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Research Article

Art Product Design and VR User Experience Based on IoT Technology and Visualization System

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Based on the Internet of Things technology, this paper analyzes the concept and basic characteristics of visualization technology and builds a visualization digital art product information system based on VRML virtual reality technology. This article first explains the background and significance, analyzes the research status at home and abroad, introduces the application of virtual realization technology, and puts forward the technical route and main research content on this basis. After field inspection of art products, the system was analyzed according to the actual situation. After analyzing the needs and goals of the system, the overall structure of the system was proposed. Under the overall framework, this paper designs the system and designs the system's visualization and real-time interaction modules. At the same time, combined with VRML technology to realize the visual 3D modeling of virtual art products, we establish the 3D model of the entire art product. Users can choose between role roaming and camera roaming. Finally, we made a summary statement to the full text and looked forward to the application prospects and development trends of information visualization technology in digital art products. During the experiment, by calling the HTC method in the Unity 3D system, this article uses the Unity 3D engine to implement UI scene loading and VR rendering technology optimization and realizes design knowledge through the integration of art product design models and IoT data interactive functions and dynamic loading of scenes. The effect of the model on the quality prediction is analyzed through experiments. The results show that the performance of the former is better than the latter two models, and it has a good performance on unbalanced data processing, which verifies the performance and effectiveness of the algorithm model.

1. Introduction

With the continuous improvement of computer technology and database technology, visualization technology is an emerging discipline that has been developed in the past ten years. Information visualization is an important research direction in visualization technology, which mainly uses computer-supported, interactive, and visual representation of abstract data to enhance people's cognition of this abstract information [1]. It is a hot research topic in the field of information resource management and an effective way to process large-scale data, discover hidden relationships between data, and improve cognitive ability [2]. Virtual reality is a new research direction and field of applied technology. It has developed very fast in recent years. It uses some human-computer interaction devices to exchange data, imitating human feelings, and virtually constructing a three-dimensional world that imitates the real environment, making people feel like themselves in a real world [3–5]. The purpose of virtual reality technology is to use code to achieve a virtual environment like a real scene, and then, under certain operating conditions, users can use a mouse or keyboard or even some other devices to interact with the virtual environment to a certain extent. The user feels real and immersive. Virtual reality technology, multimedia technology, and network technology are the three most promising computer technologies in the 21st century [6–8].

Dachyar et al. [9] further explored the display methods and processing methods of the physical characteristics of objects in a simulated specific environment on the premise of conducting research on the most basic knowledge. In terms of artistic simulation, virtual reality also plays an irreplaceable role. The art simulation system is not like a normal virtual technology, but a tour mode. The second is a simulation system that can guide the production process in a real sense. Therefore, it must combine the needs of users and develop a logic to form a complete simulation system. Chen and Yang [10] proposed another 3D model reconstruction based on laser scanning. 3D laser scanning can quickly and on a large scale collect the spatial position of the point cloud to obtain the 3D coordinates of the target surface. Three-dimensional laser scanning provides a new technical method. In the field of graphics and computer vision, obtaining a three-dimensional model of a target is a challenging problem and has become an important research topic. Yang et al. [11] proposed a laser scanning method for space targets. When modeling, after obtaining the depth data, the image is obtained by segmenting the image, and the image is registered to detect the relationship between the two perspectives. Finally, the triangle mesh analysis is performed on the mesh to obtain the three-dimensional surface model of the target object. Yang et al. [12] adopted the method of volume coloring 3D reconstruction; designed and realized 3D point cloud preprocessing, point cloud noise removal, hole repair, and 3D volume reconstruction smoothing; and obtained 3D point cloud after surface reconstruction. Guo et al. [13] reconstruct plant leaves based on point cloud data. First, the noise points of the point cloud data obtained by the 3D scanner are removed, and the data is streamlined and preprocessed. Finally, the surface grid is optimized to achieve high-precision three-dimensional reconstruction of plant leaves [14–16]. Some scholars use 3D scanners to obtain leaf point cloud data. Through point cloud simplification, point cloud repair, and denoising steps, the point cloud data grid generation and optimized rendering are performed. Finally, a high-precision plant leaf reconstruction model is obtained [17–19]. There are also scholars who build a systematic experiential virtual farm to provide users with services such as changing the virtual agricultural environment and design measures. Users can have a clear grasp of the growth of virtual crops and pay attention to changes in yield and quality in a timely manner. Through the establishment of a virtual grassland model, the biomass transfer situation is simulated, and the best solution is provided for grazing density and forage yield [20–22].

In order to make the virtual visual presentation effect more realistic, this article uses the virtual scene entity modeling of the Unity 3D development platform to make the virtual scene generated by Unity 3D driven by the actual external data can still meet the objective laws and subjective requirements of the real world. In terms of data analysis, the collected data is used to predict the surface quality of the lining paper composite. In view of the clutter in the data, the diversification of variable types (numerical values, text, images, audio, etc.), the integrated learning with strong data adaptability in machine learning is introduced, and the excellent performance is used. This paper designs a set of production equipment status monitoring system based on the Internet of Things, which collects and monitors the production status data of each station equipment in the production workshop in a timely manner, and responds to various abnormal conditions in production in a timely manner, while monitoring in an intuitive manner. At the same time, this article proposes a universally applicable analysis method for product quality prediction in art production. The product quality prediction model is constructed through the XGBoost algorithm in integrated learning, and the product yield rate is predicted to improve quality control.

