Hindawi
Scientific Programming
Volume 2022, Article ID 8495381, 13 pages
https://doi.org/10.1155/2022/8495381

Research Article

A Novel Method for Handicrafts Design Based on Fusion of Multi-Intelligent Decision Algorithm

Xiaotian Sun

School of Architecture and Design, Beijing Jiaotong University, Beijing 100000, China

Correspondence should be addressed to Xiaotian Sun; xtsun@bjtu.edu.cn

Received 22 November 2021; Revised 9 December 2021; Accepted 13 December 2021; Published 3 January 2022

Academic Editor: Sikandar Ali

Copyright © 2022 Xiaotian Sun. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the rapid development of artificial intelligence, handicraft design has developed from artificial design to artificial intelligence design. Traditional handicraft design has the problems of long time consumption and low output, so it is necessary to improve the process technology. Artificial intelligence technology can provide optimized design steps in handicraft design and improve design efficiency and process level. Handicrafts are regarded as important social products and exist in people's daily life. In the current society, many people do handicrafts and there are major exhibitions. Furthermore, the display of handicrafts is also very grand and shocking. In the design of handicrafts, the traditional design method cannot completely keep up with the production speed and efficiency of handicrafts. Therefore, this paper adopts the fusion multi-intelligent decision algorithm of multi-node branch design in the design method of handicraft. The algorithm model combination is used to analyze and design the layout of the handicraft, which speeds up the design efficiency and production of the handicraft. In this paper, two intelligent algorithms will be used for fusion; they are genetic algorithm and GA-PSO fusion algorithm obtained by particle swarm optimization and they are embedded in handicraft design method for application through mathematical model construction and function construction. After comparing the performance parameter index data of three intelligent algorithms and GA-PSO fusion algorithm, it is obtained that GA-PSO fusion algorithm is 97% correct and has 82% readability, 72% robustness, and 61% structure, making it have better important indicators. Four algorithms optimize each design problem in all aspects of handicraft design at present. Design efficiency, image distribution rate, image optimization degree, and image clarity are compared by simulation experiments. Compared with three intelligent algorithms, traditional design methods, and manual design methods, GA-PSO fusion algorithm can effectively improve the design method and design effect of handicrafts with 92.1% design efficiency, 82.7% image distribution rate, 94.3% image optimization degree, and 84% layout void rate. Finally, the space complexity experiment of four algorithms shows that GA-PSO algorithm can achieve 9.73 dispersion with 11.42 space complexities, which makes the dimension reduction relatively stable, and the algorithm can maintain stability in the design and application of handicrafts.

