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Key Technologies and Application Methods in Industrial Manipulator Design

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Abstract: Conceptual design is a pioneer in product design, and it is also the most decisive stage in the process of product forming value. It has become a hot topic in the research of design theory. In the process of conceptual design of industrial manipulators, people need to master the relevant key technologies, because these technologies determine the effect of conceptual design of industrial manipulators, and even determine the actual use efficiency of industrial manipulators in the later stage. Industrial manipulator is applied to production practice. A good design of industrial manipulator can make the function of industrial manipulator present. Based on the concept of industrial manipulator, we clarify the relevant significance of current conceptual design, put forward the technical problems in conceptual design of industrial manipulator, and discuss the key technical strategies and management strategies in view of these problems, so as to provide help for the role of key technologies in graduation design of industrial manipulator and the realization of conceptual design of industrial manipulator.

Keywords: Industrial Manipulator, Conceptual Design, Key Technologies.

1. Introduction

Industrial manipulator is an automation device which can imitate people's hand movements and automatically grasp, transport and operate according to established procedures. It can accomplish all kinds of anticipated tasks under the function of programming. It not only has the advantages of human hands in the overall structure and performance, but also has the advantages of mechanical mobile phones.

Robot is one of the earliest industrial robots. Its appearance can replace heavy labor, so that production mechanization and automation can be realized, and it can operate in harmful environment, and ultimately has a safeguard effect on personal safety. Therefore, it can be widely used in mechanical manufacturing and smelting. Among gold, electronics and light industry, it is also widely used in atomic energy and other sectors. The accuracy of manipulator operation and the ability to complete the operation in various environments have a very broad development prospect in the field of national economy. As soon as the manipulator is used to work, the quality of the product can be improved, and the productivity of the labor can be promoted. Finally, the automation of the production process can be realized, the working conditions can be improved, and the overall labor intensity can be reduced.

Under the background of the rapid development of network, the development of robotic manipulators has also gained some new development space, for example, towards the networking operation of robotic manipulators. In recent decades, industrial robots are a kind of high-tech automatic production equipment. Industrial robots are an important branch of industrial robots. The existence of industrial robots can accomplish expected tasks through corresponding programming. In terms of overall structure and performance, industrial robots have their own advantages in terms of human and robot, so they are also part of the whole. It shows human intelligence and overall adaptability. It is precisely because of the accuracy of the manipulator's operation and the ability to complete the corresponding operation in various environments that it has a very broad development prospect in the field of national economy.

2. Conceptual Design

Conceptual design refers to a series of orderly and targeted design activities that generate corresponding conceptual products by analyzing users' needs. Its main manifestation is from rough to fine, from vague to clear, and from abstract to concrete. It is a process of continuous evolution and development. Conceptual design is mainly based on the concept of design, which runs through the whole design process as a main line. It is not only an effective design method, but also a complete and comprehensive design process. But the designer uses the concept of design to integrate the complex sensibility and instantaneous thinking of the designer into rational thinking, and ultimately complete the whole design process. If conceptual design can be regarded as an article, then the concept of design is one of the thematic market ideas. Conceptual design is mainly carried out around design concepts. Design concepts will connect all aspects of conceptual design. Although they can not go to the market immediately, they can bring some inspiration to people when they do

conceptual design or seek corresponding inspiration. Some of these designs, although a little unrealistic, can let people see how a design concept is gradually evolving and growing.

2.1 Key Technologies in Conceptual Design of Industrial Manipulators

2.1.1 Product Information Modeling Technology.

Product information modeling technology mainly uses some informationized tools to build the model of related concepts. In this process, the mathematical tools of polychromatic sets will be fully used to decompose the functions of the relevant design objects, and ultimately establish the conceptual design information model of the objects. In this operation process, four steps and links are usually needed.. Firstly, we need to analyze the function of the design object in all aspects. We need to decompose the function layer by layer from the overall function of the object, and establish an effective method tree model of object function. In the process of functional decomposition, if there are more realistic mature mechanisms or parts that can make the required functions realized, then we should stop functional decomposition, otherwise we need to decompose the next level of the function. Secondly, it is necessary to carry out a comprehensive analysis operation, to find a possible constraint relationship between functions and institutions, to fully express the relationship between constraints in the functional method tree, and to classify constraints according to the previous criteria. Furthermore, it is necessary to develop multi-color sets of functions after functional decomposition, as well as some mature institutions or parts in reality. In this process, it is usually necessary to specify similar definitions into the individual color of elements and the uniform color of each layer. In the last operation step, we need to clear up the relationship among all levels in the functional method tree containing constraint information, transfer it to the polychromatic set, and choose different matrices of the polychromatic set to express it according to the nature of different relations. Finally, we can build a model that can think about the product information from the polychromatic set.