2. Art Product Design and VR User Experience Model Construction Based on IoT Technology and Visualization System

2.1. Hierarchical Distribution of IoT Technology. The Internet of Things (IoT) refers to the use of diversified information collection terminals and information collection technologies to obtain all kinds of information needed by the system and uploads these information data to the processing center through the Internet and other media for centralized analysis and finally downloads the control instructions to each terminal device to realize intelligent control. The collection technologies included in the Internet of Things include sensor technology, RFID technology, barcode scanning technology, infrared recognition technology, and GPS, all of which can realize the automatic identification and acquisition of information, and complete the connection and communication between things [23–25]. Figure 1 is the hierarchical topology of the Internet of Things technology.

As a combination of hardware, network communication, and software technology, the Internet of Things will not only use a variety of intelligent acquisition sensors as terminals but also realize information transmission between the underlying RFID, WSN technology, and other heterogeneous networks to achieve the object and the environment. Nowadays, many research and development directions are in the fields of RFID, WSN, user terminal software, and network transmission and calculation algorithms.

$$\min \sum_{i=1}^{N} a_i + \frac{1}{2}\sum_{i=1}^{N}\sum_{j}^{N} a_i y_j a_j y_i k\left(x_i^2, x_j^2\right) = 0,$$
$$L_{(\mathrm{emg},k)} = \sum_{f(\mathrm{emg},k)\in A_{(\mathrm{emg,k})}} \left(f_{(\mathrm{emg},n)} + C_{(\mathrm{emg,k})}\right). \tag{1}$$

In the face of diverse signal acquisition and the complex environment of the workshop, it is planned to use a programmable controller (PLC) with a functional integrated acquisition module to set up points near each device for acquisition. Signals such as analog and digital signals can be directly connected to the PLC for signal processing and can also be transferred through the acquisition module; and a variety of serial communication instruments, due to different locations and large numbers,

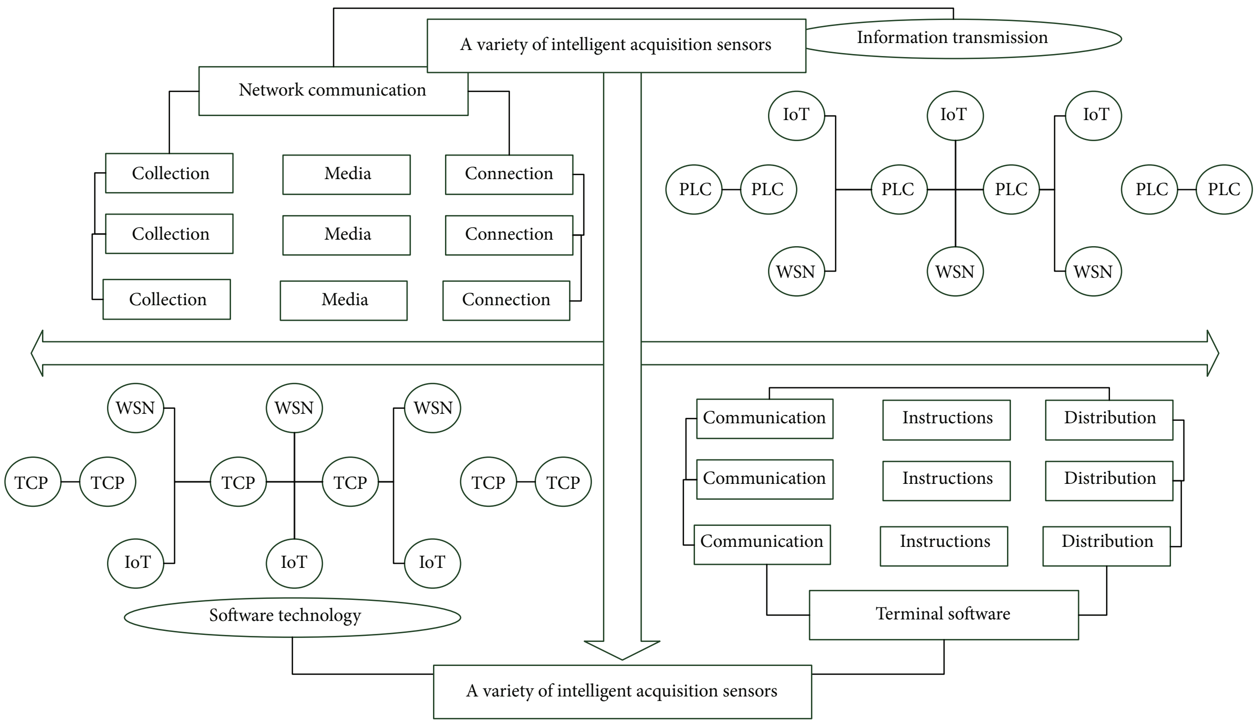

Figure 1: Hierarchical topology of IoT technology.

adopt the RS-485 bus to the serial communication port of the PLC for comprehensive data processing.

