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Optimization Strategy of Cultural Creativity Product Art Design Based on Artificial Intelligence and CAD

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Abstract. This article explores the auxiliary optimization of innovative design based on product art. Through experimental research and case analysis, this article constructs an AI-based optimization model of cultural creativity product art design, and makes a simulation study. This model optimizes the artistic design of cultural creativity products by using the Simulated annealing algorithm (SAA) in AI technology, and displays and operates the optimized results visually by using CAD. The results show that the speed of the proposed SAA to get the optimal solution is faster, which can reach 0.341s s. The proposed algorithm has obvious application prospect and optimization effect in the optimization of cultural creativity design, which can improve the efficiency of cultural creativity design. The results of this article have certain guiding significance for promoting the growth and innovation of cultural creativity industry. By introducing AI and CAD, Cultural creativity industry can be promoted to be intelligent, efficient and refined, the quality and competitiveness of products can be improved, and technical support and theoretical guidance can be provided for the sustainable growth of cultural creativity industries.

Keywords: Artificial Intelligence; Computer Aided Design; Simulated Annealing Algorithm; Cultural creativity Products; Art Design Optimization
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1 INTRODUCTION

AI is a comprehensive discipline covering many fields and technologies, aiming at simulating human intelligence and thinking, so as to realize functions such as automatic decision-making, voice recognition and image recognition. Abugharbieh and Marar [1] used a wireless communication chip as an example. Firstly, use integrated circuit design software for chip layout design and physical verification to ensure the manufacturing quality of the chip. Secondly, use circuit optimize the circuit performance of the chip to ensure its functionality and performance. Next, use electromagnetic and optimize the electromagnetic field distribution and radiation characteristics of the chip to ensure its

electromagnetic compatibility and performance. Then, thermal analysis software is used to predict and optimize the temperature distribution and thermal performance of the chip to ensure its safety and reliability. Finally, use reliability analysis software to evaluate the reliability and lifespan of the chip, in order to take appropriate measures to improve the reliability of the chip. AI can simulate the process of human perception, cognition, learning and reasoning, thus providing more convenient, efficient and intelligent services for human beings. Aizhambaeva et al. [2] used the eccentric sleeve based on the design drawings of the GP500 cone crusher. The model should include the internal and external surfaces, holes, and other detailed structures of the eccentric. Use the simulation function of CAD software to simulate the arc spraying process. During the simulation process, it is necessary to input data such as spraying materials and spraying parameters, observe the spraying effect, and adjust spraying process parameters to improve spraying quality and efficiency. Convert the established 3D model and spray simulation data into a common format for data exchange with other CAD software. Common conversion formats include STEP, IGES, etc. Import the converted data into other CAD software for further optimization design and simulation analysis. The optimization process can include measures such as structural improvement and material replacement. ML is the core of AI, which enables computers to automatically learn rules and patterns from a large quantity of data, so as to make predictions and decisions. Bernardo and Duarte [3] explored immersive advanced virtual reality technology that allows users to fully immerse themselves in the controllers. Based on the user's location and actions, the system can update the virtual environment in real-time, allowing users to experience an immersive experience. In industrial product design education, immersive virtual reality technology provides a new learning platform for teachers and students. By simulating real industrial production environments, students can conduct practical operations in virtual environments, thereby better mastering the relevant knowledge of industrial product design. By simulating real production processes, students can understand various aspects of industrial production and master practical operational skills. Immersive virtual reality can simulate fault scenarios in industrial production, helping students understand the methods and steps of troubleshooting.

CAD is a technology that uses computers and related software to design, analyze and optimize products. CAD can help designers to do 3D modeling, rendering, simulation and analysis of products, thus improving design efficiency. With the rapid development. Chai [4] explored the construction and implementation systems for art drawing mainly focus on graphic drawing, color filling, image processing, and other aspects. However, there are still some issues with these systems, such as complex operation, low level of intelligence, and lack of innovation. Therefore, the innovation of this article lies in constructing a simple, easy-to-use, intelligent, and innovative computer-aided design system for art drawing. Using programming languages and development tools, implement the functions of each module according to the requirements of system design. Specifically, it includes using efficient graphic rendering algorithms to achieve the rendering and editing of various graphics. Utilize a graphics library to achieve interface rendering and interaction functions. Realize data interaction between the database and other modules through data interfaces. The combination of AI and CAD can realize more intelligent and efficient design. For example, using ML algorithm to analyze and learn a large quantity of cultural creativity product design data, we can find design rules and trends, and provide inspiration and guidance for designers. In addition to its advantages in visual, spatial, and material representation. Chang et al. [5] explored the impact of virtual reality. Interactive learning environment refers to the creation of an interactive and collaborative learning space through technological means, promoting communication, cooperation, and knowledge sharing among learners. In this environment, learners can interact with virtual reality in various ways to gain a richer and deeper learning experience. Moreover, using CAD, the three-dimensional modeling, rendering and animation display of cultural creativity products can be carried out, which makes the design scheme more intuitive and concrete.

