Application of Computer Mechanical Drawing Technology in Mechanical Engineering Manufacturing Parts Design

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Abstract. At present, many CAD software products can not fully meet the requirements of the national standard "technical drawing and mechanical drawing", which greatly affects the quality and speed of engineering design. The purpose of this research is to develop a computer aided instruction system for mechanical drawing major of mechanical engineering department. This system is one of the attempts of the Department of mechanical engineering to develop a complete set of CAI system. A new multi-level structured manufacturing reuse model is proposed, which can obtain the abstract information, topological information and processing semantic information involved in manufacturing reuse. Firstly, machining features are identified from MBD model. Then, the clustering of coupled machining features is introduced to construct the structural elements whose granularity is larger than that of machining features. Finally, the MBD model is established through the hierarchical reorganization of machining features and the clustering of coupled machining features. The results show that the highest efficiency of JDBC is 31%, and the lowest portability of ASP is 20%.

Keywords: Computer, Mechanical Drawing Technology, Mechanical Engineering, Parts Manufacturing

1. Introduction
With the continuous progress of Internet technology, computer technology has become an indispensable part of our life. In the field of computer vision and graphics, an active research topic is to develop the algorithm of reconstructing surface from line graph. Many algorithms have been used to solve this problem, but when the geometric structure of curved objects becomes complex, these algorithms can not solve this problem.

With the development of network technology, many experts have studied the application of mechanical drawing technology in mechanical engineering. For example, some domestic teams have studied the establishment and secondary development of engineering drawing model library, which is stored in CD-ROM in the form of text and image. Through VB program initialization program code, learners can learn in turn. The teaching materials are arranged with the method of constructive learning, and the learning units are planned with vertical and horizontal thinking. Kolmogorov smimov single sample test was used to evaluate and questionnaire survey was conducted among students in each course unit. To explore whether mastering basic drawing skills and manual skills...
(technology and machinery) can help students to use computer drawing. The existing drawing types and design analysis are discussed. The use of CAD in the design process was also reviewed. This paper presents a new method for reconstructing 3D objects with complex surfaces from 2D line images. The influence of CAD on design modification, standardization, coordination and integration of design and production is studied. The analysis results are compared with the benefits of CAD, which provides inspiration for the further study of the use and management of CAD. Some experts have studied the experimental teaching design of mechanical drawing and computer drawing, using percentage descriptive statistics and multiple regression analysis methods to analyze the collected data. Emphasis is placed on the development of 3D geometric computer models and the application of digital databases at all stages of the design process. This paper introduces the results of a case study, aiming to understand the impact of CAI on learning effect in classroom environment. The effects of CAI on different cognitive levels of individual learners are evaluated. The manufacturing process of concave rectangular heat exchange tube of EGR cooler was studied by numerical simulation and experiment. Based on the numerical analysis method and the conservation principle of net heat exchange area, a new type of heat exchange tube is designed and improved. The formability of tubesheet was evaluated by forming limit curve under plastic instability. The forming limit curve based on strain and stress ensures the independence of strain path. A new method is proposed to optimize the geometric parameters, blank holder pressure, friction coefficient and other process parameters of the spring seat circular parts, and the optimization problem is proposed with the objective of optimizing the tensile load [2]. Some experts have studied the teaching technology of 3D mechanical drawing, using genetic algorithm as an optimization tool to optimize the drawing load and process parameters. The optimization results are verified by the finite element analysis simulation software fast form advanced. Combining descriptive geometry, mathematics and computer, a new geometric calculation method is proposed. Firstly, the geometric elements of general position are transformed into special position system in the new coordinate system. Then, the 3D problem is projected into a new coordinate system. According to the two-dimensional / three-dimensional correspondence principle in descriptive geometry, the solution is to use a ruler and a ruler to form a computer drawing process compass. In order to make this method a routine operation, it is necessary to establish a two-level mode. The basic layer is a set algebra wrapper function, which contains about five basic geometric functions (PGF) and a projection transformation. In the application layer, the appropriate coordinate system is established to find a series of PGF. This paper introduces the characteristics of modern engineering graphics course. According to these characteristics, choose reasonable teaching methods, set teaching content and class hours based on AutoCAD. Using the computer program based on the finite element method to simulate the plastic machining process can carry out more extensive analysis. In this paper, the multi-stage drawing process modeling software drawing2d is used for theoretical research. Through experimental verification, many problems in the process of high carbon steel drawing are comprehensively analyzed. Through the classification of parametric drawing strategy, this paper introduces the parametric drawing technology of TFE. The drawing process of thin film evaporator part drawing, printing of parametric parts and drawing strategy of assembly drawing are introduced in detail through examples [3]. Although the application of mechanical drawing technology in mechanical engineering has achieved a lot, there are still some deficiencies in the application of computer mechanical drawing technology in mechanical engineering manufacturing parts design.