1. Introduction

Decision support system should be able to provide various auxiliary means for decision-making, such as information collection, transmission, and processing. However, even in the environment with the same information, different decision-makers may make different decisions, which is related to many factors such as the decision-makers' attitude towards risks and the decision criteria they adopt. For the decision-making of complex systems or major problems, in order to improve the accuracy and scientificity of decision-making, it is often necessary to make group decision-making or multilevel decision-making [1]. Therefore, the decision support system must combine and merge multiple decisions to get the final decision. The two following problems need to be solved [2]. First, the basic decision criteria in decision theory include Laplace and Savage maximum and minimum regret criteria [3]. They have their own scope of application, and no criterion is optimal under various conditions. Comprehensive application of various criteria can often lead to the most satisfactory decision. Second, many decision-makers often have inconsistent decision results due to factors such as information possession and their own characteristics [4]. The usual group decision-making theory of equality between groups cannot be fully applied when integrating multiple decisions and considering the credibility and importance of decision-makers. To solve the above problems, distributed intelligent decision support system should be introduced [5], and decision fusion mechanism is the core problem. We have noticed that the artificial neural network (ANN) [6] has attracted people's attention because of its organizational structure and learning ability similar to human brain. Although it is not perfect, some research results are widely used in function fitting, automatic control, optimization, and so on. Arts and crafts design in today's society has been completely integrated into people's lives, affecting every field of people's life, so it has become unrealistic to use a single style to create design. Therefore, in the face of such an environment [7], we should constantly innovate and widely use a variety of innovative thinking and creative research to make changes in our lives. Innovative thinking expresses a comprehensive way of thinking, including innovative thinking, thinking in images, and reverse thinking, so it is a cutting-edge design method to integrate perfectly in handicrafts. There are many advantages and benefits in this design method. This can promote the efficiency of people's handicraft design, greatly increase the number of finished products of handicrafts, and greatly save human resources [8]. In industrial production, in real life, in administrative management, and in scientific research practice, we often adopt the cooperation type of horizontal decision in multiagent system, That is, each agent in a cooperative group can solve problems independently [9]. By using the knowledge and data of different agents to reason or adopting different reasoning mechanisms, different decision-making schemes can be obtained, and then the credibility of solutions can be greatly improved through the interaction between agents. Multiple agents in a multiagent system will produce a variety of different decision-making schemes. In this situation, it is inevitable to sort them out [10]. Only then can the interaction and cooperation among multiple agents in the system be further carried out to obtain a solution with higher credibility [11]. These different intelligent architecture individuals are distinguished by decision research and analysis, and we can set their different advantages and disadvantages to build them in turn. In the recent twenty years, the research on the ranking of decision-making schemes in different fields and industries has entered a very brand-new development stage and achieved considerable results. After finding the noninferior set of multiobjective decision-making problems by decision-making method, these solutions may not meet the requirements of decision-makers. How to eliminate the solutions that do not meet the requirements of decision-makers from the noninferior set needs to retain the feasible solutions that meet the wishes of decision-makers [12]. This often requires some information sources and information channels at a higher level [13], and these information sources and data need to determine the final optimal solution according to the specific analysis of decision-makers. Some are nonprofessional, some are qualitative, and some are accumulated by experience [14]. Based on the research of multi-intelligent decision-making algorithm in this paper, the noninferior solution set can be further optimized by adaptively adjusting membership function to integrate this information, which makes the final decision-making result more humanized [15]. Finally, the feasibility and efficiency of multi-intelligent decision-making algorithm for handicraft design method are understood through the simulation comparison experiment in this paper. It makes the multi-intelligent decision-making algorithm realize the algorithm design method, and brings good news to people's quality of life.

2. Fusion Decision Algorithm

Fusion multi-intelligence algorithm is no stranger in today's society, which often brings many conveniences to people's scientific research and social progress. Fusion algorithms generally adopt the way of data fusion, which is a way to fuse models and algorithms for multisensor or single-sensor contents, so that the calculation processes of algorithms can interact with and dissolve each other. Different fusion data algorithms are adopted for different application problems.

BP model and GA algorithm are used in many artificial neural network model [16]; BP network model is the most widely used. Its algorithm is based on minimizing quadratic performance index function, which can also be called cost function.

$$E = \frac{1}{2}\sum_{j=1}^{L}\sum_{i=1}^{m}\left(C_{ij} - C_{ij}\right)^2, \tag{1}$$

where L is the number of sample variables generating training and C_i is the calculated output value of the network output of the j-th sample at node i. C_{ij} is the expected output value. By learning part of the data of the sample, the numerical generation from the input n-dimensional Euclidean space domain to the output m-dimensional Euclidean space is completed [17]. Therefore, it can be used to complete nonlinear classification problems and predict data development and other problems; that is, it can be used in the prediction of military field, submarine cable, and handicraft design. However, the classical BP network mainly has some defects such as slow convergence, poor stability, and easiness to fall into local minima, which greatly limits the application and popularization of neural network.

$$\begin{aligned} &2^{mi-1} \le \left(w_{\max} - w_{\min}\right) \times 10^n \le 2^{mi-1},\\ &C - E = 2^n - 1,\\ &p_i = \sum_{i=1}^{f_i/M} f_i. \end{aligned} \tag{2}$$

This is a formula variable of genetic operation [18], P_i is the individual fitness value obtained in i adaptive individuals, and the product value of the number of crossover operators in f_i dimension can get the number of variants in the variable, which reflects the information interaction frequency of biological heritage in biology.