$$\begin{cases} V_{(i,f)} = \dfrac{J_i^f + J_i^{f-1}}{T}, \\ V_i = \left\{ V_{(i,\mathrm{i})}, \cdots, V_{(i,f)} \right\}. \end{cases} \quad (2)$$

For these sample sets, the base learner is trained and finally combined with weights. Then, we divide a data set containing m samples and randomly select a sample from it and merge it into the sampling set and then put the sample back, repeat m random sampling times in this way, and then obtain a sampling set containing m samples. Finally, the estimated variance is reduced through the integration of base learners.

$$\psi(x) = \frac{f(x,d) - f(x,m)}{f(x,d) + f(m,d)}, \quad \chi(x) = \begin{cases} \exp\left(-\lambda L \times \left(1 + \lambda \times x^2\right)\right), \chi \geq \chi(x), \\ 0, \chi < \chi(x). \end{cases} \quad (3)$$

In order to ensure the safety and convenience of communication between the production area and the main control room, the central switch is used to connect and communicate with the subnets, and the Ethernet (TCP/IP) is used to transmit data. The workshop subnet assigns an IP address to each device for easy identification and query by the host computer. The PLC, which is responsible for collecting and preliminary processing data, undergoes protocol conversion through Modbus gateway, converts from Modbus RTU to Modbus TCP/IP, and then connects to the switch.

$$G(x) = \begin{cases} g(x) \times [0, x, 1], x \subset X, \\ g(x) \times [x, 1, 0], x \subset Y, \\ g(x) \times [1, 0, x], x \subset Z. \end{cases} \quad (4)$$

The configuration software is the monitoring software used in the art automation to connect the data acquisition stage and carry out the production process control and status monitoring, namely, SCADA software. As a highly integrated development platform, the configuration software provides users with flexible configuration design methods, enabling users to develop adaptable configuration interfaces and functions as needed. The software contains various module plug-ins, which can quickly and conveniently realize multiple functional requirements involved in condition monitoring. At the same time, it has a high degree of openness and supports the connection of I/O devices of different brands of hardware.

2.2. The Composition of Visual System Factors. Visualization technology refers to the theoretical method of representing data through interactive graphics or images based on computer graphics and image processing technology. It covers areas including computer graphics, image processing, computer vision, and computer-aided design. Generally, the graphical user interface and the menu are not directly related, but the fonts, icons, etc. displayed by the menu in the graphical user interface are often richer than the character user interface. Compared with the command line operation of the character user interface, the menu operation of the graphical user interface only requires the user to select an operation description instead of typing a command, which greatly reduces the user's operation difficulty. At the same time, the graphical user interface has the characteristics of cultural and language independence, which reduces the time to search for visual objects to a certain extent. In contrast to the purely textual representation of data information, visualization technology to represent data information in the form of graphics and images can help us to better and faster discover the features and laws hidden in the data. Figure 2 is a pie chart of visual system factors. This technology fully takes into account the direct image characteristics of graphics and images and combines the characteristics of human intelligence with the powerful graphics and image processing capabilities of computers.

The point cloud obtained by 3D scanning is very dense and has a lot of redundant information. If triangulating the origin cloud data directly, the whole process will consume a lot of time and computer resources, greatly reducing the efficiency of 3D reconstruction. It is necessary to ensure that the premise is still close to the physical model, and to speed up the simplified processing and optimization of point cloud data as much as possible. The surface patch is constructed through the construct surface patch command, and the surface patch count selection is automatically estimated. After the construction is completed, you can use the position editing function and slow the surface processing of unreasonable patches and modify the parameters of the surface patch by executing the construct grid command. The smaller surface patch is finally automatically fitted into two continuous Nurbs surfaces through the fitting surface function. Usually feature engineering includes three major parts, namely, feature construction, feature extraction, and feature selection. The purpose of feature extraction or feature selection is to sort out the original data features and filter out effective features. But the difference is that feature extraction adopts the method of transforming features, using forms similar to statistical physical quantities to replace features, while feature selection is to screen out the subfeature sets with physical and statistical significance from the original feature set. Both steps can achieve feature dimensionality reduction, redundant data cleaning, etc., leaving more meaningful and effective features, and at the same time showing the importance of these features for model building.

2.3. Analysis of Art Product Design Data. Art product texture mapping is the process of mapping texture pixels in texture space to pixels in screen space. The method of texture mapping has been widely used in three-dimensional graphics, especially for drawing realistic objects. For example, if we want to draw an object, we only need to apply the real photo of the object or the image texture we made ourselves to a structure consistent with the shape of the object. At the same time, texture mapping can ensure that when the polygon is transformed, the texture on the polygon will also change. When facing a huge shape, we can use this technology to put multiple texture images on the model. At this time, we need to use texture control technology to achieve the effect we want. On this basis, the roadway space topological relationship is established, and the method of modeling the roadway body and the roadway node separately is adopted. In order to achieve the effect of smooth transition at crossing roadways, a roadway arc interpolation processing algorithm is designed. The point cloud after noise reduction contains a lot of redundant data. The data can be simplified through unified sampling. These outliers have a common feature: they have high frequency, which will affect the later model optimization and rendering output. In order to avoid the above situation, the noise of outliers should be eliminated first. When we are faced with some complex and irregular geometry, or very large geometry, we can no longer directly put the picture on it, which will greatly reduce the authenticity of the model. This can reduce the amount of point cloud data and increase the speed of data analysis and modeling. It is best to check boundary when sampling to avoid loss of point cloud surface features during the sampling process, which will affect the modeling accuracy. When facing a responsible shape, we can also use this technology to zoom in and rotate the texture image. Figure 3 is the design framework of art products.