At present, the shortcomings of product model in conceptual design mainly come from the unreasonable establishment of function method tree model. Once you need to improve the corresponding function method tree model at this level, to change the situation that there is no clear expression of the various constraints in the model, and at the same time to improve the corresponding function method tree in all aspects. Such an improved function method tree model can express various constraints and provide more sufficient information for designers. The hierarchical structure model of polychromatic sets can be used to formally express the product model of conceptual design, so the design of industrial manipulator can be fully assisted in the field of product information modeling and design to a certain extent, and provide help and impetus for the development of industrial manipulator.

In the conceptual design of industrial manipulator, product information modeling technology is a key technology. With the continuous development of society, the diversity of this type of technology becomes more and more prominent. Therefore, in the specific product information modeling technology, it is necessary to further objectively divide the various models. At present, in the product information modeling technology of industrial manipulator, people have planned and summarized several commonly used modeling technologies. At the same time, these technologies are introduced into the analysis of software. People can use software to carry out further analysis and evaluate the application effect of different models.

2.1.2 Reasoning Technology

In the conceptual design of industrial manipulator, reasoning technology is a very core technology. The difficulty of product conceptual design is that it is not easy to find and select some appropriate methods to map the user's needs to the actual structure of the needs. In order to achieve this mapping effectively, three pairs of mapping relationships need to be considered, namely, the relationship between function and structure, the relationship between behavior and structure, and the relationship between function and behavior. For reasoning technology, it can be divided into a kind of mapping between function and structure, and corresponding mapping between behavior and structure and between function and behavior will also be generated. Before the selection of reasoning technology, people need to realize that a large amount of data is a key foundation in the process of reasoning. In addition, people also need some knowledge-driven in the field, which is what people call transcendental knowledge. Through the support of these two types of knowledge and related data, it can help people choose a more correct reasoning technology and way among them. Therefore, at the corresponding level of reasoning technology, it can be divided into data-driven reasoning technology and knowledge-driven reasoning technology. Data-driven reasoning technology mainly depends on the execution of reasoning in the example database. Conversely, knowledge-driven reasoning needs to emphasize the use of rules, use causality and logical thinking to carry out reasoning work.

At present, great progress has been made in supporting the effect of conceptual design reasoning technology. At the same time, many technologies will face the problem of expanding the scope of application. In this context, translating these technologies into practical design applications will face greater obstacles. For a simple design case, it is possible to specify specific areas of knowledge, but if it is a realistic design and relevant applications, the relevant provisions may not be feasible. Knowledge acquisition in AI is a problem that people must focus on. A feasible solution is to use data mining technology in some existing large databases to mine some meaningful knowledge. For reasoning technology, another problem is that it tends to give a simple assumption in advance. Normally, this assumption does not exist in reality. Therefore, feedback technology will be used to improve the assumption. Such an operation can make technology and real world applications more matched, and it will become a major concern in the future. Research direction.

In the reasoning technology of industrial manipulator, different types of technology can be classified and operated according to different types. For rule-based deductive reasoning, forward deductive reasoning and reverse deductive reasoning can be formed. In recent years, people have begun to develop two-way deductive reasoning technology. Among uncertain reasoning, probabilistic reasoning societies are widely used in industrial area manipulators. In the process of development of this type of technology, specific conclusions will be drawn from the existing facts and knowledge according to a certain strategy, and then implemented through the program, even with the help of inference engine. There are various ways of thinking in human intelligence activities. Artificial intelligence is an intelligent simulation operation method for human beings. Therefore, there will be a variety of reasoning methods, which can be used as the choice of reasoning methods for industrial manipulators.

2.1.3 Evaluation System and Method of Product Conceptual Design

In the process of product conceptual design, the evaluation of the design situation is a key link, which determines the rationality and effectiveness of the motion of the industrial manipulator in the later stage, as well as the boosting effect on industrial production. In the process of conceptual product scheme formation, how to effectively evaluate the various combination schemes of principle solutions, and how to obtain the optimal combination schemes by this way are the links that people need to pay attention to. The structure size of conceptual product schemes has not been accurately determined, so there is no way to quantitatively analyze some attribute indicators, and only some fuzzy concepts can be used to describe them. For example, fuzzy evaluation is one of the typical contents. Fuzzy evaluation mainly uses fuzzy mathematics to digitalize the fuzzy information, which can be introduced in this way. Conduct quantitative evaluation. In order to make the evaluation more scientific and comprehensive, and enhance the overall rationality, it is necessary to establish a comprehensive fuzzy evaluation system for the scheme.

