Construction of Digital Model of Auto Parts Based On 3D Printing Technology

Cenglin Yao1,*

1Wuhan Business University, Wuhan, Hubei, China, 430056

*Corresponding author e-mail: 2428788@wbu.edu.cn

Abstract. Made in China 2025 I energy saving and new energy vehicles put forward higher requirements on connection technology from the aspects of better quality and efficiency in body manufacturing. With the development of Industry 4.0, China's automobile industry and the world's automobile manufacturing industry have gone through roughly four similar stages. With the acceleration of transformation and restructuring, the development of energy-saving and new-energy vehicles is an important way to solve energy and environmental problems. Automobile products have been transformed to lightweight, production and manufacturing methods have been transformed to mass customization, new energy technologies have been developing at a faster pace, and automobile manufacturing has become increasingly digitalized and modular. Combined with this new situation, this paper expounds the application status of 3D printing technology in China's automobile industry in detail, and makes a brief analysis and prospect of its prospect[1].

Keywords: 3D Printing, Car, Parts

1. Introduction

In the 21st century, China's automobile industry has been developing rapidly. With the increase of market ownership and the market approaching saturation state, the competition in the automobile industry has become more and more fierce, and the development mode of automobile manufacturers has also begun to change and gradually developed towards the direction of subdivision mode. In such a competitive situation, auto makers from many aspects, such as research and development, design, production comprehensive elaboration.

3D printing technology is a recently developed technology. It is characterized by high efficiency and rapid. There are two aspects in the automobile industry: The first is the research and development in the automobile research and development department; The second aspect is the maintenance in the automobile after-sales department. In the research and development stage of new auto products, some auto parts should be redesigned according to the requirements of new products. The traditional way of producing auto parts is to develop sample molds first, and then mass production according to samples. This traditional production mode has many problems, such as multi-stage trial production, long cycle and high r&d cost. In the after-sales maintenance of cars, some high-end cars and imported cars are confronted with a series of problems. At the same time, some old models that have stopped
production are unable to be replaced due to the discontinued parts. The application of 3D printing technology can perfectly deal with all the above problems, which is bound to play an important role in the development of the automobile industry [2].

2. Base wood concept for 3D printing technology

2.1. printing technology

3D printing technology is different from traditional processing, which is based on material reduction processing and mold processing. 3D printing is a rapid prototyping processing method by adding materials [3]. The printing processing method saves more raw materials and time and cost than the cutting material processing method and mold processing method. The main core technologies are shown in the following table 1:

| modeling technology | 3D modeling is the operation of 3D software on a computer to design new products, including their shape, structure, color and so on |
|---------------------|-------------------------------------------------------------------------------------------------------------|
| scanning technology | Scanning and collecting objects, using a series of tools such as computer vision and graphics to obtain accurate modeling data |
| printing molding technology | On the basis of model data, the object material is printed layer by layer by printer, and finally formed. |

The first two technologies are used for modeling and scanning to obtain the modeling data in the early stage of the object. The computer storage format of the data is STL format. STL format is a standard file format in CAD/CAM. The third technique is to use the modeling data obtained from the first two techniques to print the object.

2.2. The basic principle

The main idea of 3D printing is to discrete the object first and then accumulate the object. Firstly, we carry out data modeling for the parts, secondly, the model is segmented by computer software, and then the contour shape of each section of the object is obtained. Finally, the printer prints the object material layer by layer and finally forms the object. This is the basic principle of printing. In the process, there are many ways to print. Different materials and different production have different forming principles and requirements, which is the use and research content of printing technology in automobile manufacturing production and maintenance. Figure 1 shows the basic process of object printing and forming [4].

![Figure 1. The basic process of object printing and forming.](image)

3. Data modeling

The most basic part of 3D printing is 3D data modeling. The methods to establish 3D digital models include computer software and object scanning and forming. Through computer 3D software to complete the design content of the car. Usually, computer software includes AutoCAD, etc., and each industry has its own software. The industry-specific computer software used in the automobile industry is CATIA, which is set as the industry standard software in the European automobile
industry. Scanning technology can also help auto repair departments to model the data of parts and produce simple parts. After the model is established, the model can also be beautified. For example, the design department combines various data analysis requirements to beautify the appearance of the car dashboard and modify the good-looking dashboard. Once you have the model, you can print it.

The core technology of 3D printing is slice processing technology. The so-called slice technology is to cut the digital model into two dimensional plane along a certain axis and then obtain continuous two dimensional plane data. Printing technology is to process the plane and continuously process each section according to the processing technology of each plane. According to the analysis, slice processing technology is an important part in the printing molding process. Each layered slice is strictly controlled to ensure the overall quality of each product.

4. Related application cases

In the automotive industry, 3D printing technology has a good development prospect. Printing technology can well solve a series of problems such as the shortage of spare parts for high-end cars and imported cars. Some of the old models that have stopped production also have problems such as failure to replace the spare parts due to the suspension of production. The following article will focus on how 3D printing technology is applied in the automotive industry.

4.1. Data modeling

There are two ways to obtain 3D models of auto parts: one is from manufacturers; Second, it can be obtained by scanning real objects. Auto repair factory it difficult to get digital model directly from the car manufacturers, so the automobile repair factory generally take the second way a scanning object. Currently, there are two mainstream 3D scanners in the market: contact scanning and non-contact scanning. There are two non-contact scanning methods: one is raster scanning or photo scanning, and the other is laser scanning. Further subdivision, the picture scan has white or blue light scanning, laser scanning is divided into point laser, line laser.

4.2. The data to print

Automotive rearview mirrors are generally made of polymer ABS materials, because the requirements of rearview mirrors on materials, accuracy and surface roughness are not high. Therefore, according to the requirements in the design process of this paper, the first choice is to print the car rearview mirror by FDM printing molding method. According to the cost-performance advantage of the product, the model of Guangzhou Netenergy Product Design Co., Ltd. is fDM50-50503DFDM printer.

ABS 3D printer has the characteristics of high precision, high efficiency and low cost. More importantly, the products formed after 3D printing can not be used directly, but also need a series of processing such as polishing and painting, which is the same as the traditional production and processing methods.

5. Conclusion

3D printing technology can be proficiently applied in the manufacturing of auto parts. In addition, the application scenarios of emerging printing technologies are far more than these, such as automobile structure design, appearance modeling design and other automobile design. At present, there are few literatures and researches on the application of 3D printing technology in these aspects. This blank field needs to be filled and explored in large quantities, which will undoubtedly be of great help to the development of the automobile manufacturing industry in the future.

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