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Computer Graphics Modeling and 3D Printing Technology

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Abstract: Nowadays, with the development of science and technology, people's production methods are also undergoing tremendous changes, especially in the manufacturing industry, advanced computer graphics modeling and 3D printing technology can complete the seamless connection of the whole process from research and development to production, and the changes in manufacturing are obvious. The computer is used to digitally model the size, specification, performance, etc. of the product, and adjust the data drawing parameters at will to achieve the real browsing effect, and finally achieve "visible and obtainable". 3D printing can input computer graphics modeling files into a 3D printing device, and after further assembly and assembly, the final product is obtained. Computer graphics modeling and 3D printing technology have become an important production mode in the information age.

Keywords: Computer graphics modeling; 3D printing technology; Apply

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Introduction:

Computer graphics modeling technology is a complex object manufacturing method with wide application prospects, which has been widely used in recent years. As an emerging high-tech technology, 3D printing technology has been widely used in various fields of society because of its superiority in the manufacturing process. The organic combination of computer graphics modeling and 3D printing technology can intuitively test, modify and inspect the whole process of designing products, and can effectively lock the design link, improve R&D efficiency, and make products go to market faster.

1. The relevant overview of computer graphics modeling and 3D printing technology

1.1 Computer graphics modeling

Computer graphics modeling is the presentation of a three-dimensional model of a design by computer or video, and the objects to be displayed can be virtual or real in real life. There are three main modeling methods: instrumental measurement modeling, video or image modeling, and 3D software modeling. At present, the commonly used modeling software on the market is Autodesk3dsMax, UG, AutoCAD, etc. What they all have in common is that they all construct geometric scenes by translating, rotating, and boolean operations on geometric elements such as spheres, cubes, and cuboids.

1.2 3D printing technology

3D printing technology, that is, additive manufacturing technology, is a technology that uses a three-dimensional printer to quickly manufacture and mold a three-dimensional model based on the design. Powdered plastics, nylon, food, metals, resins, gypsum, and other adhesive materials can be processed and processed, and the physical object can be constructed using layer-by-layer printing technology. 3D printing technology is very precise, the thinnest layer that can be printed is only 0.025 mm, which can print high-quality products even on low-quality 3D printers. This computerized digital manufacturing method can produce the relevant parts directly without the need for very complex processes, large factories, or large numbers of people. At present, 3D printing technology has been widely used in aviation, mold, industry, jewelry, automotive military and other industries [1].

3D printing technology can generate models that meet the designer's needs for shape, color, etc., and can also design complex internal structures according to the designer's needs. Design and printing are the two major links of 3D printing technology, designers can use 3D modeling software or 3D scanner to design 3D models, according to a certain axis to divide the 3D model into multiple sections, and then multi-layer printing, so as to build a stable and reliable solid model. From a design point of view, 3D printing technology can make the designer's imagination, creativity and spatial thinking ability be fully exerted, better express the three-dimensional graphic model, designers can have a deeper understanding of the model, quickly master and learn three-dimensional geometry, but also improve the efficiency of research.

2. The application of computer graphics modeling and 3D printing technology

2.1 Mathematics teaching

In recent years, some scholars have proposed to apply 3D printing technology to the teaching of advanced mathematics to teach more specifically. The application of 3D printing technology to geometry teaching is a new teaching method, which can make the teaching process more intuitive and concrete. For example, the International Research Center for Theoretical Physics in Italy applies 3D printing technology to mathematics classrooms, printing three-dimensional modeling of equivalent surfaces and sending them to students, so that students have a more intuitive understanding and understanding of what they have learned. The application of 3D printing technology to the teaching of advanced mathematics can allow students to have more understanding of the knowledge they have learned, help stimulate students' interest in learning, strengthen students' intuitive feelings, prompt students to solve problems by themselves, and improve students' spatial thinking ability, problem-solving ability and creative ability.

2.2 Industrial design

It makes great sense to combine computer graphics modeling with 3D printing technology to aid industrial design. Computer-aided industrial design can provide design models for 3D printing technology, while the realization of industrial design virtual products needs to be completed through 3D printing technology. The organic combination of the two will change the process and method of industrial design, and the organic combination of the two can play a better role in industrial design.

Take the design of the mascot, for example. In terms of 3D model manufacturing, using McNeel's self-developed Rhinoceros software, the mascot body is modeled with the help of the polygon modeling plug-in T-spline, first constructing the body part, and then editing in the Rhinoceros software through the transformation of polygons to NURBS surfaces, and finally completing the manufacture of the mascot data model. This method can output the model data in STL format, which is convenient for importing into a computer program connected to a 3D printer. After setting the position, size and other parameters, the printer issues commands, prints it layer by layer, and finally after simple cleaning and trimming, you can get a complete 3D printed model.

2.3 Spine correction surgery

At present, the clinical spinal deformity surgery method based on pedicle fixation is no longer applicable and is gradually being eliminated, while modern imaging technology, reverse engineering principle, computer three-dimensional reconstruction and rapid prototyping technology have become the research hotspot of spinal correction surgery, which can construct a new spinal pedicle nail navigation template to lay the foundation for clinical application. The use of computer graphics modeling to assist in spinal correction surgery has irreplaceable advantages. The use of computer graphics modeling and 3D printing technology to assist in the treatment of spinal deformities has the following advantages:

First, the use of computer graphics modeling and three-dimensional printing technology can reconstruct the three-dimensional shape of each vertebrae, which is helpful to observe it from multiple angles. Second, models reconstructed using 3D bone reconstruction software can be imported into 3DS, CAD, MAX, or other image processing software. The processed image processing provides precise position, angle, depth and other parameters to provide a reliable basis for subsequent corrective surgery and ensure the success of the first nail placement. Third, computer simulation technology can be used to accurately measure scoliosis, and correct it, and design a suitable orthopedic scheme according to the physiological curvature of the human body to extend the operation time and reduce the surgical error. Fourth, compared to the existing direct printing of spinal models, the nail placement template can be designed with the help of a computer to accurately find the position of the nail point, while also saving a lot of material. This method takes the surgical model as the reference point, which can provide a reference point for physicians to visually observe nail points, reduce the visual error of physicians, and make it a tool to assist surgery [2].

Through the research, the three-dimensional reconstruction technology will be further improved, and provide reliable technical support for the development of pedicle screw insertion technology. With the help of computer graphics modeling and

3D printing technology, it can not only provide doctors with intuitive 3D models and information, but also improve the effect of clinical treatment, thereby improving the overall medical quality of the hospital. Through three-dimensional reconstruction and three-dimensional finite element, the stress status of various parts of the spine and the stress status of the fixator are studied, which provides technical support for the development of a new pedicle fixator. This method can not only be used for material research and development, but also through reverse engineering to achieve precise nail access and complete the production of personalized pedicle navigation template, which reduces the risk of spinal correction surgery and improves the accuracy of pedicle nailing.

Concluding remarks

In summary, with the development of computer graphics modeling and 3D printing technology, the manufacturing cost of 3D printing technology is constantly decreasing, but the manufacturing accuracy is constantly improving, making up for the shortcomings of the traditional printing industry and promoting the development of the printing industry. In recent years, computer graphics modeling and 3D printing technology are developing rapidly, and are widely used in mathematics teaching, industrial design and spinal correction surgery, etc., promoting continuous progress in related fields. With the rapid development of science and technology, researchers in various fields are also continuing to study it, computer graphics modeling and 3D printing technology will be used in more fields, thereby promoting the continuous improvement of social productivity.

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