In order to study the application of computer mechanical drawing technology in mechanical engineering manufacturing parts design, through the research of computer vision technology and mechanical drawing technology, the statistical characteristics of quality data are found. The results show that the computer mechanical drawing technology is conducive to the design of mechanical engineering manufacturing parts.

2. Method
2.1 Computer Vision Technology

(1) Computer vision technology

Computer vision can replace human vision in target tracking, robot guidance and other aspects of detection, especially in the case of the need to repeatedly and quickly obtain accurate information from the image [4]. Computer vision detection is a non-contact detection method based on computer vision, which uses image processing measurement and pattern recognition technology [5]. The principle of this method is to analyze the image of the measured object obtained by the computer vision system, obtain the required measurement information, and judge whether the measured object is standard according to the existing prior knowledge [6].

(2) View graphics error detection technology

The most common error in students' homework is the view graphics error [7]. For example: lack of necessary drawing line in part view; drawing redundant drawing line without drawing line; although the corresponding position data of drawing line is correct, the line type and line width of drawing line are incorrect, improper position selection between views or wrong rotation pattern can also be summarized as view error [8]. If students do not have a good grasp of the perspective projection relationship, or do not have a good understanding of the common views of mechanical parts drawing, it is easy to make such mistakes [9].

2.2 Mechanical Drawing Technology

(1) The design of parts in mechanical drawing

Through the analysis of parts, we can determine how to establish the characteristics of parts, which is conducive to the future development planning [10]. After the 3D model of the part is established, the 3D model is processed by rendering technology, which makes the appearance of the part model more realistic [11]. The data information of the system mainly includes two parts. The first part is the basic information of the part, including the name of the part model, the name of the part thumbnail, the name of the picture of the part representation scheme, the basic shape and dimension of the part, such as the length, width and height. This requires the name of three parts as one; The second part is the specific dimension data in the part structure. After the zero dimension is completed, the dimension information of the corresponding parts needs to be retrieved successfully from the database for the subsequent work [12].

(2) Mechanical 3D drawing

There are many kinds of 3D solid modeling software. Solid modeling generates three views and three sections. You can draw high-quality renderings, surface features, shadows, and background features to show real colors, materials, and shapes. CAXA solid modeling software can make the project form a realistic solid model. In the concrete demonstration, the solid can rotate in any direction and cut any section, and the structure of each part of the object can be clearly observed. Because the model is fully parametric and controllable, the drawing changes automatically with the model. With this function, a solution of drawing engineering drawing can be put forward, and the drawing of engineering drawing can be completed quickly, which greatly improves the efficiency of designers. Generally speaking, the main view is the core of a set of drawings. Select the home view to consider the projection direction and location of the home view. The projection direction should reflect the shape features of parts as much as possible, and select the direction with more structural shapes. The selection position is, generally select the machining position or working position for easy understanding.

2.3 Statistical Characteristics of Quality Data

There are two common statistical characteristics of quality data: one is the characteristics of data set, such as average value, median value, etc.; the other is the characteristic value of discrete data, such as interval, standard deviation, etc., as shown in formula (1)
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\[ \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \]  

(1)

The range R reflects the degree of data dispersion. Although the calculation is simple, it is not accurate enough. Therefore, in the case of high calculation accuracy, the standard deviation should be used to express the degree of data dispersion, as shown in formula (2)

\[ s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} \]  

(2)

Although there are many kinds of control charts in form, ±3σ the idea of their control boundary algorithm is in a continuous line. The general calculation formula (3-4) is as follows:

\[ UCL = E(X) + 3D(X) \]  

(3)

\[ LCL = E(X) - 3D(X) \]  

(4)

3. Experience

3.1 Extraction of Experimental Objects
It is difficult to automatically generate complex parts model by pro/toolkit program, and it is impossible to realize it, such as variable cross-section scanning, mixed scanning and other advanced functions. The 3D model is generated by interaction. Then, based on the part 3D model, according to the design requirements of the part, the shape and size of a group of 3D models are comprehensively controlled. The program program the design parameters of parts, and realize the functions of searching, modifying design parameters and generating new 3D models according to new parameters. When you draw, constraints are applied automatically. For example, if you display horizontal or vertical symbols when you create a line, the associated constraints are applied. Depending on the precision of the sketch, one or more constraints may be required to fix the shape or position of the sketch. The first feature created in the part is the base feature. The basic features are usually based on sketch profiles and represent the most basic shapes in the part.