Traditional methods need to be tried and modified repeatedly, and the design efficiency is low and it is difficult to ensure the design quality. In the manufacturing process of molecular products, process design is a key link that directly affects the performance, quality, and production efficiency of the product. These factors may lead to fluctuations in process performance, which in turn can affect

product quality. Therefore, how to carry out of properties to improve the stability of process performance and product quality. Frutiger et al. [6] through experimental verification, we found that this optimization strategy can effectively improve the stability of process performance and product quality. Therefore, the combination of AI and CAD can effectively solve this problem. Lee et al. [7] elaborated on how immersive virtual reality design tools affect the educational insights of fashion designers. For fashion designers, immersive virtual reality design tools have significant educational value. Firstly, these tools can serve as powerful learning tools design, and production process of clothing. By practicing in a virtual environment, designers can gain a deeper understanding of fashion trends, explore innovative design concepts, and enhance their professional skills. Secondly, immersive virtual reality design tools provide designers with a platform to showcase design concepts and innovative achievements. On this platform, designers can showcase their works, receive immediate feedback and suggestions, and continuously improve their designs. This platform can also help designers establish their own portfolio and showcase their talents to potential customers and partners. The purpose of this article is to explore the optimization strategy of cultural creativity product art design based on AI and CAD. Therefore, this article constructs an AI-based optimization model of cultural creativity product art design, and makes a simulation study. This model uses SAA in AI technology to optimize the artistic design of cultural creativity products, and uses CAD to visually display and operate the optimized results. Its innovations are as follows:

(1) Compared with traditional design methods, AI technology can automatically analyze a large quantity of design data, mine design rules and trends, and provide designers with more accurate and intelligent optimization schemes.

(2) This article not only uses AI technology to optimize the artistic design of cultural creativity products, but also combines CAD to visually display and operate the optimized results. Designers and users can more experience the characteristics and advantages of cultural creativity products.

(3) This article constructs an AI-based optimization model of cultural creativity product art design, which effectively combines AI technology with CAD.

Firstly, art design is introduced in detail, including ML algorithm, natural language processing, computer vision and the concrete realization of CAD. Based on this, an AI-based optimization model of cultural creativity product art design is constructed, and the design ideas, implementation methods and optimization objectives of the model are introduced in detail. Finally, adopts a GAN based optimization algorithm for cultural and creative product art design. This algorithm trains the GAN model to learn the characteristics and laws of cultural and creative products, thereby generating products that are more artistic and creative. We used a large amount of cultural and creative product data as the training set, and used various evaluation indicators to evaluate the performance and effectiveness of the algorithm. In this article, AI and CAD are introduced into the optimization field of product art design in Cultural creativity, which can improve the design efficiency and ensure the design quality, and practice of product art design in Cultural creativity.

2 RELATED WORK

Liow et al. [8] used genetic algorithms to optimize product design. By inputting the performance requirements and other constraints of the product, genetic algorithms can automatically generate design solutions that meet the requirements. The optimization strategy for artistic design of cultural and creative products based on AI and CAD is effective and feasible. Both algorithms can effectively improve the quality and performance of cultural and creative products. But GAN based algorithms perform better in generating products that are more artistic and creative. Reinforcement learning refers to learning how to make optimal decisions through interaction with the environment and reward/punishment mechanisms. Machine learning has broad application prospects in art works and design laboratories. Through the application of machine learning technology, and the possibilities of creation, while also improving the efficiency and accuracy of design. Among them, 3D factory simulation software is increasingly receiving attention from the industry due to its unique advantages. Pelliccia et al. [9] During the design and planning stages, 3D factory simulation software

can assist designers in testing and verifying equipment. By simulating device operation, designers can check the performance, stability, and reliability of the device to ensure that it meets the requirements in practical use. It can also be used for operational training. By simulating real industrial environments and workflows, students can learn how to operate equipment and processes, improving their skills and proficiency. Simulation software can also be used for accident simulation and safety analysis. By simulating accident scenarios, designers can better understand the causes and consequences of accidents, and thus take effective safety measures to prevent accidents from occurring. With the development of technology, 3D factory simulation software has gradually enriched its functions and is now widely used in the simulation, optimization, and management of industrial processes. The enterprise first used a 3D model to conduct detailed modeling of factory layout, equipment, assembly lines, and other elements.

Then, virtual production testing and optimization are carried out through simulation software. After several rounds of iteration, the goal of increasing production efficiency by 15% was ultimately achieved. Pietroni [10] explores the practice and future development of digital communication within museums from three aspects: experiential design, virtual reality, and media integration. The are important directions for the development of museums in the digital era. By optimizing experience design, visitors' visiting experience and participation can be improved; Achieving more convenient visits and research; By utilizing media integration, various forms of media can be integrated and disseminated, expanding the influence and audience of museums. Multimedia display is the use of various media forms to display museum collections and exhibition content. In addition to traditional forms such as text and pictures, museums can also use various forms such as video, audio, and animation to present exhibition content more vividly and vividly. In addition, museums can also facilitate in-depth research and learning for scholars and audiences by establishing digital databases and other means. Pradhan and Dhupal [11] introduced the integration method equipment. Convert the data obtained from simulation and modeling into formats that CAD software can recognize, such as STEP, IGES, etc. By developing interface programs with CAD software, achieve interoperability between simulation and modeling data and CAD software. This requires developing corresponding data conversion and processing programs to import simulation and modeling data into CAD software. Design and optimize the hot abrasive jet machining device using CAD software. By visualizing the imported data, the structure and performance characteristics of the hot abrasive jet processing device, thereby optimizing the design. Feedback the optimized design to the simulation and modeling stages to verify and optimize the design scheme. Through repeated iterations, the design and performance improvement of the hot abrasive jet machining device are achieved.

