of soil and water loss prevention and control in residual soil disposal and abandoned soil field is studied, and representative power transmission and transformation projects are selected for technical research. In this process, the reasonable use of three-dimensional digital technology can faster grasp the influencing factors of power transmission and transformation project map disposal, understand the basic principles and effective process of each operation, and provide technical support for the disposal of power transmission and transformation project residual soil.[3.4]

Now, in the field of power transmission engineering construction, a new power industry development pattern is gradually formed, which provides a solid foundation for power industry to develop in the new era. However, the water and soil loss problem faced by the power transmission and transformation project will have a negative impact on the ecological environment of the region, which is not conducive to the construction and operation of the power transmission and transformation project. Therefore, strengthening the research on water and soil conservation technology of the project is the basic condition for the innovation and development of the power industry at present. In THE NEW MARKET ENVIRONMENT, ACCORDING TO THE characteristics OF power transmission and transformation engineering, starting from the development and construction of soil and water conservation technology, deep exploration of the development direction of soil and water conservation technology, reasonable use of three-dimensional digital technology theory, is helpful to promote the long-term development of electric power industry. With the rapid development of computer technology, the design field has begun to explore and apply 3D digital design auxiliary technology based on the application requirements of the whole life cycle of engineering. As a new design method, it has been widely promoted in the research of design, construction and operation and maintenance units because of its convenience and intuitionistic characteristics. At present, the only commonly used transmission line auxiliary design software in the world is PLS-CADD software system, which is a relatively mature survey technology software for high-voltage transmission lines in the world. However, PLS-Tower and other internationally used Tower calculation software focus more on the calculation and analysis of Tower stress, and do not comprehensively consider the electrical clearance to optimize the probe function. BIM technology originated in the United States. As early as 2009, 80% of the top 300 enterprises in the American construction industry took the initiative to use BIM technology for construction analysis. According to the extensive research on BIM technology by various research institutions at home and abroad, it is mainly applied in many fields such as rock and soil, road and bridge, industrial and civil construction, etc., but it is not much applied in the power line industry. After the concept of BIM system was introduced in 2003, the application of BIM can reach 90% of the new project in 2020 in our country. Therefore, this paper mainly discusses the application of 3D digital technology in the mechanized construction of transmission line engineering and map disposal.[5.6]

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2. Method

2.1 Analysis of key technologies of 3D digitalization

The key technologies of 3D digitalization of transmission lines include platform design, data interaction, collaborative design, data transmission, processing, etc., which are constantly improved and optimized in practice, helping to provide quality services for project construction management. The specific contents reflect the following points:

First, development platform. The platform functions include basic management and advanced development functions. At present, the relevant platform can basically meet the needs of designers in all aspects, mainly for the transmission line engineering three-dimensional simulation, collision detection, pipeline optimization, engineering quantity statistics and other operations. But other advanced extensions are missing. The functional design of the overall platform is shown in Figure 1 below:

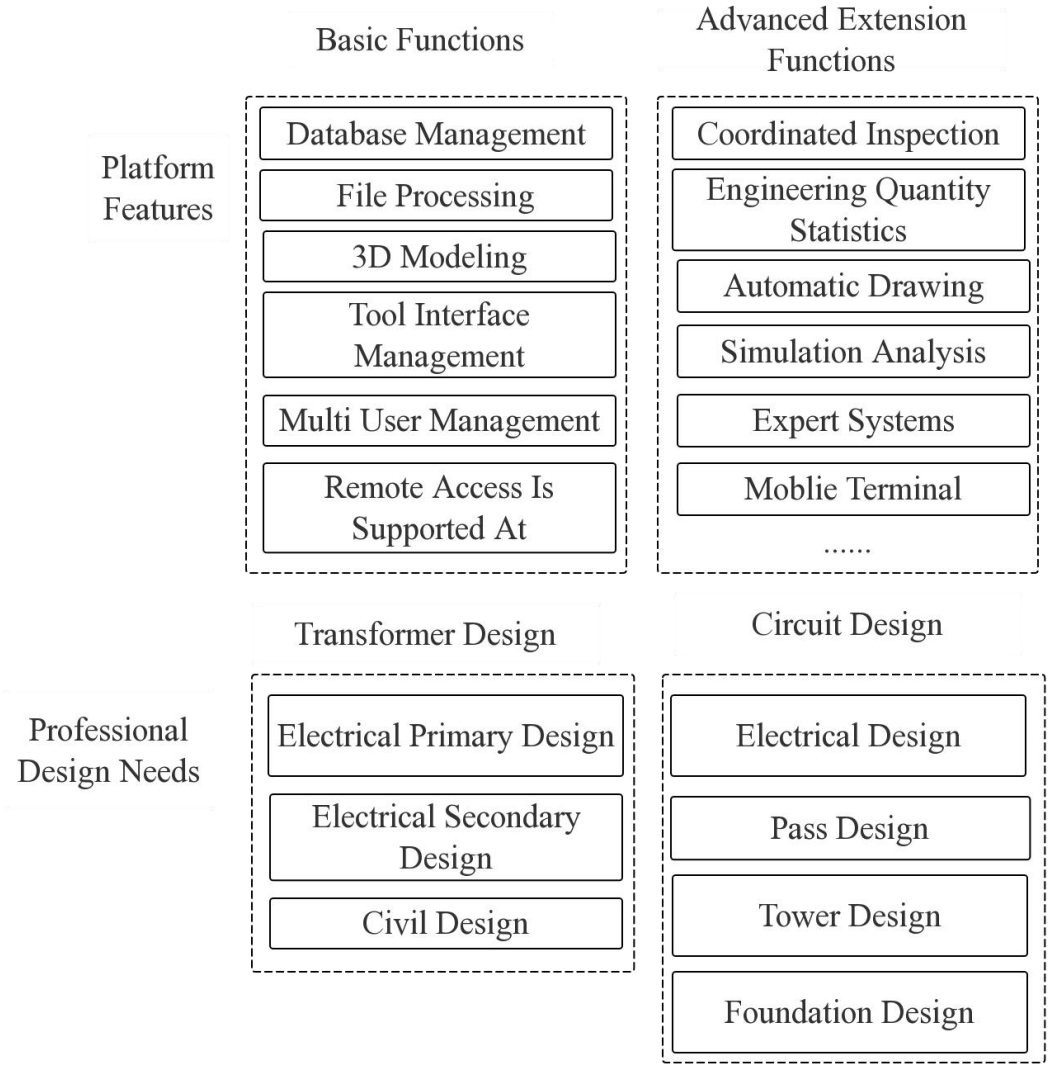

Figure 1 Structural diagram of platform functions

Combined with the above analysis, it can be seen that the research platform in this paper basically meets the basic requirements of professional design, digitalization and collaborative design, and focuses on the realization of simulation analysis and expert system assisted decision-making scheme of relevant majors, which is helpful to improve the quality of automatic drawing and practical work efficiency.

Second, data interaction. Power grid design is produced by multi-professional and multi-unit collaborative operation, and there are interaction problems between different platforms and between

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platforms and professional tools. From the perspective of practical development, the core of interaction is to study and formulate unified standards, which should focus on the interaction among cost, survey, design, manufacturing, construction and operation and maintenance. The specific diagram is shown in Figure 2 below:

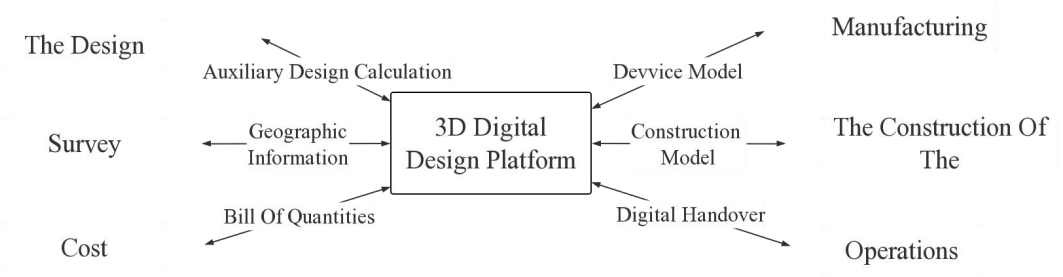

Figure 2 Schematic diagram of data interaction

Third, collaborative design. The key of collaborative design is unified storage and management of data, centralized control of the overall workflow, clear division of labor and interface, introduction of permission management mechanism, and construction of operation rule system.

Fourth, data transmission and processing. This link involves big data, cloud computing, fast communication, parallel processing, data integration and other technologies, which helps the system to achieve decision-making assistance, remote collaboration, platform construction and other functions. The specific flow chart is shown in Figure 3 below:

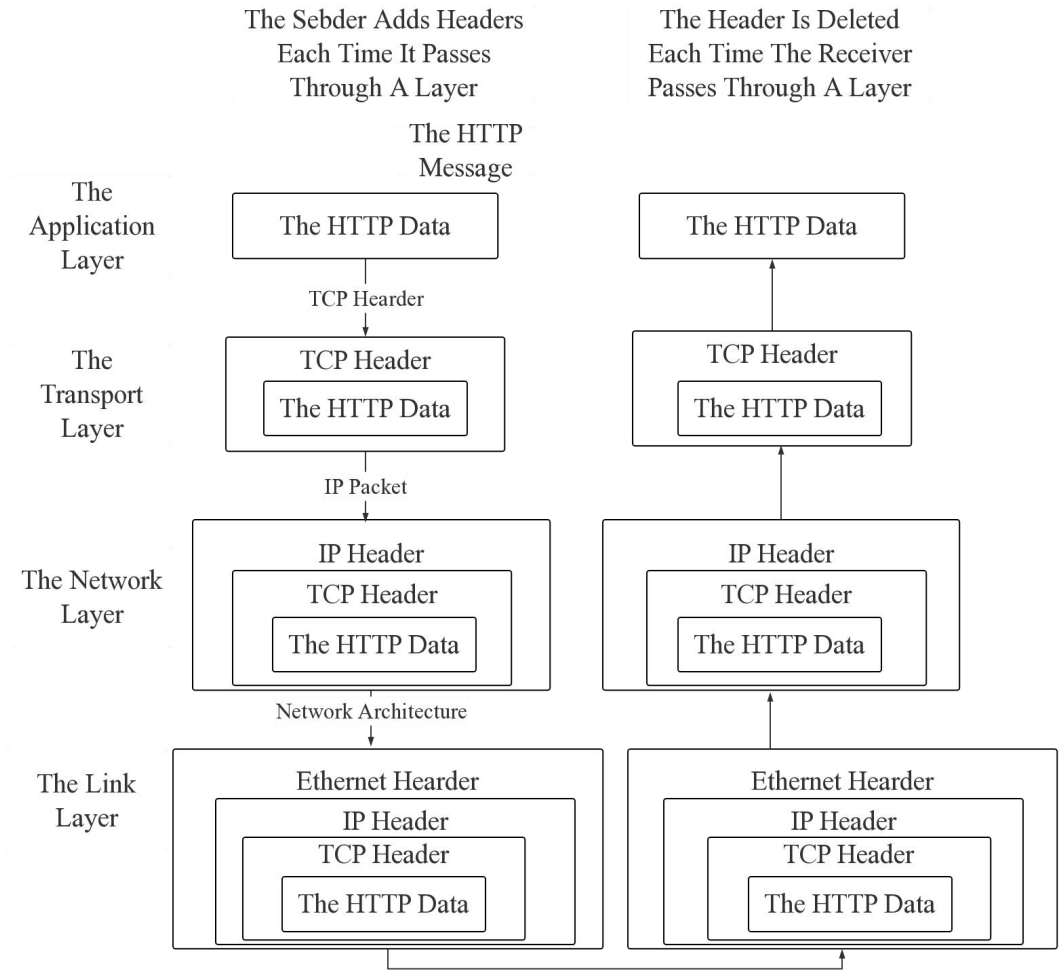

Fig. 3 Flow chart of data transmission and processing

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2.2 Application analysis in transmission line engineering

The application of 3D digital technology in transmission line engineering has the following advantages: firstly, it can help to improve the refinement level of design, reduce the design error rate in parallel collaborative design, and provide designers with a variety of design results such as real scene simulation and data model. Secondly, promote the efficient development of project management. For example, visualization can help the owner to understand the design scheme and the intention of the design more quickly during construction. Various majors and units can communicate more quickly and orderly expand the application services of project management, such as virtual construction and intelligent manufacturing. Finally, it helps to promote the permanent preservation of life-cycle application models and data information, and truly realize digital operations and asset management. The applied structure diagram is shown in Figure 4 below:[7.8]