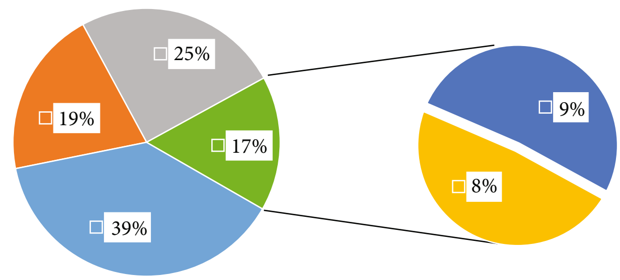

Figure 2: The pie chart of visualized system factors.

According to the spatial distribution of noise points in the point cloud, noise points can be divided into the following two types according to different states: the first is discrete points, which, as the name suggests, are scattered points far away from the main body of the point cloud. Finally, a polygon mesh is created through point cloud data encapsulation, and a new object is created in the model manager, which refers to data whose frequency of data changes is small or basically unchanged. The collection frequency for this type of data is low, or it is collected manually. The unit collection module is responsible for comprehensively collecting the production status data (operation status, spindle speed, tension, etc.) of the corresponding equipment and other parameters (power consumption, ambient temperature, and humidity) and other information, as well as preliminary data processing. Then, the unit acquisition module corresponding to each station equipment is transmitted through Modbus TCP protocol, and integrated processing is done by the central switch and connected to the upper computer server.

2.4. VR Model Weight Update. The foundation and core of virtual reality technology is virtual scene modeling technology. As the name suggests, virtual scene modeling technology is a method of building a model similar to the real

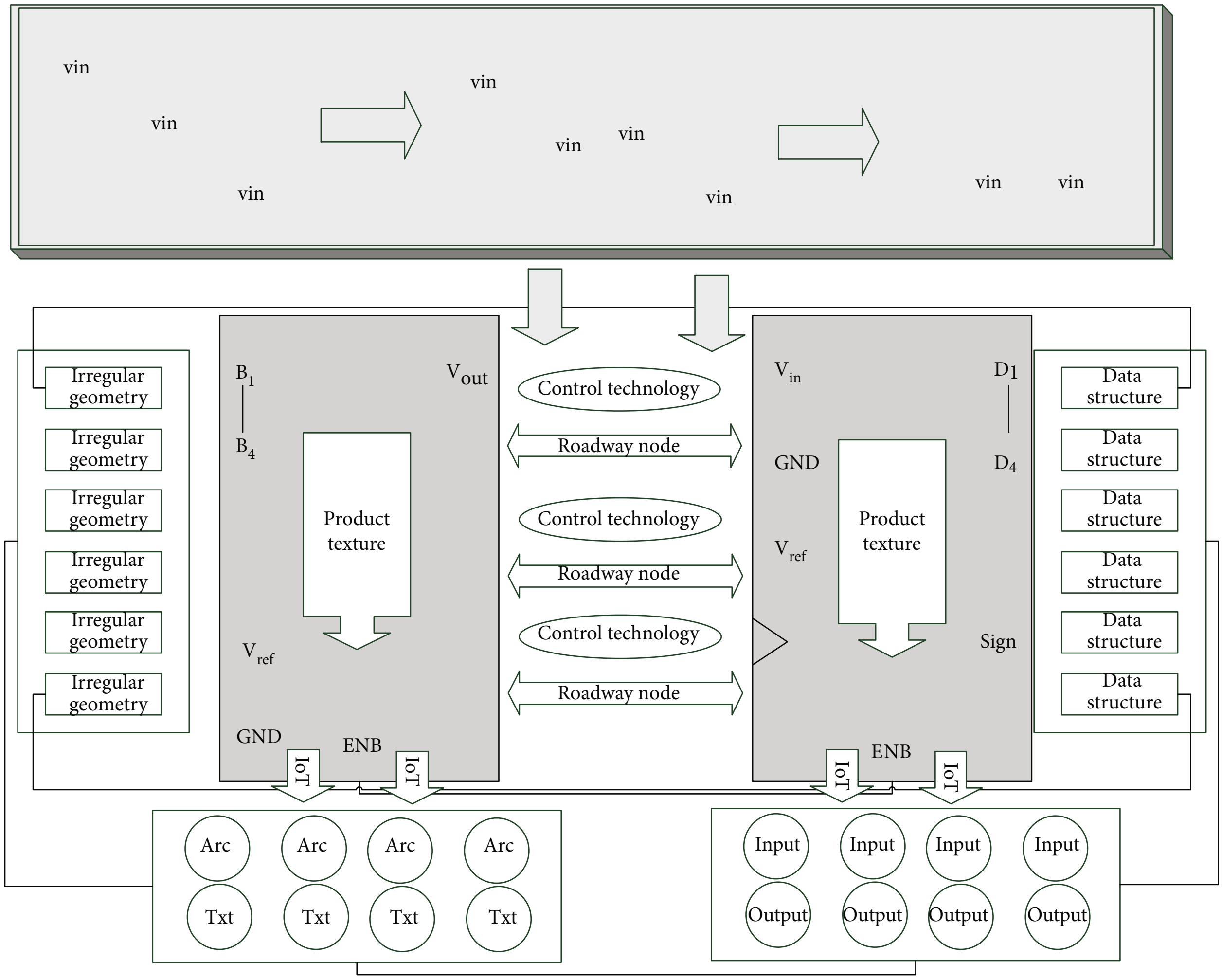

Figure 3: Art product design framework.