The main function of this equipment is to extrude, mix, and shape dough containing a large amount of inclusions, making it into products of various shapes and specifications. With the increasing demand for food products from consumers, the performance. Salahuddin et al. [12] used three-dimensional computer-aided design (CAD) to conduct machines to optimize their performance and efficiency. By establishing a detailed model, we can explore the working principle of the machine, the movement mode of each component, and stress distribution. The key factors in modern product production. It not only helps designers achieve innovation and optimization in product design, but also improves product quality and production efficiency. Meanwhile, high-quality product design can win the favor and trust of consumers, bringing more market share and profits to enterprises. Therefore, the progress and development of computer-aided design are of great significance for modern product design and production. Using computer-aided design for product functional analysis can better understand consumer needs and design products that better meet consumer needs. Computer aided design can help designers achieve a balance between aesthetics and practicality in appearance design, making products more competitive in the market. Computer aided design can help enterprises achieve precise process planning, improve product quality and production efficiency in the production and manufacturing stage [13]. Cultural design elements represent the history, traditions, values, and cultural essence of a country or nation. Integrating these elements into the mobile application creative industry can enhance the brand image and user experience of the application, while inheriting and promoting national culture. A game application inspired by traditional Malaysian handicrafts. Samsuri et al. [14] enable users to understand and learn about the

traditional handicraft production process in Malaysia through rich hand drawn illustrations and unique game gameplay. While promoting traditional Malaysian culture, it also stimulates user creativity and enhances the fun of the game. An educational application that integrates traditional Malaysian architectural styles. This application uses 3D modeling and virtual reality technology to enable users to understand and learn about Malaysia's traditional architectural style and historical culture through interaction. Stochino and Lopez [15] delved into the application science and future development trends of simulated annealing optimization technology for reinforced concrete slabs. The simulated annealing optimization algorithm is based on the annealing process of solids, and gradually finds the optimal solution by implementing random perturbations on the objective function and evaluating their impact. Specifically, this algorithm allows for certain "errors" or "noise" during the search process, in order to find the optimal solution globally rather than falling into local optima.

In the optimization of building structures, simulated annealing optimization algorithms can help designers seek the best design solution for reinforced concrete slabs under various constraints such as strength and stiffness. The application effect of simulated annealing optimization technology for reinforced concrete slabs is significant. By comparing the performance indicators before and after optimization, we can find that the optimized reinforced concrete slab exhibits better performance in terms of design parameters, bearing capacity, and cost. Su et al. [16] explore modern interior design art in Dunhuang, and analyze its expressive forms and aesthetic characteristics. In traditional interior design, designers usually need to spend a lot of time and effort on drawing design drawings, making models, and so on. Designers can visually present the unique architectural style and decorative elements of Dunhuang, such as caissons and murals. At the same time, innovative design can also be carried out based on modern aesthetic needs, combining tradition with modernity. In virtual environments, the performance of sound effects is also very important. By collecting and reproducing traditional Dunhuang music, a rich cultural atmosphere and sense of history can be created in the design. Augmented reality (AR) technology provides unlimited possibilities for innovation in traditional products. Tosida et al. [17] aim to explore how to use AR technology to enhance the sustainable imaging of Kujang products, further expanding their cultural connotations and commercial value. By designing an AR system based on local culture, the aim is to enhance the user experience of Kujang products and promote their inheritance and development. Users observe Kujang products through AR glasses and trigger the image recognition and tracking module; The virtual scene generation module generates corresponding virtual scenes based on the recognition results. Users interact with virtual scenes, and interactive data is recorded and stored. The data storage and analysis module processes and analyzes data, providing a basis for system optimization.

The experimental results indicate that AR technology based on local culture can significantly enhance the sustainable imaging effect of Kujang products. By observing and evaluating user reactions and feedback in the experiment, it can be found that this combination not only enhances the fun and attractiveness of the product, but also makes it more culturally valuable and commemorative. Xu et al. [18] explored the products encounter AR (augmented reality) technology. Through experimental research, it has been found that using augmented reality technology to showcase historical and cultural creative products can significantly improve consumers' evaluation of the products. The experimental group using augmented reality technology to showcase historical and cultural creative products had significantly higher evaluations of the products compared to the control group. In the discussion, the researchers analyzed possible reasons: augmented reality technology. In addition, augmented reality technology has also provided new channels, cultural, and creative products, allowing consumers to more conveniently understand and experience the products. Zhang [19] explores how to apply as well as its potential impact and prospects. Virtual reality technology can be used to create realistic historical scenes or cultural phenomena. Enable students to intuitively understand and experience history and culture, thereby improving teaching quality and effectiveness. For example, by simulating the life scenes of ancient people, students can learn historical knowledge in practice, enhance memory and understanding. Through virtual reality technology, viewers can "travel" to ancient cities or civilizations and experience the life and cultural atmosphere of that time. This display method not only enhances audience participation, but also enables better inheritance and protection of cultural heritage. Consumers can experience the design

and functionality of products through virtual reality technology. This sales method can not only increase product recognition and attractiveness, but also reduce marketing costs and improve efficiency. Designer emotional analysis refers to the method of analyzing the emotional reactions exhibited by designers. Emotional analysis by designers is of great significance for improving design quality and efficiency. Zhou et al. [20] future development direction of designer sentiment analysis. In collaborative design, designer sentiment analysis can help identify communication barriers and conflicts between designers, thereby promoting communication and cooperation among designers. Meanwhile, by analyzing the emotional reactions of designers, one can understand their needs and preferences.

