Research on the Application of Computer-Aided Industrial Design and 3D Printing Technology: A Comprehensive Perspective Analysis

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Abstract: With the continuous development and popularization of computer-aided industrial design technology and 3D printing technology, the integration of the two is also receiving more and more attention. Starting from the basic principles and development history of computer-aided industrial design technology and 3D printing technology, this paper introduces the advantages and current situation of the integration of the two, and focuses on exploring the integration of computer-aided industrial design and 3D printing technology in product design, process analysis, and manufacturing process optimization. Finally, the development trend and future prospects of integration application are summarized.

Keywords: Computer-aided industrial design; 3D printing technology; integration application; product design; process analysis; manufacturing process optimization

1. INTRODUCTION

Computer aided industrial design technology and 3D printing technology are widely used high-tech tools in today's industry. Their application can greatly improve the efficiency and quality of industrial design and provide strong support for the rapid development of manufacturing industry. With the continuous progress of computer technology and manufacturing technology, computer-aided industrial design technology and 3D printing technology are also developing and improving, and the integration application of the two is also receiving more and more attention.

This paper mainly discusses the integrated application of computer-aided industrial design technology and 3D printing technology, focuses on the application of the two in product design, process analysis and manufacturing process optimization, and analyzes the development trend and future prospects of the integrated application, with a view to providing reference and reference for researchers and engineers in related fields.

Computer-Aided Industrial Design (CAI) technology is a method of applying computer technology to industrial design. It includes Computer-Aided Design (CAD for short), which is an industrial design technology based on computer-aided design. It uses computers to carry out product design, drawing, editing, storage and transmission. CAD technology can quickly complete the formulation of design schemes, improve design efficiency and accuracy, and at the same time can easily modify and adjust design schemes, saving time and cost.

CAE technology is an engineering design technology based on computer-aided analysis. It uses computer simulation analysis tools to carry out engineering design and analysis. CAE technology can analyze products in mechanics, thermodynamics, hydrodynamics and other aspects, so as to improve the reliability and safety of products.

CAM technology is an industrial design technology based on computer-aided manufacturing. It uses computers to manufacture and process products. CAM technology can quickly and accurately generate processing programs, improve manufacturing efficiency and quality.

2. THE PROPOSED METHODOLOGY

2.1 Fusion application in industrial design

In industrial design, the integrated application of CAD, CAE and CAM technology can realize the seamless connection of design, analysis and manufacturing, thus improving the design efficiency and quality of products. At the same time, through the integration and application of 3D printing technology, the design scheme can be quickly converted into a solid model to achieve rapid verification and optimization.

For example, in automobile design, engineers can use CAD software to design the appearance and structure of automobiles, and use CAE software to conduct mechanical analysis and simulation, and finally use CAM software to convert the design scheme into manufacturing procedures. At the same time, 3D printing technology can be used to rapidly manufacture solid models of automobile parts for use in design verification and improvement.

In addition, in industrial design, 3D printing technology can realize rapid prototype manufacturing and small batch production, thus shortening the product development cycle and production cycle. For example, in the development of new products, designers can use CAD software to develop product design schemes, then use 3D printing technology to manufacture solid models for verification and improvement, and finally convert the design schemes into manufacturing procedures for mass production.

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2.2 Fusion application in 3D printing technology

The integration and application of industrial design and 3D printing technology requires a deep intersection of computer technology and manufacturing technology, which requires designers to have broader knowledge and skills, which puts forward higher requirements for talent training and education.

1) Secondly, data integration and sharing in fusion applications is also an important issue. Because industrial design and 3D printing technology usually involve different software and file formats, it is necessary to develop corresponding data interfaces and standards to achieve seamless data conversion and sharing. CAD into intelligent CAD is shown below.
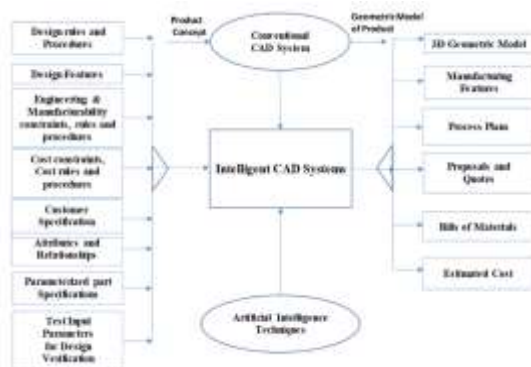

Fig. 1. CAD into intelligent CAD (image from Internet)

2) Finally, the manufacturing technology in the fusion application also needs to be continuously developed and improved. At present, there are still some limitations and limitations in the material, precision and speed of 3D printing technology, which need further research and improvement.

In short, the integrated application of computer-aided industrial design and 3D printing technology is a promising technology, which can improve the efficiency and quality of industrial design, and also expand the application field and scope of 3D printing technology. However, in practice, we need to overcome some problems and challenges in technology and management to achieve good results of integrated application.

3. CONCLUSION

This paper analyzes the integration and application of computer aided industrial design and 3D printing technology, focusing on its technical characteristics, application advantages, integration methods, existing problems and challenges. Based on the research and practice at home and abroad, the following conclusions are drawn: First, the integrated application of computer-aided industrial design and 3D printing technology can improve the design efficiency and quality, shorten the product development cycle and production

cycle, and also expand the application field and scope of 3D printing technology. This integrated application has been widely used in many industries, including automotive, aerospace, medical, education and other fields. The integration and application of industrial design and 3D printing technology requires a deep intersection of computer technology and manufacturing technology, and requires designers to have broader knowledge and skills. Data integration and sharing in fusion applications is also an important issue, and corresponding data interfaces and standards need to be developed to achieve seamless data conversion and sharing. The manufacturing technology in the fusion application also needs to be continuously developed and improved.

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