world. Virtual scene modeling technology mainly includes the following three methods: modeling technology based on graphics rendering, modeling technology based on image rendering, and modeling technology based on geometric graphics and mixed image rendering. The virtual scene realized by the geometric modeling method, because it adopts the geometric method, can design the scene relatively freely; of course, it can also realize the scene imagined by the developer. This layer includes local area network, mobile communication network, and Internet and is responsible for data access and network transmission. Data access completes the networking control and information collection of the information of the end nodes of the application and realizes the Internet of Things through various communication networks and the transmission network formed by the Internet of Things, such as the network provided by the mobile operator, or the Internet. The function of the transport layer is mainly undertaken by the sensor network, which is a network constructed by a large number of different types of sensor nodes. Image-based modeling and rendering technology completely abandons the previous rendering method of modeling first and then determining the light source; compared with modeling technology based on graphics rendering, this method does not need to establish a lighting model and a scene geometric model, and it does not need to be complicated, which reduce the difficulty of virtual scene modeling to a certain extent.

In animation 3ds max modeling, it mainly involves several aspects of polygon, subdivision, and spline curve modeling. During the animation modeling process, materials need to be used for lighting analysis, etc., and attention should be paid to avoid surface problems in the process of triangular mesh modeling. Figure 4 is the texture mapping value of the 3D modeling of the Internet of Things. Due to the large defects in the scan results of some plants, there is no way to repair them later and then update them in 3ds max (2018 version) or MAYA. The modules of the entire system are composed of two parts: a visualization module and a real-time interaction module. The visual design is divided into virtual art product structure design and modeling method design. Interactive design is divided into roaming design and art product library retrieval and navigation design. The roaming design is divided into three modules: animation display design, character roaming design, and camera roaming design. Therefore, the system can be divided into seven small modules, including virtual art product structure

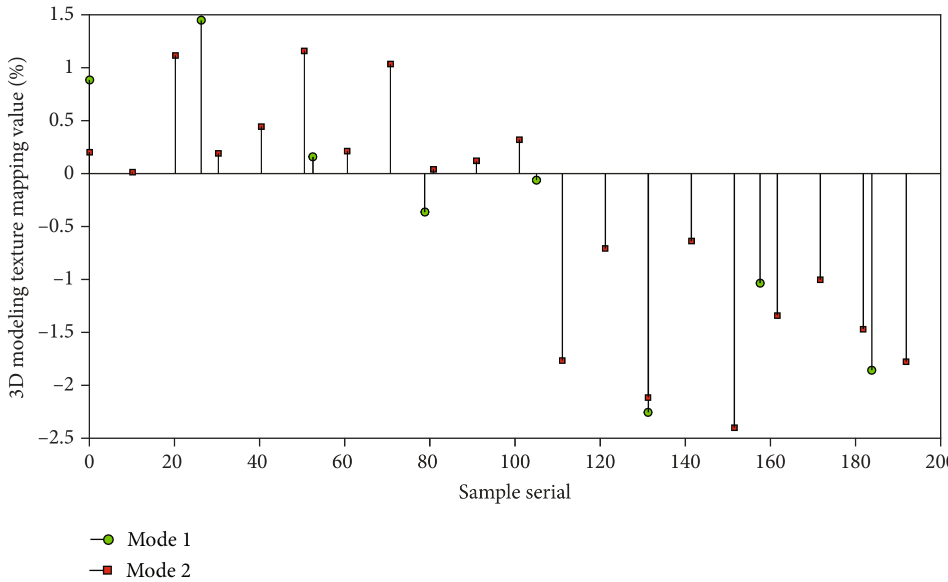

Figure 4: 3D modeling texture mapping value of the Internet of Things.

design, modeling method design, animation display design, character roaming design, camera roaming design, art product retrieval and navigation design, and background information update management design. Based on such a platform, the two parts are perfectly integrated. In the 3D modeling of virtual art products, it is divided into the 3D model and image technology. In the realization of the interactive module, the interactive function of the visual art product involves the integration of basic technology with other modules. The realization of the function is based on collision detection, simple interaction in VRML, script editing interface SAI, EAI interaction, and the interaction between JavaScript and VRML.

3. Results and Analysis

3.1. Data Collection of IoT Technology. The data acquisition system of the Internet of Things technology adopts the communication mode. The Modbus protocol is a message transmission protocol on the 7th application layer of the network system. As a standard communication protocol in the art field, it can connect different types of buses (star, ring, etc.) and network devices and provide them with a client/server. The data communication mode of Modbus protocol is Master/Slave. The master sends a data request through serial commands. After receiving the request and matching successfully, the slave sends a response to the master to respond to the request. The master station can directly modify the data of the slave station by sending instructions to realize two-way reading and writing. Secondly, software for collecting shutdown events based on .NET is designed, which cooperates with a data collection node to realize data collection for warp knitting machine shutdown events. Through this protocol, serial communication can be achieved between the art equipment and the controller. Figure 5 shows the data serial communication rate of the Internet of Things technology.

