

Application research of computer artificial intelligence technology in art information simulation processing system

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Abstract. This paper also studies the application of computer artificial intelligence technology in collecting various information, and then integrates and organizes data through computer, and then uses various mature technologies such as virtual design technology, artificial intelligence technology, database technology, intelligent layout technology, and plug-in expansion technology. Computer application technology collects relevant information through data sensors, then performs powerful processing, and then performs data signal processing, thus forming a new type of art information data processing system, which has a wide range of uses.

Keywords: Computer, artificial intelligence, data simulation processing, relational database, virtual reality.

1. Introduction

The traditional crafts model making is the designer's conception and intention of design, comprehensive aesthetics, technology, etc., relying on the control of various materials to shape the shape of a three-dimensional space. Craft models of different materials have different production processes, but no matter what, the production cycle is relatively long and the cost is relatively high. For a long time, the formulation of reasonable material processing technology plans has been based on theoretical analysis and experience accumulation. Moreover, the formulated process parameters are often able to ensure the feasibility of the process, but they cannot guarantee the optimum, and cannot ensure the purpose of saving labour in the forming process and improving the performance of the workpiece [1]. Therefore, it is necessary to optimize the design of the forming process. Craft-oriented design systems generally use general-purpose CAID systems. Due to the complexity of free-form surface modelling, these general-purpose systems have high requirements for users, and are not intelligent enough to be conducive to human-computer interaction; or their functions are too complex, including Many modules are useless to CAID, so that the production efficiency of CAID system in the field of handicrafts is low, the scope of application is limited, and it lags far behind other auxiliary design systems. We propose an art-oriented, open, and innovative design system that is tightly integrated with CAM.

2. Handicraft Design System

2.1 System architecture

Its overall structure is shown in Figure 1 (picture quoted in Tooling Cardboard for Smart Reuse Testing a Parametric Tool for Adapting Waste Corrugated Cardboard to Fabricate Acoustic Panels and Concrete Formwork). This system includes 6 parts: 1) Human-machine interface. It is used to input the processing conditions and requirements, cutting conditions and cutting and tool database data. 2) Modules for automatic generation of typical process steps and automatic allocation of margins. According to the processing procedure, processing size and accuracy requirements and blank size, the process steps are automatically divided and the allowance is allocated. 3) Tool optimization module. According to the characteristics of the workpiece, such as material, surface shape, size requirements, etc., the tool is selected from the tool magazine. 4) Automatic generation module for cutting parameters. After obtaining the processing conditions and requirements from the man-

machine interface or the host computer, first check whether there is any successful experience through self-organized learning of the adaptive resonance neural network (ART1); if not, transfer to another sub-module, and check the cutting through the expert system Database and calculation to find the best cutting parameters. 5) Learning, correction, and optimization modules [2]. If the cutting parameters obtained do not meet the requirements after trial cutting, the actual working conditions such as poor surface roughness, vibration, etc. can be input into the system, and the existing cutting parameters can be optimized according to the optimization target through the genetic algorithm (GA). If you are satisfied, learn this parameter through ART1 as experience accumulation. 6) Database management module. It is used to maintain and update the tool and cutting database.