3 OPTIMIZATION MODEL OF CULTURAL CREATIVITY PRODUCT ART DESIGN BASED ON AI AND CAD

Although some achievements have been made in the previous research in related fields, there are still some shortcomings:

(1) Lack of interpretability of algorithms: Many researches rely on ML algorithms such as deep learning, but these algorithms have poor interpretability and are difficult to explain their decisions and behaviors.

(2) Lack of user participation and feedback: The existing research mainly focuses on the design methods and technologies, but less on user participation and feedback. However, the purpose of cultural creativity product art design is to meet users' needs and preferences, so users' participation and feedback is very important for the success of design.

(3) Lack of application: Many research achievements have made some progress in theory, but they have not been widely used and verified in the actual artistic design of cultural creativity products. All this limits the practical application value of the research results and the promotion of cultural creativity industry.

And then constructs an AI-based optimization model of cultural creativity product art design, and introduces the design idea, implementation method and optimization goal of the model in detail. In recent years, AI and CAD have been more and more widely used in the artistic design. AI technology can provide strong support for the artistic design of cultural creativity products, including design inspiration, design scheme and design optimization. For example, AI can find design rules and trends cultural creativity design data, and provide inspiration and guidance for designers. Moreover, AI can also optimize and improve the design scheme according to the needs of designers and market feedback. CAD provides an effective means to realize the artistic design of cultural creativity products. CAD can realize three-dimensional modeling, rendering, animation display and other operations of cultural creativity products, and help designers transform design schemes into specific Cultural creativity products. In addition, CAD can also optimize and improve Cultural creativity products according to market demand and user experience, and improve the competitiveness of products.

In short, the application of AI and CAD can help designers to better explore and create unique and aesthetic works. For example, the ML algorithm can be used to automatically optimize the color, shape, material and other characteristics of cultural creativity products, thus improving the aesthetics of products. Moreover, using CAD, the products of cultural creativity can be finely designed and manufactured, which makes the products more in line with market demand and user experience. In this section, the construction process of cultural creativity product art design optimization model based on AI and CAD will be introduced in detail. And visually display and operate the optimized results by using CAD.

3.1 Optimization Model Construction of cultural creativity Product Art Design

This model uses SAA in AI technology to optimize the artistic design of cultural creativity products, and uses CAD to visually display and operate the optimized results. First of all, we need to collect a lot

of data about the artistic design of cultural creativity products. These data can include historical design data, market feedback data, user evaluation data, etc. Through the analysis and processing of these data, we can understand the design rules and trends, and provide data support for subsequent model training. Moreover, the collected Cultural creativity product design data should be cleaned, duplicated and marked to meet the input requirements of SAA. Then, it isneeded to establish a mathematical model for the optimization of cultural creativity product art design. This includes defining the concept and scope of design variables, establishing mathematical expressions of design objectives and constraints, and determining the solution method of optimization problems. The probability here is defined as:

$$p = \exp\left(\frac{-\Delta E}{kT}\right) \tag{1}$$

The product form is mainly based on modeling elements, and different images are expressed through the combination of different sample elements. In this article, the distance and area characteristics between any two points on the model surface are used to calculate the eigenvalues of the modeling structure. Assume that two sampling points are:

$$P_1\ x_1, y_1, z_1\ ; P_2\ x_2, y_2, z_2 \tag{2}$$

$$d^2 = x_1 - x_2\ ^2 + y_1 - y_2\ ^2 + z_1 - z_2\ ^2 \tag{3}$$

$$dis\ M_1, M_2\ = \sum_{i=1}^{500}\sum_{j=1}^{100}\left|m_{ij}\ 1\ - m_{ij}\ 2\ \right| \tag{4}$$

Compared with product modeling design based on traditional algorithm, SAA is more conducive to simulating the detailed design process in design thinking. The basic process is shown in Figure 1.