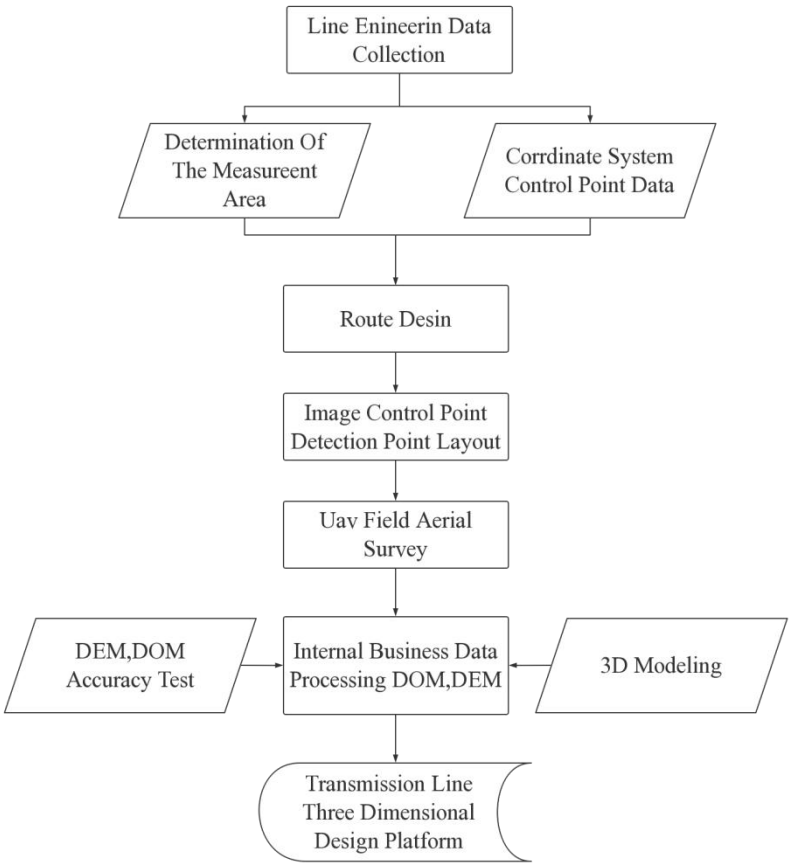

Fig. 4 Application structure diagram of transmission line engineering based on 3D digital technology

3. Result analysis

From the perspective of transmission line engineering and the mechanized construction of residual soil disposal, the design and analysis using 3D digital technology can be divided into three stages: the first is the initial stage, the second is the development stage, and the last is the mature stage. At present, Chinese three-dimensional digital design has crossed the starting stage and gradually entered the development stage. Although three-dimensional digital technology has made outstanding achievements in our country, but the overall development is not mature, there are still many problems to be solved, therefore, future scientific research scholars and industry experts should carry out innovation research from the following aspects: First of all, 3D digital technology to change the industry design is an inevitable trend, but technical innovation often appear stage difficulties, so experts and scholars should on the basis of correct understanding, combined with the

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power of the government and enterprises to carry out innovation reform; Secondly, a unified standard system as shown in Figure 5 below should be constructed to standardize design quality, design depth, interaction function, collaborative process and other contents. At the same time, the whole life cycle of 3D digitalization should be considered as the main objective when setting standards.

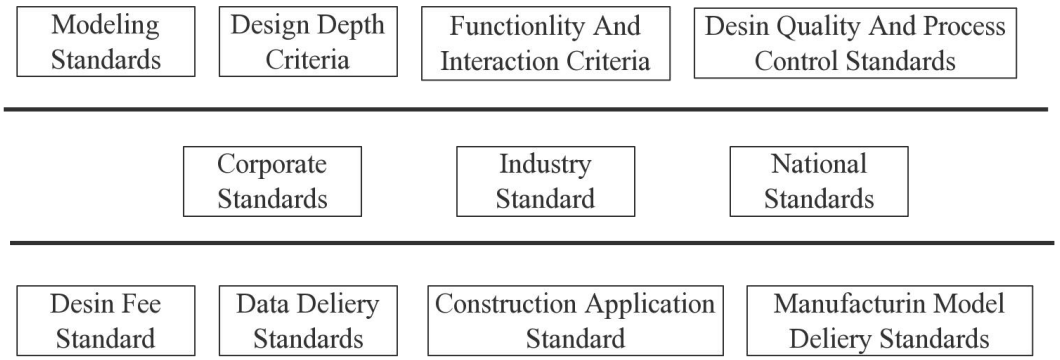

Figure 5. Unified standard system

Again, the design unit should pay attention to the training of professional and technical personnel with complexity, which is helpful for designers to adapt to the new development mode faster. At the same time, it is necessary to establish the distinguishing standard of 3D digital design technology to encourage the design industry to strengthen investment. In addition, incentive mechanism and quality management system should be formulated for the development of the industry, quality certification methods for 3D digital design results should be explored deeply, and technical support should be strengthened in hardware and software purchase, education, investment and training, etc. Finally, 3D digital technology can not only be used in the design process, but also establish the basic concept of whole-industry chain participation and whole-life cycle management, which is mainly used to improve the participation degree and application depth of manufacturers and construction units, so as to fully demonstrate the application value of 3D digital technology in the development of the new era.[9.10]

4. Conclusion

In conclusion, according to the analysis of the problems faced by the mechanized construction of transmission line engineering and residual soil disposal in recent years, the reasonable use of three-dimensional digital technology can not only strengthen the comprehensive level of construction, but also reduce unnecessary costs and shorten the overall construction period. Therefore, construction units and government departments should not only pay attention to the application and innovation of 3D digital technology, but also strengthen the training of professional and technical personnel and pay attention to technical innovation combined with practical project construction needs. At the same time, but also the integration of the transmission line engineering construction in recent years accumulated experience, in all kinds of problems faced by clear, pay attention to combining with the basic requirements of soil and water conservation, reasonable planning the overall project construction management content, and put forward the technical standards of specification, security design can be obtained in practice to explore a more perfect design, not only can get scientific and reasonable construction project, It can also guarantee the quality of project application from the basis.

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