It can be seen that as the threshold increases, the number of point clouds after restoration becomes less and less, the threshold increases from 10 to 80, the number of remaining point clouds decreases, and the number of point clouds decreases by 86.53%, correspondingly. The thresholds are 10 and 80, respectively, and the time reduction is only 34.57%. Through the above processing, a simplified point cloud model can be obtained. The obtained streamlined point cloud model is imported to execute the precise surface command to enter the surface editing state, and the contour detection command is executed. The detection area is calculated by setting the curvature sensitivity and the minimum sensitivity partition. The editing command can be used to edit the detection and then extract the contour line to generate; you can also automatically generate the contour by detecting the curvature method, but the continuous surface object is automatically detected, the patch segmentation model is difficult to meet the requirements, and the contour editing process needs to be further carried out. The three-dimensional visual monitoring system integrates monitoring systems such as production monitoring systems, video monitoring systems, and personnel positioning systems. Each monitoring subsystem integrates broadband wireless technology and sensor technology, dynamically and real-time acquisition of underground information and data. The original data uploaded to each subsystem is filtered, analyzed, and sent to the spatial database server through information neural network integration. The integrated system performs data processing and sends early warning, decision-making information, and solutions.

3.2. Art Product Design Model Simulation. This article refers to the human-computer interaction interface (HMI) in the art control field and selects configuration software as the development platform for secondary development. Configuration software generally includes two basic parts, usually the upper computer/lower computer structure (also called

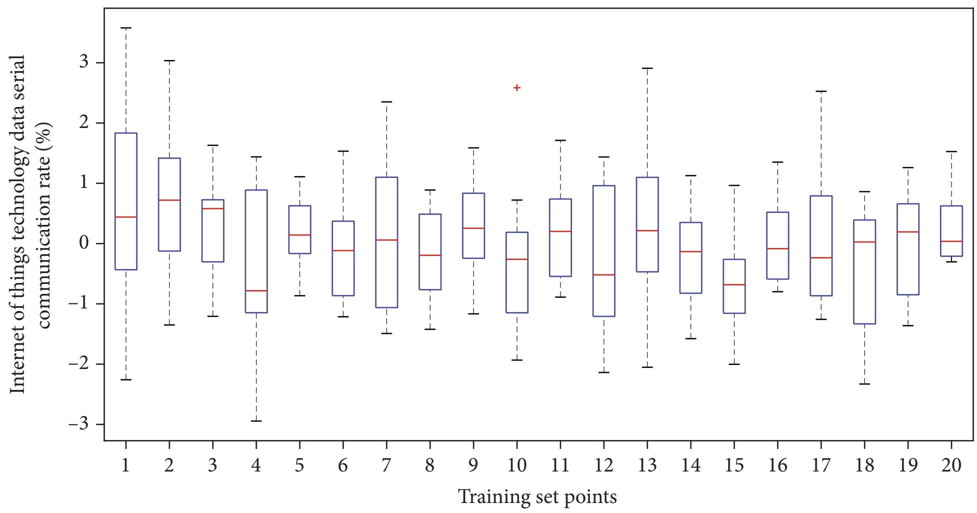

Figure 5: Serial communication rate of IoT technology data.

C/S structure, namely, client/server), the upper computer and the server as the main control unit, and HMI is the server side. In the HMI part, functions such as data display, equipment operation, historical data recording and query, report generation and printing, operation log recording and query, and alarm information display and query are completed. After simplifying the point cloud data, it is found that there are still two major problems of inadequate detail processing and point cloud noise. For this situation, the noise in the 3D point cloud data needs to be finely processed to eliminate outlier noise. For points that are difficult to distinguish and inconvenient to manually select, the isolation points and external noise reduction functions can be removed through Geomagic Studio software. In addition, the deviation can be automatically calculated after filtering by the model software. Then, we eliminate other confounding points fused with the correct point cloud, based on the literature as the premise, based on bilateral filtering and trilateral filtering, through the use of normal vector correction to eliminate small-scale noise, so that the depth data is converted into a grayscale image. The secondary bilateral filtering is then converted to depth data, which removes noise while retaining the integrity of the edge data. Figure 6 is the noise curve of the 3D point cloud data of the Internet of Things.

We input the generated file of VisualSFM, Meshlab can create a clean, high-resolution mesh containing texture through a series of operations and automatically calculate UV mapping and create texture image. By deleting the selected noise area, rebuilding the meshed surface, a closed model is generated, and the manifold edge is repaired to realize the visualization of the wheat ear shape. After completing the extraction of the dense and scattered point cloud data, the point cloud fitting is completed with the help of Geomagic software. The point cloud data does not need to be imported multiple times, just once. After receiving the data in the background and performing the unpacking, parsing, and storage procedures, it informs the front desk through the “server push” module. For asset management data, the data storage uses the Mediawiki service, and each device generates a separate wiki page. For the asset information query function, it requests the API interface of Mediawiki to obtain the asset detailed information in XML form, and the background program uses the SAX method to parse the obtained XML data. Table 1 is the analysis of XML data of the Internet of Things.