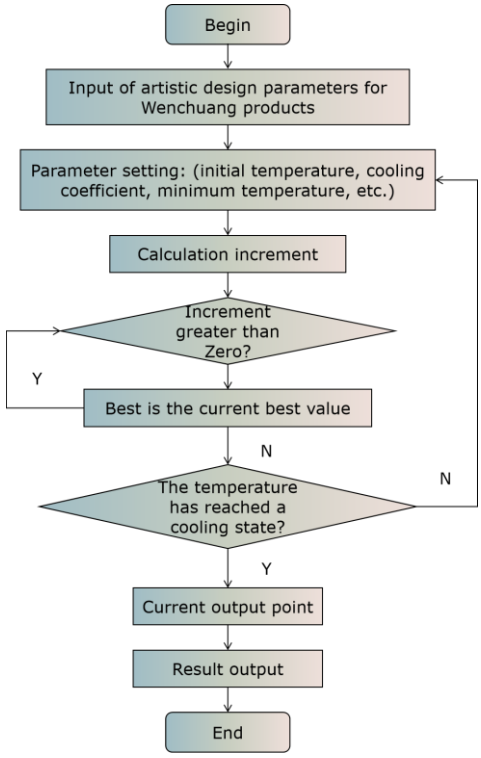

Figure 1: Basic process of SAA.

Specifically, the realization method of the optimization model of cultural creativity product art design based on SAA mainly includes the following steps: ⊖ Parameter setting: according to the characteristics and requirements of cultural creativity product art design optimization, set SAA parameters, including initial temperature, cooling coefficient, minimum temperature and so on. ⊜ Problem coding: Code the parameters and objective function of cultural creativity product art design, so as to facilitate SAA's search and optimization. ⊛ Initialization: Initialize the state of SAA according to the result of problem coding, including the initial values of design variables and optimal solutions. ④ Iterative search: On the basis of initialization, SAA starts iterative search. In each iteration, a new candidate solution is generated according to the current state. ⑤ Result output: After a certain quantity of iterations, SAA converges to the optimal solution or the optimal solution meeting certain accuracy requirements. At this time, the artistic design parameters of cultural creativity products corresponding to the optimal solution are output, and the optimization results are visually displayed and operated by using CAD. Firstly, this article sets the initial state of SAA according to the problem example:

$$I\begin{bmatrix} a_1 & a_2 & \cdots & a_n \\ b_1 & b_2 & \cdots & b_n \\ c_1 & c_2 & \cdots & c_n \end{bmatrix} \tag{5}$$

$$\Delta f = f\ \ j\ \ - f\ \ i \tag{6}$$

Let the feature vector of sample x_i be expressed as:

$$a_{i1}, a_{i2}, a_{i3}, \ldots, a_{im} \tag{7}$$

Firstly, the analysis is made according to the quantity of edges and the area of the surface, and the calculation methods of their similarity are as follows:

$$Se_{ij} = 1 - \frac{n_i - n_j}{\max\ n_i, n_j} \tag{8}$$

$$Sa_{ij} = 1 - \frac{\left| a_i - a_j \right|}{\max\ a_i, a_j} \tag{9}$$

$$\varphi = \begin{cases} 0, & T_s = 0 \\ \alpha_1 Se_{ij} + \alpha_2 Sa_{ij} & T_s = 1 \end{cases} \tag{10}$$

Where α_1 and α_2 represent weight values, and:

$$\alpha_1 + \alpha_2 = 1 \tag{11}$$

SAA seeks the optimal solution of the problem by introducing an annealing process similar to that in physics. In the process of solving the model, SAA is used to search and optimize the design variables to achieve the design goals and meet the constraints. After the model is solved, the optimization results are visually displayed and operated by CAD. Specifically, according to the optimization results obtained by SAA, the shape, color and material of cultural creativity products can be improved and adjusted by CAD. Moreover, simulation test and effect evaluation can be carried out to ensure that the optimized design scheme can meet the actual needs.

3.2 Visual CAD Display of Cultural Creativity Design

After the training of cultural creativity product art design optimization model is completed, this article uses CAD to visually display and operate the optimization results. Specifically, the shape, color and material of cultural creativity products can be improved and adjusted by using CAD according to the optimization results of model output. Moreover, simulation test and effect evaluation can be carried out to ensure that the optimized design scheme can meet the actual needs.

In this article, three-dimensional animation display of cultural creativity products is combined with discrete distributed control method, and the CAD visual display of artistic design of cultural creativity products is combined with IoT technology and embedded technology. In this article, the grid structure is selected for the full-area grid design of three-dimensional animation display of cultural creativity products, and the three-dimensional animation display area of cultural creativity products is constructed in four vertices. These vertices will form a quadrilateral instead of two triangles, and the process of generating the entity module for obtaining the CAD visualization of cultural creativity products is shown in Figure 2.

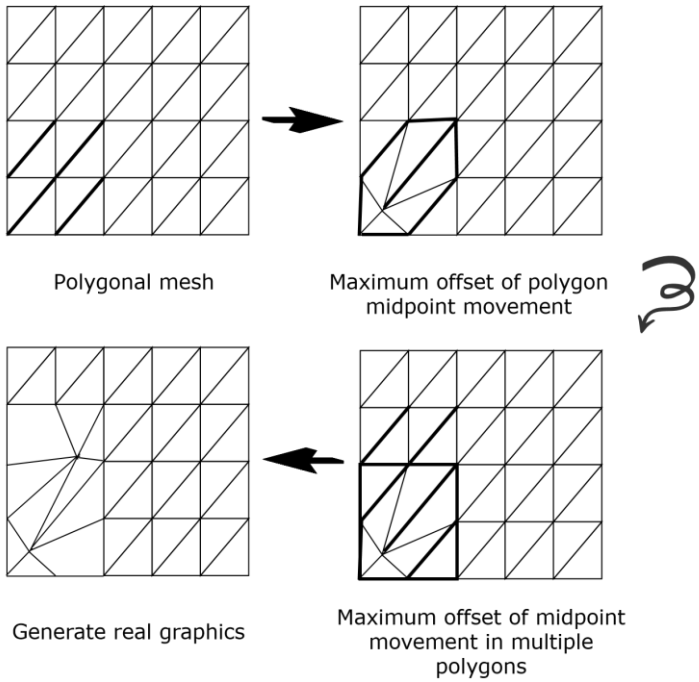

Figure 2: The generation process of entity module for CAD visualization of cultural creativity products.