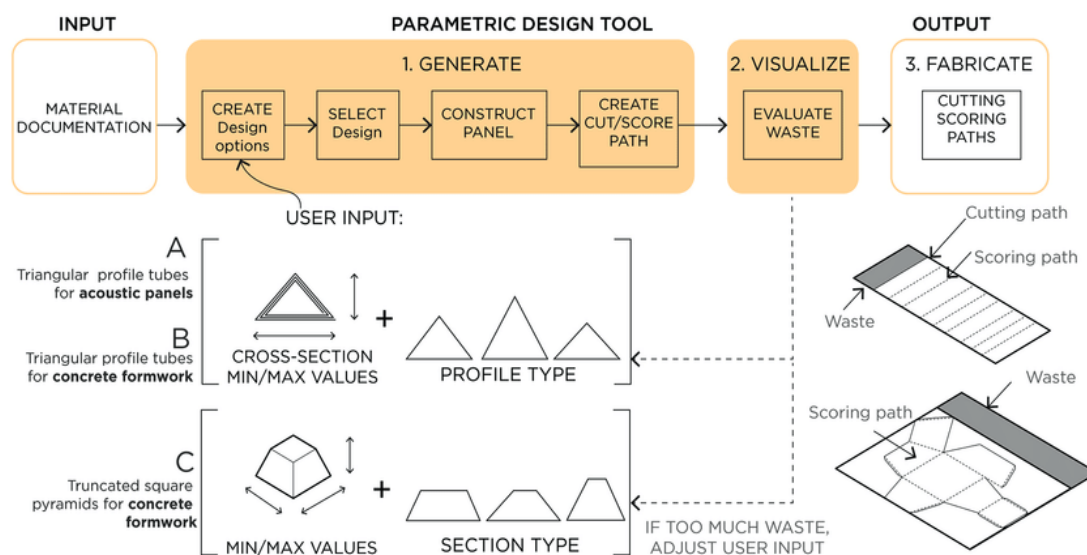


Figure 1. Tool selection and automatic generation of cutting parameters structure diagram

2.2 Model classification database

The goal of the model classification database is to cooperate with the knowledge base and the inference engine, through the designer's description of the desired characteristics of the design object, and automatically produce the design results that meet the design requirements, which is a goal-oriented and constrained decision-making process [3]. In the entire design process of handicrafts, design description has gone through a process from concept to shape, from abstract to concrete.

The logical structure of the model is closely related to the final problem solving. The logical structure also determines the realization of the crafts database management system and its retrieval method. In this database system, a prototype-based intelligent CAD method is adopted, and from the perspective of ergonomics, the actual use of designers is considered.

3. Intelligent layout based on genetic algorithm

Layout design is an important aspect of the design process. It generally refers to the process of product layout according to layout variables such as arrangement, configuration, and size ratio. At the same time, it is necessary to consider the shape, material, process, surface modelling, texture, etc. of each component. Shape elements. The research goal of layout design is to determine the spatial existence of product components. In order to obtain a more refined and uniform titanium alloy microstructure under a small forming force, it is necessary to optimize the design of the alloy's thermoplastic deformation process parameters, that is, the best matching of the deformation process parameters [4]. The optimized design is carried out on the basis of the data obtained from the thermal simulation compression test and metallographic analysis performed on the Gleeble1500 thermal processing simulation test machine. Taking deformation temperature, deformation degree and deformation rate as optimization variables, its vector is expressed as

$$X = (t, \varepsilon, \dot{\varepsilon})^T \quad (1)$$

In the formula, ε is the degree of deformation, and $\varepsilon \leq 60\%$. $\dot{\varepsilon}$ is the deformation rate, $0.01s^{-1} \leq \dot{\varepsilon} \leq 1s^{-1}$. t is the deformation temperature, $750^\circ C \leq t \leq 900^\circ C$. The specific goals that need to be achieved are: the smallest forming force, the smallest equivalent grain size, and the largest percentage of recrystallization (that is, the smallest percentage of non-recrystallized). This is a multi-objective optimization problem [5]. It is necessary to construct an evaluation function and transform it into a single-objective optimization problem of seeking evaluation function. In the optimization problem of multi-objective functions, each single objective often cannot reach the optimal solution at the same time, and sometimes even completely opposite situations occur. Therefore, it is not possible to find the best by simply comparing the value of the function. This study uses the linear weighted sum method to construct the evaluation function for multi-objective optimization.

$$\Phi(X) = \min \sum_{i=1}^3 \lambda_i \phi_i(X) \quad (2)$$

In the formula, $\phi_i(X)$ is the function model of equivalent grain size, percentage of non-recrystallized and forming force ($i=1,2,3$). λ_i is the weighting coefficient, reflecting the importance of the i optimization objective in multi-objective optimization? In order to avoid the situation of "big numbers eating small numbers" in the process of multi-objective optimization and to ensure that the overall optimal solution is finally obtained, a reasonable compromise between each sub-objective is required, so the weighting coefficient λ_i is taken as

$$\lambda_i = 1 / \phi_i^* \quad (3)$$

Where ϕ_i^* is the optimal value of the i -th objective function? In this study, the minimum value of each objective function obtained under the current thermal deformation conditions is the optimal value.