We record the actual total output and the planned completion ratio data on the monitoring and management software interface at regular intervals, record the current cloth length displayed on the industrial computer of the warp knitting machine, and calculate the planned completion ratio based on the planned output. In the actual application process of the system, we record the start time, end time, and the reason of a warp knitting machine shutdown and then compare with the data in the shutdown event record table in the workshop production database to analyze the accuracy of the data. In addition, we test whether the system will increase the authority to enter the reason for the shutdown by sending a short message prompt when the shutdown time exceeds 30 minutes. The message queue is used to realize the synchronization and communication between tasks, and the data acquisition program and data transmission program are analyzed and designed. The total output data displayed by the system and the current cloth length of the industrial computer increase over time. In each time period, the output displayed by the system is the same as the increase in the current cloth length of the industrial computer, indicating that the output data collected by the system is basically synchronized with the data of the industrial computer of the warp knitting machine. At the same time, the planned completion ratio of the system is also consistent with that of the industrial computer. The test result shows that the output data of the system has high real-time performance, which meets the needs of users.

3.3. Analysis of Experimental Results. In terms of hardware, it mainly includes data acquisition equipment, information transmission network, data storage and management

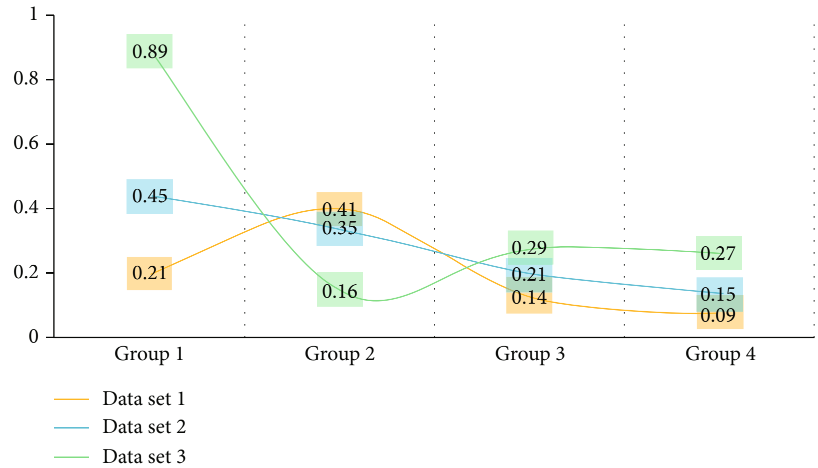

Figure 6: Noise curve of 3D point cloud data of Internet of Things.

Table 1: XML data analysis of the Internet of Things.

Index number	Name	Weight	Defaults
1	max_delta_step	0.21	0-1.2
2	colsample_bytree	0.37	5
3	min_child_weight	0.11	1-5
4	Subsample	0.09	0-8
5	Lambda	0.22	4

equipment, and data acquisition driver, for the front-end monitoring interface of CNC machine tool communication module, industrial control host computer, OPC service, and DNC software system at the production workshop site. The existing LAN in the workshop was used to extend the network to monitoring nodes such as equipment and workstations to form a data collection method for different interfaces and realize the data integration of equipment operating parameters of different manufacturers. In terms of software, Unity 3D is used as a virtual reality development platform to realize the creation of a three-dimensional virtual workshop, C group is used as the development language of the system, and the B/S structure (Browser/Server) is used as the system architecture. Introducing the idea of SPC into the intelligent monitoring of the status information of the production workshop and analyzing the stability of the equipment status during the production process can provide a certain reference for the equipment management of the production workshop. Figure 7 is the detection of the Internet of Things information transmission network.

When the user enters the time range that needs to be queried on the client, the intelligent monitoring system of the production workshop will call the Web Service provided by the MES system and send the query time range to the MES system in the form of XML. The efficiency of equipment affects the production efficiency of the workshop. Therefore, it is necessary to monitor and analyze the efficiency of the equipment to improve the production efficiency of the workshop and reduce the production cost. There are many ways to analyze equipment effectiveness. The most common method currently used is to analyze overall equipment effectiveness (OEE). After receiving the request, the MES system queries the database according to the time range and returns the query results in the form of XML. Due to the limited processing capacity of the acquisition I/O station, the data published to the message agent does not have a time stamp attribute. Therefore, after subscribing to the temperature and humidity data in the background of the system, the first thing to do is to add a time stamp label to the data. The intelligent monitoring system of the production workshop parses the returned results and displays them on the web page. There is no abnormality in the mean-standard deviation control chart, indicating that the equipment state is under statistical control.