The main optimization goal of cultural creativity product art design optimization model based on AI and CAD is to improve design efficiency and ensure design quality. By introducing SAA, the artistic design of cultural creativity products can be automatically optimized and the design efficiency can be improved. Moreover, by using CAD for visual display and operation, we can intuitively understand and evaluate the optimization results and ensure the design quality. In this article, VegaPrime editor is used to load three-dimensional programs, and the three-dimensional animation objects of cultural creativity products are represented with different precisions. According to the changes of observation points, the rendering modules of different three-dimensional animations of cultural creativity products are selected, and the spatial distribution model of three-dimensional animation display of cultural creativity products is constructed. As shown in Figure 3, it is the artistic design image of the original Cultural creativity product.

Through the visual display of CAD, designers can observe and evaluate the design details and effects of the optimized model more intuitively. For example, designers can observe different angles and details of the model by rotating, zooming and moving. You can also change the visual effect of the model by adjusting the settings of materials and light sources, so as to better explore and create design inspiration. As shown in Figure 4, the artistic design image of cultural creativity product after optimization of rendering is displayed.

Figure 3: Original Cultural creativity product art design.

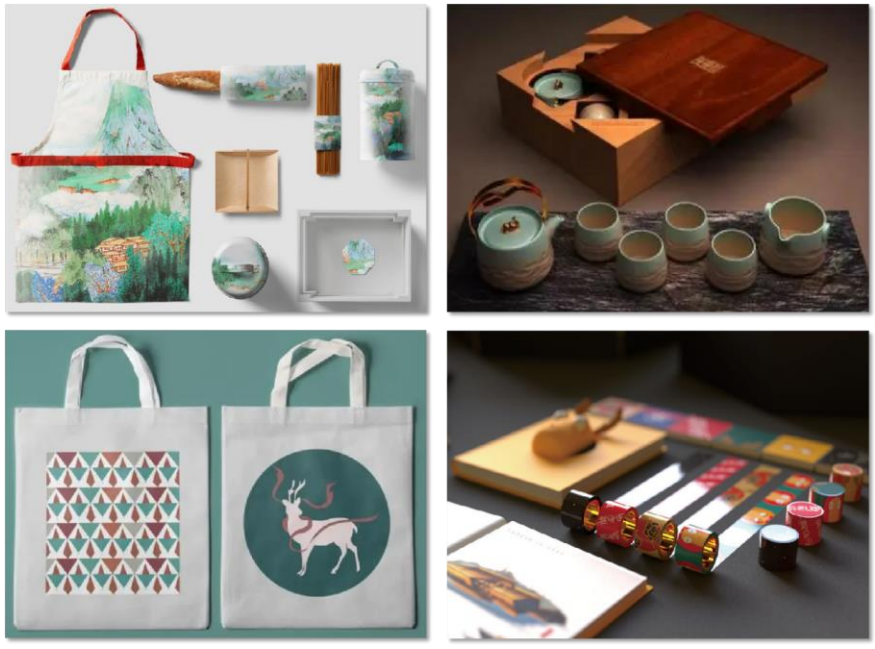

Figure 4: Render the optimized Cultural creativity product art design image.

In addition to visual display, CAD also provides a wealth of operating tools and adjustment means, enabling designers to interact and adjust Cultural creativity products in real time. For example, designers can cut, stretch and scale the model through tools in CAD software, and observe the changes of the model in real time. Moreover, designers can also use parametric tools in CAD software to make parametric adjustments to the model. These parameters can be design variables or

constraints, and designers can explore different design schemes and observe the changes of the model by adjusting these parameters. Through the operation and adjustment of CAD, designers can explore and create more flexibly, making the design more efficient, accurate and beautiful.

4 SIMULATION STUDY

This section adopts the method of simulation research to carry out experiments and analysis. Specifically, this section uses SAA to train and predict Cultural creativity's product art design optimization model, and uses CAD to visually display and operate the model.

SAA is an effective method to solve combinatorial optimization problems, but its performance and quality of results are affected by many factors. By analyzing the experimental results and adjusting the algorithm parameters and methods, the performance and quality of SAA results can be improved. In this article, the implementation process of simulated annealing is shown in Table 1, and algorithm mining is performed 546 times.

Number of executions	*Temperature*	*Adaptive value*
1	900.3	10
2	960.1	9
3	950.6	8
…	…	…
269	50.3	4
…	…	…
546	34.2	0

Table 1: Simulated annealing execution process.