4. System functional structure

The system generally includes three major modules: model input and output interface, system main platform, model rendering module (Figure 2 is quoted in Interactive Knowledge Elicitation for Application Dependent Feature Evaluation Supported by Conditional Attributed Rewriting Systems). The input and output interface module provides support for various input and output devices, input devices such as 3D scanners, digital cameras, etc., output devices such as 3D engraving machines, rapid prototyping machines, etc.; the main platform module provides a creative platform for crafts. This scalable system structure lays a solid foundation for the future application of computer-aided design and manufacturing of similar handicrafts and electronic products [6]. The system mainly realizes free-form surface modelling, sculpture surface and relief surface modelling, advanced rendering, creation and management of handicraft model database, handicraft texture generation, intelligent generation based on examples, support for multiple interfaces and scalability.

The system mainly realizes the following functions: 1) Free-form surface modelling function. This system optimizes the functions of handicrafts, especially spotted copper crafts. The content includes the simplification of the menu and the integration of functions. 2) Sculpture surface modelling includes intelligent generation of relief surfaces. The free sculptural surface plays an important role in the modelling function. Can greatly improve creative inspiration and work efficiency. The intelligent generation of the relief surface is even more outstanding. Users only need to follow the relief guide to easily generate complex relief surfaces. 3) Advanced rendering functions. Supports full-colour output. This is provided for the generation of renderings. 4) The establishment and management of a database of bronze crafts models. We have adopted mature relational database technology and emerging virtual reality technology [7]. We store the models in the database in the form of components. The system provides an interface for retrieving and adding models, as well as a VR-based 3D preview function. It is worth mentioning that the selected model can be directly added to the system workbench for editing and rendering. 5) The texture generation function of the spotted

copper crafts. According to the characteristics of spot copper crafts, a set of textures are specially designed and various adjustment methods are provided. This makes the texture generation of spotted copper crafts more convenient and faster. 6) Example-based intelligent generation function for spotted copper crafts. The system uses the most mature technology of artificial intelligence. Case-based reasoning greatly improves the intelligence of the system and improves the efficiency of the system.