In the process of evaluating product conceptual design, the related scheme evaluation mainly evaluates manufacturability and assemblability. In this way, an index system of product assemblability design evaluation is established to complete the overall evaluation and estimation operation. Such a method can establish an effective binary tree model, and also form a technology facing future objects, so that each assembly unit can become an independent object. In short, each node is a relatively independent object, and the evaluation index system of assemblability can take the relevant assembly units as an important basis. In the subsequent evaluation, it will be reflected in the way of iteration and calendar of nodes. For such an evaluation index, there are many factors involved, so it is difficult to use a quantitative way to clarify the evaluation criteria. Therefore, people will try to use the fuzzy evaluation method in fuzzy mathematics to evaluate its manufacturability and assemblability. For the evaluation method of conceptual design, it is a very important step in the reasoning process of conceptual design, and it is also a key link to decide whether the conceptual design scheme can be accepted by people. If there is a phenomenon of evaluation distortion in the results of comprehensive evaluation, in short, that is, the design schemes fail to pass the relevant comprehensive evaluation, then it is necessary to modify the design requirements, and then redesign the product concept.

3. Deficiencies of Existing Technology and Countermeasures

In the process of product development such as industrial manipulator, 80% of the design work is also carried out on the basis of reuse. The reuse of design can effectively shorten the cycle of product redevelopment, effectively reduce the cost of design, and avoid some repetitive mistakes. In the development process of industrial manipulator, conceptual design is the most creative stage, and it is also the stage with the least cost, but this stage has the largest value-added range for product value. The importance of conceptual design can effectively promote product innovation and achieve the optimization effect of design. However, in the process of conceptual design of industrial manipulators, it is an indisputable fact that the information reuse mechanism is not perfect enough. In the process of conceptual design of industrial manipulator, it involves the collaboration of various departments. But in the real work, the information transmission between different departments is one-

way. It fails to effectively manage the whole information of product life cycle from design to after-sale, so as to realize the reuse of information in each department. Especially under the production mode of many varieties and small batches, in order to enhance the ability of enterprises to respond to market demand, more and more enterprises hope to optimize the allocation of enterprise resources through some integrated means, and ultimately promote the improvement of the utilization rate of information resources, which can transform the existing information resources of enterprises into productivity and promote the collaborative ability of enterprises. All-round improvement of competitiveness. At present, the construction of information reuse mechanism in many enterprises is not particularly ideal. It is prone to the phenomenon of poor information exchange and communication, which leads to the information becoming a one-time use. Finally, it can not play its role in the conceptual design of industrial manipulators, and affects the efficiency and progress of the overall work.

In the process of conceptual design of industrial manipulator, incomplete information expression is an important link that restricts the conceptual design of industrial manipulator. In the process of conceptual design, the development of design depends on relevant information and resources, but the incomplete expression of information will affect the generation and communication of the concept, and even the information errors between them. In the case of information errors, the concept of industrial manipulator can not become a reality, and even there is a big gap between the design products and the realistic ideal. This gap will restrict the overall effect when applied to actual production. In the process of information expression, it depends on some important processing software. These software can make information present in a data way, and eventually integrate into the conceptual design model of industrial manipulator. But software is not a fully automatic and intelligent tool. In the process of information processing, it relies too much on the original program and database. In the process of expressing some information, there are deviations easily. The existence of this phenomenon will also restrict the conceptual design of industrial manipulators to a certain extent. Especially in the process of software processing the expression of information, it will easily lead to the expression of information, too rigid, unable to effectively integrate with specific conceptual design, and even there will be ambiguities in understanding, affecting the expression of conceptual design of industrial manipulators.

In the process of conceptual design of industrial manipulator, the reason for conceptual design is to better respond to the changing market demand and related industrial production demand. Therefore, in the whole process of production, innovation is a key level. Without the support of innovation link, it is easy to lead to the communication of concepts and information, which is hindered to some extent. At present, in the conceptual design of industrial manipulators, there is a lack of support for some innovative problems, especially for some frontier information, which to some extent restricts the achievement of conceptual design effect of industrial manipulators. The lack of conceptual design of industrial manipulators and the diversity of support for innovative problems have not only the internal organizational and management factors, but also the influence of personal concepts, but also the lack of some effective innovative problem hunting tools and information acquisition tools. The existence of various factors has led to the serious impact and development of conceptual design of industrial manipulators.