The speed of obtaining the optimal solution by different optimization algorithms is shown in Figure 5. According to the comparison in Figure 5, we can compare and analyze the speed at which SAA, Particle swarm optimization (PSO) algorithm and GA get the optimal solution.

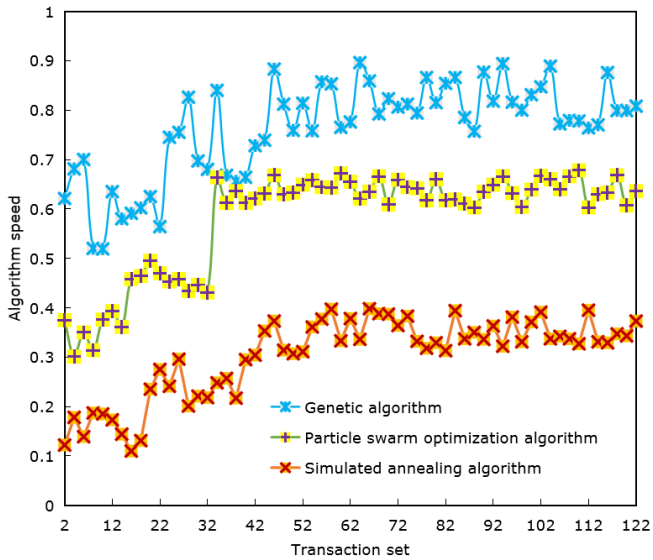

Figure 5: Speed comparison of optimization algorithms.

First of all, as can be seen from Figure 5, the speed of the proposed SAA to get the optimal solution is the fastest, which can reach 0.341s s. This shows that SAA has fast convergence speed and efficiency in solving the optimal solution. This is because SAA not only considers the value of the objective function, but also considers the influence of random disturbance in the iterative process, so that it can find the optimal solution in a short time. Secondly, PSO and GA are relatively slow in solving the optimal solution. This is because PSO and GA mainly rely on the cooperation and information sharing of individuals in the group in the iterative process, and this cooperation and information sharing mechanism will lead to the slow convergence of the algorithm. In addition, PSO and GA are relatively complex in parameter setting and adjustment, which will also affect their convergence speed and efficiency.

To sum up, by comparing and analyzing the speed of obtaining the optimal solution by different optimization algorithms, we can draw the following conclusions: the proposed SAA has higher efficiency, and can find the optimal solution in a short time; However, PSO and GA are affected by group cooperation and information sharing mechanism, parameter setting and adjustment, and the speed of solving the optimal solution is relatively slow.

In this experiment, different initial temperature, cooling coefficient, minimum temperature, initial solution and iteration times are set to observe the influence of these parameters on the accuracy and efficiency of SAA. Moreover, this article tries different acceptance criteria to find a better search strategy. Figure 6 shows the accuracy of SAA. Figure 7 shows the accuracy comparison of the three algorithms.

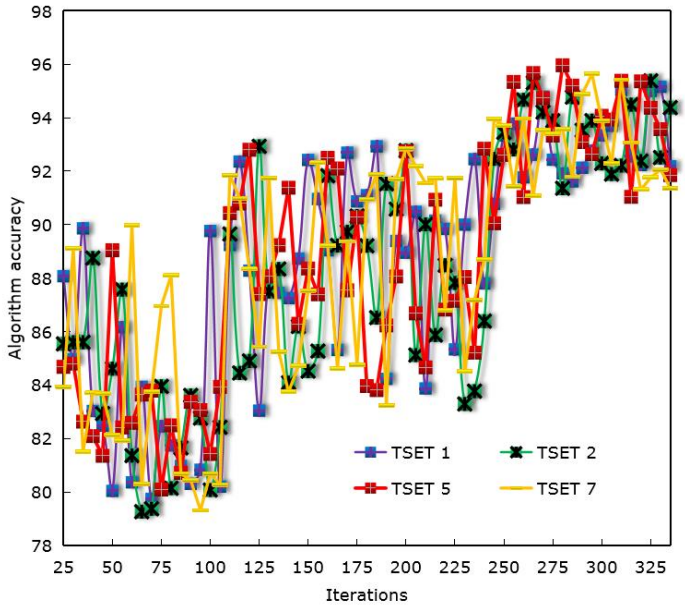

Figure 6: Accuracy of SAA.

With the increase of iteration times, the accuracy of the proposed SAA is gradually improved. After the quantity of iterations reaches a certain value, the improvement of accuracy gradually slows down and finally approaches 100%. The results are better than those of PSO and GA. This result shows that SAA can gradually approach the optimal solution after a certain quantity of iterations, and achieve high accuracy. The improvement of SAA accuracy is closely related to the selection of initial solution, cooling coefficient and minimum temperature. In the iterative process of the algorithm, the initial solution provides a good starting point, but with the iteration, the algorithm will gradually deviate from the initial solution and gradually approach the global optimal solution.