Figure 8 is the accuracy rate of the information parameter analysis of the Internet of Things. After the data is accessed by the background, after parsing, unpacking, and storage, the server push module pushes the pushlet message to notify the front desk of the updated data type and room. The front desk parses the parameters in the pushlet message to know the page and function that should be updated. By calling the predefined interface, the corresponding data can be obtained from the back-end database, and the data can be displayed on the interface using visual components. The creation of the 3D virtual workshop achieves the static consistency with the real production vehicle. In order to achieve dynamic consistency with the real production workshop, it is necessary to introduce real-time data into the virtual environment and drive the data of the three-dimensional model, so that the three-dimensional virtual workshop and the real production workshop can be dynamically mapped. First, the target is determined according to the actual needs and production process; secondly, the characteristics of the collected data are analyzed, and preprocessing such as cleaning is completed to improve the data. Each submonitoring system has many types and complex methods. Interface design should be used to realize seamless connection and data interaction between the sub-system and the art product spatial database server through the interface design and the operation law and cycle of each subbusiness system. The business data is synchronized to the space server, and the functions of

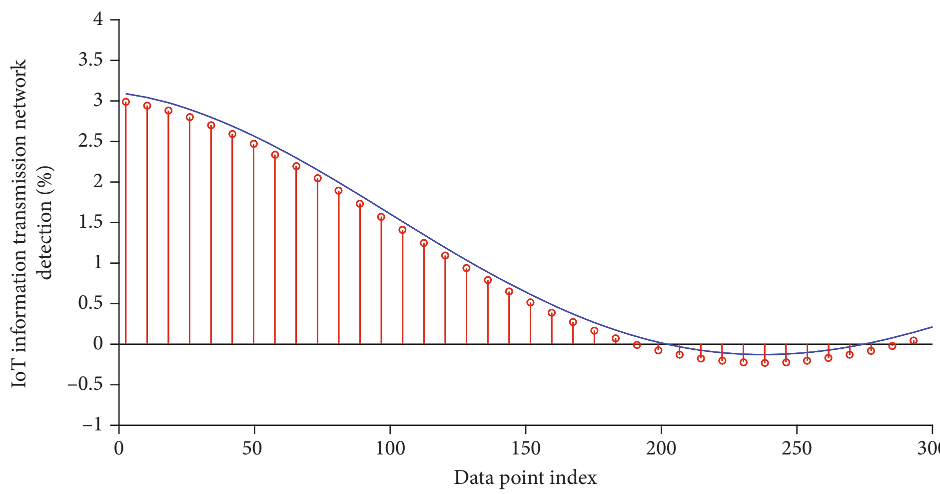

Figure 7: Internet of Things information transmission network detection.

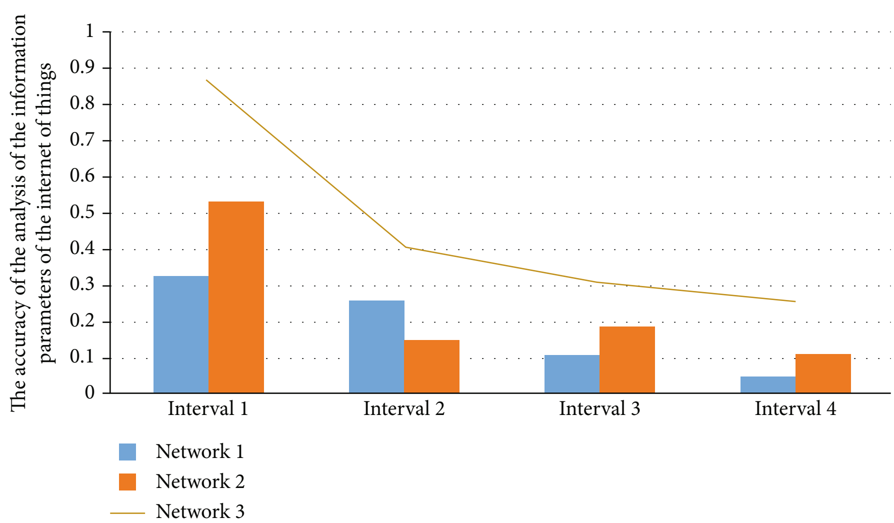

Figure 8: The accuracy of the analysis of the information parameters of the Internet of Things.

statistical analysis and display are realized in the 3D monitoring system of art products. Database connection, Json format data, Web Service, and other multitechnology combination methods can be used to establish a data interaction interface between each business subsystem and the art product spatial database. Through the data access to the subsystem, the output and equipment of the art product can be achieved.

4. Conclusion

This subject takes the creation of 3D shapes of art products and the creation of virtual scenes for Internet of Things design and immersive interactive roaming applications as the research goals. Based on the 3D point cloud modeling of art products and the analysis of the growth scene structure, the 3D point cloud data is used to reconstruct different design measures; in terms of modeling of the VR environment, the existing 3D modeling software has insufficient performance capabilities. It is proposed to use a 3D laser scanner to obtain a point cloud model combined with the Unity 3D engine. At the same time, using the interaction of art product design knowledge and IoT meteorological data, the dynamic loading principle and interaction trigger of data-driven and art product design knowledge are explained, and the models appearing in the scene creation process are explained. Rendering optimization has been done for display issues. In order to solve the dependence of traditional human-computer interaction on the mouse and keyboard, this article uses somatosensory interaction instead of traditional human-computer interaction and uses the combination of virtual handle and Unity engine to achieve interaction with the virtual scene; finally, in order to further enhance the immersive roaming effect, the roaming vision is synchronized with the rotation of the human head (developed by steam VR software) to realize the full-scale immersive roaming of the human body in the three-dimensional scene. Through the use of point cloud data denoising, streamlining, higher-quality reconstructions can be achieved and more realistic visualization effects can be obtained.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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