Research on Automatic Design of Computer Aided Mechanical Motion Scheme

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Abstract: Conceptual design is a critical stage in the design of mechanical products. The decisions made at the conceptual design stage have a significant impact on the cost, performance, reliability, safety and environmental effects of the product. With the computer and other modern science and technology of the ever-increasing, with its operation of the high efficiency and accuracy, has been widely used in all walks of life. Computer technology has also been widely used in the design of mechanical products, but mostly concentrated in the detailed design stage, and in the most creative conceptual design stage, although domestic and foreign scholars in recent years to do a lot of research, formed a different The theoretical system, but to develop a practical computer-aided design system there are still many problems. The main reason is the lack of mathematical model for computer reasoning. In view of this problem, this paper introduces the idea of coding, digitizes the physical information of the organization, and realizes the automation reasoning of the program selection through the digital reasoning.
Keywords: Mechanics Products, CAD, Mechanic Movement

1. INTRODUCTION

Conceptual design is a critical stage in the product design process. The decision-making in the conceptual design phase has a significant impact on the cost, performance, reliability, safety and environmental effects of the product. It is estimated that the design decision determines the final product cost. More importantly, good detailed design can not improve the bad conceptual design. The survey found that most of the problems in the design process were related to the design of the conceptual design phase, such as design strategy, concept selection and evaluation methods, not just the detailed design of the parts. Conceptual design is becoming increasingly important in meeting the specific needs of the growing user. Not only that, the conceptual design also affects the productivity and product quality at the manufacturing stage. Because many manufacturing processes such as casting, machining, are indirectly determined at the conceptual design stage.

2 CONCEPT DESIGN OF MECHANICAL MOTION SYSTEM

The conceptual design of mechanical products is the pre-process of mechanical product design. The result of the conceptual design is to produce the design scheme. Therefore, the concept of pre-design work, including design tasks and design concepts to play, to build the overall framework of mechanical products. And the concept of design work will focus more on the concept of functional structure, the choice of functional principles, design process of movement and determine the mechanical movement program. The conceptual design phase identifies the mechanical motion of the product. The computerized design of the conceptual design has become an important development direction in the design field. In order to improve the conceptual design level of the mechanical product, it is necessary to carry out the computer. The computerized design of the mechanical product has become an important development direction. Conceptual design of auxiliary machinery products. Because the selection design of the motion system is the key problem in the conceptual design of the mechanical product, this paper will focus on the selection of the motion system and the automatic selection design of the motion system, and put forward the evaluation solution for the selection scheme.

According to the design requirements or process requirements, consider what functional principles to achieve these requirements, such as the requirements of the wells to raise the water to a certain height, we must consider what the principle of the use of water to enhance the water. You can consider the use of mechanical energy to change the kinetic energy of water, forcing it to move upward, the experience of institutions with rotary impeller centrifugal pump and past rural water tankers can also change the volume of the container, the use of atmospheric pressure so that the water inhaled and pressed out of the container Method to suck up the water, the experience of the body has a volume of the pump. It is clear that the use of different functional principles of the required motion law design must also be different. From this step we can see how to define the functional principle of the problem is vague, but also must consider the functional principle of the representation and abstract to what state is suitable for computer storage and processing. According to the requirements or process requirements of the

design agency, in the actual work, we have to design the machinery is often more complex, its use requirements or process requirements often require a lot of functional principles combined into a general functional principle to complete. Such as the common automatic machine, usually by the feeding, processing, testing, cutting and other process requirements, and each process requires a set of functional principles to achieve.