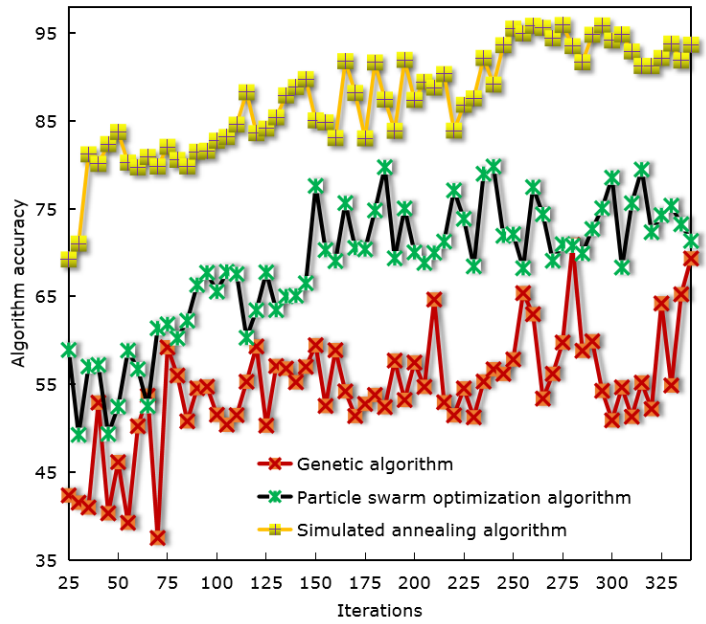

Figure 7: Accuracy comparison of three algorithms.

The cooling coefficient and minimum temperature control the convergence speed and search range of the algorithm, and appropriate parameter. In addition, the accuracy of SAA is also affected by the complexity of the problem and the acceptance criteria. For more complex problems, the algorithm needs more iterations and finer parameter settings to obtain higher accuracy. The acceptance criterion determines the acceptance degree of the new solution in the iterative process, and reasonable acceptance criterion can improve the global search ability and accuracy of the algorithm.

To sum up, by analyzing the accuracy of SAA, we can draw the following conclusions: with the increase of iteration times, the accuracy of the proposed SAA can reach more than 90%, and finally close to 100%; The improvement of the accuracy of the algorithm is closely related to the selection of initial solution, cooling coefficient and minimum temperature. Factors such as problem complexity and acceptance criteria will also affect the accuracy of the algorithm. In practical application, appropriate parameters and methods can be selected according to the characteristics and requirements of specific problems to improve the accuracy and efficiency of SAA.

Firstly, the experiment collects and sorts out the relevant data of cultural creativity products, including the size, shape and material of cultural relics. Secondly, the 3D solid model of cultural creativity product is built by using 3DSMAX software, and it is finely carved and modeled. According to the actual material and texture of cultural creativity products, the three-dimensional solid model is mapped with material and texture to make it highly realistic. Then, in 3DSMAX software, according to the display scene of cultural creativity products, the lighting, environment, atmosphere and other settings are set to render Cultural creativity products with high quality. Using the animation function of 3DSMAX software, the products of cultural creativity are dynamically displayed, such as rotation, scaling, movement, etc., so as to present its three-dimensional sense and dynamics. Finally, the three-dimensional solid model and animation display of cultural creativity products are integrated into the CAD visual display system to realize the interactive display of cultural creativity products. In this experiment, different parameter settings are adopted, including model accuracy, material quality, rendering resolution, animation speed, etc., to optimize the quality of output results. The specific output result is shown in Figure 8.

Figure 8: CAD visual display of cultural creativity products.

The output results of the CAD visual display system of cultural creativity products designed by 3DSMAX software have high quality and stability. It is embodied in the following aspects: ⊖ The three-dimensional solid model is accurately constructed, and the shape, structure and details of cultural creativity products are accurately presented. ⊜ The mapping of materials and textures has a strong sense of reality, which can well restore the original features and texture of cultural creativity products. ⊛ The scene rendering effect is excellent, and the lighting, environment, atmosphere and other settings are reasonable, which makes Cultural creativity products have a good visual effect in the display scene. ④ The ability of three-dimensional animation display is strong, which can realize all kinds of dynamic, and enhance the audience's three-dimensional. ⑤ The output of the system is stable, and both the 3D solid model and the animation display can maintain stable effect and quality. CAD visual display of cultural creativity products, and has strong 3D animation display ability of cultural creativity products and good output stability.

A large quantity of simulation experiments has been carried out in this section. The results verify the effectiveness and feasibility of the design based on AI and CAD. By comparing the performance and effect of different algorithms, the superiority of SAA. This shows that the optimization strategy of cultural creativity product art design and ensure the design quality. This provides practical experience and theoretical support for further popularization and application of AI and CAD in Cultural creativity industry.

5 CONCLUSIONS

Through experimental research and case analysis, we can find that these technologies can improve the efficiency, some typical artistic design cases of cultural creativity products are selected in the experiment, and they are optimized through the model. By introducing AI technology and CAD into the art design field of cultural creativity products, intelligent and convenient design tools and methods, and also provides strong technical support and theoretical guidance for the growth and innovation. Generally speaking, the research results have certain guiding significance for promoting the application and growth of AI and CAD in Cultural creativity industry.

In the future, with the continuous growth of AI and CAD, the optimization strategy of cultural creativity product art will have a broader application prospect. For example, AI technology flow of cultural creativity products. You can also use CAD to achieve more refined product design, manufacturing and application operations. Therefore, it isneeded to further study and explore the application and development trend of AI and CAD in Cultural creativity product art design in the future.

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