3.2 Experimental Analysis
In order to maximize the reusability of functional modules, according to the basic ideas of structural programming and object-oriented programming, this paper puts forward further requirements for the access and encapsulation of each functional module: 1. Design single input single output module as far as possible. Each module only provides the interface function of external access and call; in principle, the internal processing and implementation function of the module does not allow external direct intervention. The return of module processing results is also realized through this separate interface. Each functional module transmits data by defining a series of external data structures, and the control domain of each module will not exceed the module itself. In this way, the independence of each functional module can be guaranteed to the maximum extent, and favorable conditions can be created for the independent design and debugging of the module program. 2. Independent debugging and incremental debugging. The error in algorithm design and program design can only be located and solved by repeated program debugging. Drawing correction software contains many functional modules, which brings great difficulties to debugging. In order to reduce the difficulty of overall debugging after software module assembly, it is required to test each module separately before the final overall debugging. For function continuous modules, incremental method is used, that is, debug from the bottom module, then add the middle module in turn, and finally debug the top module. Using
this debugging method, we can find the errors in the algorithm and program design as soon as possible, and reduce the difficulty of debugging the whole module.

4. Discussion

4.1 Comparison of Database Access Technology

According to the analysis of database access methods of three languages, we can see that each method has its advantages and disadvantages, and compare the execution efficiency and portability of different access technologies, as shown in Table 1.

Table 1. Comparison of Web database access technologies

|      | Implementation efficiency | Portability |
|------|---------------------------|-------------|
| ASP.NET | 24%                      | 16%         |
| JDBC | 31%                      | 36%         |
| PHP | 25%                      | 28%         |
| ASP | 20%                      | 20%         |

It can be seen from the above, ASP.NET The results show that the execution efficiency of PHP is 24%, and the portability is 16%; the execution efficiency of JDBC is 31%, and the portability is 36%; the execution efficiency of PHP is 25%, and the portability is 28%; the execution efficiency of ASP is 20%, and the portability is 20%. The results are shown in Figure 1.

Figure 1. Comparison of Web database access technologies

It can be seen from the above that the highest execution efficiency of JDBC is 31%, and the lowest portability of ASP is 20%.

4.2 Analysis of Column Section size of Double Section Straight arm Window Cleaner

If it is a round pipe, it is the relationship between the section dimension D and the allowable stress. The allowable stress is determined according to the mechanical stress requirements. These section sizes are the key conditions of parametric graphics. The mechanical stress requirements are as follows: when calculating the strength stress, the strength limit of the material used shall not exceed the allowable stress in Table 2.

Table 2. Fracture inspection parameters

| type       | S value |
|------------|---------|
| Load case 1 | 1.25    |
| Load case 2 | 2.63    |
| Load case 3 | 1.83    |
It can be seen from the above that the s value of load case 1 is 1.25, the s value of load case 2 is 2.63, and the s value of load case 3 is 1.83. The results are shown in Figure 2.

![Figure 2. Fracture inspection parameters](image)

From the above, the maximum s value of load case 2 is 2.63, and the minimum s value of load case 1 is 1.25.

5. Conclusion
With the wide application of CAD in education, ED has become an important subject, which will change from manual drawing to CAD. In order to ensure the continuity of the teaching process, camased prototype will realize automatic reading, not manual reading. The design and implementation of an automatic evaluation tool for mechanical engineering drawings are introduced. Taking the computer aided design of typical mechanical parts as an example, the paper puts forward the method of developing corresponding functions in CAD software to improve the standardization level of engineering design. The integrated prototype of GUI in concurrent engineering is developed, namely, icedmp. With icedmp, users can access product data in different fields of computer tools in a software system, and evaluate the design of mechanical products according to DFM and DFA standards.

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