Because the functional element at the bottom of the functional structure is the smallest granularity function element of the existing mechanism, the design of the mechanical motion scheme is usually carried out from the bottom of the functional structure.To establish the design scheme of the motion scheme which the computer can recognize, The design process of the mechanical motion scheme is summarized as follows: 1) enumerate and organize the mechanism of the subordinate functional elements (minimum granularity functional elements), and get their solutions directory; 2) combine the subordinate functional elements of the same functional element to form 3) from the morphological matrix solution method, in accordance with the functional structure of the integrated approach, get (upper) functional elements of different institutions solution; 4) respectively, the organization of the functional elements of the solution, the formation of various functions 5) the function element that has formed the solution directory as the lower-level functional element of the upper-level function element adjacent to it; 6) Thus, the solution directory of each function element is obtained from bottom to top , To obtain the total function of the solution directory; 7) is preferred to evaluate the total functional solution of the various organizations in the solution, get the mechanical motion program. The motion program design is summarized as the seven steps, System standardized mechanical movement and the program design process, to facilitate the establishment of design patterns can be recognized by the computer.

It can be seen from the design process of the mechanical motion scheme that, apart from the minimum granularity function element, the functional solution of each functional element is only related to the selection and combination of the subordinate functional element mechanism belonging to it. Therefore, In the design unit, depending on the desire function element as the "functional unit"; the combination of the lower functional unit as the "sub-functional structure." In this way, the functional unit of the lower part of the functional unit as a separate "design unit" The design goal of the design unit is to obtain the functional solution of the functional element by means of the solution of the morphological matrix according to the sub-functional structure and the solution of the lower functional element. The complex design process of the motion scheme is transformed into the solution of the functional elements in the different design units, and the solution of each design unit is exactly the same as that used in the computer language, so that the computer-aided design unit Of the design goals, a computer-aided mechanical movement program design of the essence and core.

3 KNOWLEDGE OF MECHANICAL MOVEMENT SYSTEM

The knowledge of mechanical design is not only very rich, but also very complex, both the design of the object involved in the field of knowledge, but also includes the mechanical design of the design methods and processes such as empirical knowledge. It can be divided into descriptive knowledge, problem-solving knowledge, process knowledge and meta-knowledge describing the control strategy. The knowledge representation method can also be divided into descriptive knowledge representation and procedural knowledge representation from the nature of the expressed knowledge. The method used to express knowledge should have the following four properties: Fully express the ability to express all kinds of knowledge in the relevant field. Effective reasoning can be combined with efficient reasoning to support the control strategy of the system. Easy to manage easy to achieve modular, easy to detect contradictory knowledge and redundant knowledge, easy to update knowledge, easy to maintain the knowledge base. Easy to understand makes the representation of knowledge transparent. The first two requirements have a complex expression of the situation in order to describe the rich and complex knowledge, the latter two emphasis on the use of simple and standardized forms of expression in order to facilitate understanding and management.

4 CODING REASONING PROCESS MODEL OF MECHANICAL MOTION

Forward reasoning, also known as bottom-up, data-driven, forward link, etc. refers to the reasoning from an initial state to the target state of reasoning. In forward reasoning, the user provides a number of facts in advance and puts them into the factual library. The forward reasoning machine matches these facts with the prerequisites of the rule, and the concluding part of the successful rule is stored as a new fact in the fact store , And continue with the above process, the updated database of all the facts and then match the rules until there is no matching rules so far.

The underlying idea is to first propose a goal or a hypothesis, and then attempt to support the goal by examining the known facts in the context or requesting evidence from the user or the user's claim to the target or the hypothesis, Hypothesis. If the facts in the context do not support the hypothesis, the fact becomes the sub-target that is assumed to be tracked. If the assumptions can not be confirmed, the system can make new assumptions, until all the

assumptions are not supported by evidence, then the reasoning is considered a failure.

Using the above method, we can reason out some institutional or institutional combinations to complete all forms of movement. In particular, in order to avoid the program explosion, the use of the model for institutional motion program reasoning, taking into account the actual feasibility of the results of the program portfolio should not be too long, so the number of cycles should be a certain limit. At the beginning of the cycle, the maximum number of organization combinations should be set. When the cycle reaches the upper limit, the cycle is interrupted and the design is finished. In addition, in order to make the combination of institutions is not so complex, so that the organization of sports behavior more accurate, so that the whole program more practical, in the reasoning can also add some constraints, such as axial relationship, transmission ratio, rapid return characteristics and so on.