Information modeling is a key link for conceptual design of industrial manipulator. At the same time, in this link, we should pay attention to solving the problems of mechanism in information and focus on solving the phenomenon of inadequate information expression. In the operation process of information modeling, we should pay attention to the use of some new software and technology for relevant processing. XML is an information modeling tool in the conceptual design of industrial manipulator. When people first used this tool, they regarded it as a standard for data exchange. But at present, the function of this tool has gone far beyond the corresponding scope, and even plays a core role in the field of development and deployment platform. The most typical one is Microsoft's. NET platform. This tool has gradually become a tool for component modeling in information systems, and construction can complete its own construction operation according to the related content. Therefore, in order to solve the problems encountered in the graduation design of industrial manipulators, designers should be good at grasping the tool and establishing relevant information models, focusing on how to use the tool to achieve a better grammar and style in the new flagship mode, and in the process, find out how to build a flexible and efficient system with a small programming input. Application system.

In addition to the tools mentioned above, the tools available are very diverse. Model-driven is one of the types. It is a new method for describing and building systems. This method mainly divides the functions of the system in the specific platform, realizes the descriptive operation between the functions, and carries on the extensive application and the operation between the functions, so that the system model of the software is separated into a platform-independent model and a platform-related model. Finally, under the function of transformation rules, the system model is obtained. Unification of effectiveness. In this process, model-driven can provide the relevant conversion mechanism, select the appropriate information model to effectively

establish, provide help for the conceptual design of industrial manipulator, and better realize the communication and exchange of information.

In the process of conceptual design of industrial manipulator, the link of conceptual design depends on a variety of information. In fact, conceptual design is to present the requirements of information, integrate it into the corresponding theoretical model, form a conceptual theory, and provide effective basis and reference for later construction. Based on the incomplete information expression in the process of conceptual design of industrial manipulator, people should pay attention to establishing an information expression and inspection mechanism. Through the corresponding information expression and inspection mechanism, the accuracy and rationality of information expression can be checked. At the same time, the correctness of information processing can be judged to help people provide effective information for him. They conduct the second inspection and approval of information, and finally take effective means to process information, promote the accuracy of information transmission, provide more help for industrial manipulator conceptual design, and ensure that conceptual design can be presented in a complete information way. In the process of establishing the information expression and inspection mechanism, we need to start from two aspects. The first aspect is the construction of hardware. It is mainly to establish a complete human resources system of information expression and inspection mechanism within the enterprise. It is clear which part of the staff do this work and what are the specific responsibilities of carrying out the work. The second aspect mainly carries on the software construction, is through the corresponding technology, establishes the information expression aspect inspection mechanism, through such a mechanism, carries on the effective impetus to the work, uses the related mechanism, carries on the inspection to the information expression accuracy, finally guarantees the industrial manipulator concept design to obtain the reasonable impetus.

Conceptual design of industrial manipulators is to keep pace with the times, paying special attention to the functional requirements of industrial manipulators in the actual market demand, so it is very important to establish a support system for innovation issues. Innovation support services need to address some of the problems faced by enterprises in the process of innovation and commercialization, so as to provide a comprehensive series of services, to enable enterprises to face the conceptual design of industrial manipulators, to achieve a state of ease. In the process of conceptual design of industrial manipulator, the establishment of innovation support system should first pay attention to technical support services. Objectively speaking, the development of conceptual design of industrial manipulator depends on the core concepts of the enterprise itself, and the core competence of the enterprise is actually their technological innovation ability, an innovative support service, in addition to providing targeted attacks on technological capabilities, but also around the relevant technological development, to provide technical support. In the process of building the support system for innovation problems, we should pay attention to the full understanding of market development services, because the conceptual design of industrial manipulators is ultimately aimed at the production of industrial manipulators. The production of industrial manipulators is to apply industrial manipulators to specific production. Therefore, market development services are very critical. Only with market, industrial machinery. Only the manipulator can have the space for development and application, on the other hand, the conceptual design of industrial manipulator can have the space for production. In the process of carrying out innovation and supporting system construction, enterprises should pay attention to market development and service development. At present, this link is the weak link of many enterprises. Therefore, enterprises need to pay attention to the analysis of technology and product market potential, formulate strategic plans according to the situation of market development, and select reasonable marketing strategies and means.

4. Conclusion

Conceptual design is a forerunner in product design, and it is also the most decisive stage in the process of product forming value. It has become a hot topic in the research of design theory. In order to support conceptual design more effectively, the key technologies in conceptual design of industrial manipulators need to be broken through, and the basic and breakthrough technologies that industrial manipulators need to use in conceptual design should be clarified. With the continuous development of society, the application of industrial manipulators is becoming more and more extensive. In the conceptual design process, the overall concept leadership role is highlighted. It can strengthen the usability of industrial manipulators, and at the same time, it can provide effective help for the integration of industrial manipulators into the market to a certain extent, and ultimately promote the application and development of industrial manipulators.

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