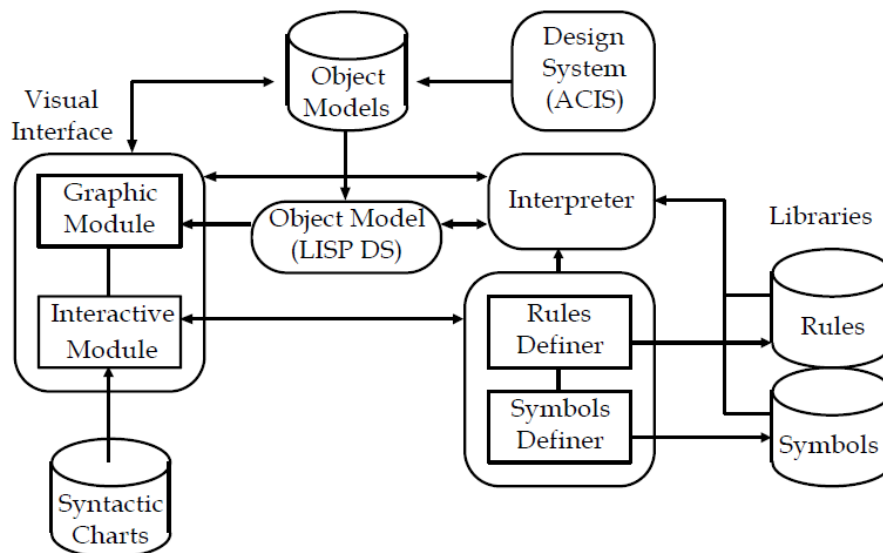


Figure 2. System block diagram

5. Optimization results and analysis

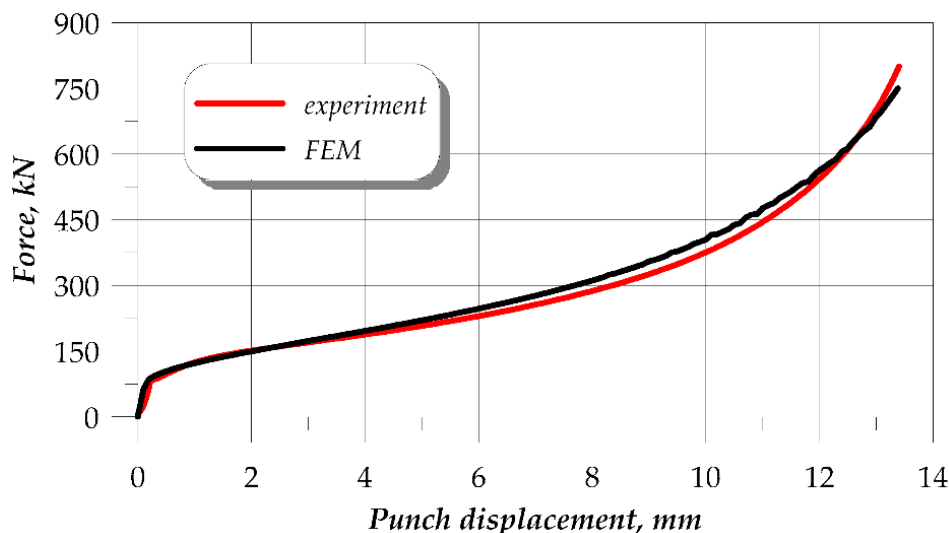


Figure 3. Experimental results of microstructure and forming force under different deformation parameters

This research uses VF language to compile the optimization algorithm program by itself to optimize the thermoplastic forming process parameters of artistic crafts. The initial population size is 40, the binary code length of the design variables is 8, the crossover uses the single-point crossover operator, and the mutation uses the basic bit mutation operator. In order to ensure the diversity of the group, and at the same time to ensure that its optimization ability will not become a random search, the crossover probability in this optimization is set to 0.7, and the mutation probability is set to 0.001. When the degree of deformation is 60%, the experimental results of the thermal deformation microstructure parameters and forming force of Ti-15-3 alloy at different deformation temperatures and deformation rates are shown in Figure 3 (picture quoted in Effect of Annealing Time and

Temperature Parameters on the Microstructure, Hardness, and Strain-Hardening Coefficients of 42CrMo4 Steel). It can be seen that under the optimized process parameters, due to the low deformation rate and the full dynamic softening, the forming force is significantly reduced [8]. At this deformation rate, due to the relatively low deformation temperature, the grain growth is not obvious, so the equivalent grain size is small, and due to the relatively high deformation storage energy, the recrystallization percentage (δ) is relatively high, and the microscopic the organization is more refined and uniform.

The optimization of multi-objective functions needs to coordinate between the optimal solutions of each objective, and make appropriate concessions to each other in order to obtain the overall optimal solution. It also shows that the optimization problem of multi-objective function is much more complicated than the optimization problem of single-objective function, and it is more difficult to solve.

6. Conclusion

The article studies an innovative artwork processing system. It comprehensively applies computer artificial intelligence technology not only to establish a natural bronze handicraft model library according to the characteristics of natural bronze tourism products, but also to provide a set of methods to quickly generate natural bronze handicrafts. and electronic products. Modular design concept. And with the support of computer big data, a modular integration has been carried out to form an advanced art processing system.

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