Evaluation of Institutional Motion

Conceptual design itself is a process, and information is gradually added and clarified in the process. Because of the imperfect knowledge of the design object and the inaccuracy of the information, it is difficult to make the correct evaluation, which makes the evaluation of the program throughout the conceptual design stage become one of the most objections but has to do one thing. The development of computer-aided design, concurrent engineering and virtual product manufacturing reduces the workload of people in the detailed design phase, enabling designers to focus more on the conceptual design while also allowing people to evaluate the concept design Will be a number of similar, difficult to choose a clear choice of the program into the specific design and not increase the amount of work, so as to get the best solution to provide the conditions. Concept design decision-making stage usually use the following three methods, value engineering method, system engineering evaluation method and fuzzy comprehensive evaluation method. Value engineering method. Value engineering method is to improve the practical value of the product for the purpose of functional analysis as the core, to develop collective intelligence resources as the basis, to scientific analysis methods as a tool to achieve the most cost-effective mechanical products with the necessary functions. The essence of the method is to evaluate the function of the object, the amount of evaluation for the scale to find the necessary cost to achieve a minimum cost. System Engineering Evaluation Method. The system engineering evaluation method takes the whole scheme as a system, and evaluates the scheme from the overall requirements, so that the overall optimal scheme can be selected objectively and effectively from a variety of schemes. The core task of this approach is to establish an appropriate evaluation index system. Fuzzy comprehensive evaluation method. Fuzzy comprehensive evaluation method is to use the set and fuzzy mathematics to fuzzy information numericalization to carry out quantitative evaluation method. The evaluation index system of mechanical movement program is composed of a number of evaluation indicators, because the evaluation index is often fuzzy, the application of fuzzy evaluation method for comprehensive evaluation will achieve better practical results.

The program should have different weight assignments depending on the type of application, and the weight of the evaluation index can be determined uniformly for a set of motion scenarios with the same application environment and needs. At this point, if only an expert's judgments are often unable to fully reflect the objective facts of things, easy to lead to the judgment of the distortion or even miscarriage of justice, it is necessary to play the wisdom of the group to remove the individual subjective deviation. When there are multiple experts to construct the evaluation index weight matrix, how to determine a more accurate comprehensive weight matrix based on these weight matrices. Is a problem. In the previous fuzzy comprehensive evaluation of the weight of the solution, if there are a number of experts involved in the evaluation, in the process of synthesizing the views of the experts generally use a simple arithmetic average, this synthesis can not reflect the level of differences in the evaluation of experts, is clearly not reasonable. If you can consider the level of expert evaluation, with the "expert credibility" of the size of the indicators reflect the level of expert level, and then use the weighted method of calculation. , You can improve the accuracy of the judge.

5 CONCLUSION

On the basis of this view, this paper puts forward a method of formal expression of mechanical motion design based on the function-structure mapping theory in conceptual design, which is a kind of method of motion state vector, which is composed of many basic institutions. Notation. The motion matrix is used to describe the motion of the mechanism and the position relation of the axis. The first order constraint expresses the motion quality characteristics (such as the continuity, uniformity, reversibility, etc.) of the motion module, and the motion state vector and mass characteristic A complete description of the organization module is implemented. By looking for a nonzero element in the matrix, a set of mechanism blocks satisfying the motion function and constraints can be selected to realize the mapping mechanism from the functional domain to the domain. In addition, the expression method provides a formal tool for the design requirements (function) decomposition, and can automatically generate various possible solutions. In short, this method can be used to achieve

mechanical automation program integrated, in particular, can be obtained complex and innovative sports program. In addition, the method is easy to implement programmatically.

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