$$f_i = \sum_{i=1}^{j} m \sum_{j=1}^{m_1} \frac{1}{2} if\ g_1(x) \leq 0 \text{ and } \min_{X \in D}\{f_1(X), f_2(X), \ldots f_n(X)\}. \quad (3)$$

However, a brand-new decision-making algorithm for information construction and processing structure was studied for specific unilateral problems. This can also be called the correlation of multiple data sources, the multidirectional synthesis of data sources, the multi-sensor mixing of decision algorithms, and so forth. However, a relatively more accepted name is the information source fusion method of data multisensors, which can also be referred to as fusion decision algorithm for short. Because of the universality and diversity of its research contents, it is very difficult to give a unified definition of data fusion at present. Thus, the optimal position of the evaluation scheme is derived [19], and then the optimal solution is obtained by comprehensive evaluation of distance measurement for each measured advantage distance.

$$\begin{aligned} h(F(X)) &= h(f_1, \ldots, f_n) = \sqrt{\sum_{j=1}^{n} \left(f_j(X) - f\right)^2}, \\ f_j^0 &\leq \min_{X \in D} f_j(X) j = 1, 2, \ldots, n. \end{aligned} \quad (4)$$

According to the objective function, the important weight parameters of the solution to $f1(x), f2(x), \ldots, fn(x)$ are given in advance, and the objective function solution is obtained by satisfying the following formula:

$$\begin{aligned} &\lambda_j \geq 0, j = 1, 2, \ldots, n; \sum_{j=1}^{n} \lambda_j = 1, \\ &h(F(X)) = h(f_1, \ldots, f_n) = \max_{1 \leq j \leq n}\left\{f_j(X)\right\}, \\ &\min_{X \in D} h(F(x)) = \min_{X \in D}\left\{\max_{1 \leq j \leq n} f_j(X)\right\}. \end{aligned} \quad (5)$$

This method is generally applicable to the optimization proposition of two objectives; namely,

$$\begin{cases} f_1(X) \geq 0, f_2(X) \geq 0 X \in D \\ \min f_1(X) \\ \max f_2(X) \end{cases}. \quad (6)$$

This is generally a technology that uses the unique technology of computer to automatically analyze the information collected, observed, and obtained by sensors with different numbers obtained by the algorithm of time sequence division and cooperation under certain specific criteria. Then, optimization and synthesis are carried out to complete the final decision-making algorithm and the information cooperative processing process for multitask processing [20]. According to this definition, various sensors are the basis of data fusion; for example, they can be used to construct and solve nonlinear programming problems.

$$\begin{aligned} \max_{X \in D} h(F(X)) &= \max_{X \in D} \frac{f_2(X)}{f_1(X)}, \\ h(F(X)) &= \frac{f_2(X)}{f_1(X)}. \end{aligned} \quad (7)$$

By constructing the first range parameter and the second range parameter of the linear solution and of the nonlinear solution $f1(x)$ and $f2(x)$, the optimal solution of the specific problem of $h(F(x))$ can be obtained by constructing the function curve equation.

$$\begin{aligned} x_m^{k+1} &= v_1^k + c_1 \cdot r_1 \cdot \left(p_m^k - x_i^k\right), \\ x_1^{k+2} &= x_{in}^k + v_{in}^k. \end{aligned} \quad (8)$$

The crossover operation in evolutionary algorithm also introduces the HPSO [21] model of PSO. Firstly, the crossover mechanism selects the particles to be crossed from the particle swarm with certain crossover probability and then constructs new particles called offspring particles by random crossover operation. The position and velocity of offspring particles are as follows:

$$\begin{aligned} &child_1(\vec{x}) = p * parent_1(\vec{x}) + (1.0 - \vec{p}) * parent_2(\vec{x}), \\ &child_2(\vec{x}) = p * parent_2(\vec{x}) + (1.0 - \vec{p}) * parent_1(\vec{x}) \end{aligned} \quad (9)$$

Multisource information is the processing object of data fusion, which is small and accurate. The commonly used fusion algorithm model is based on PCA. It combines the associated coefficient matrix to construct the mathematical model, calculates the eigenvalue and eigenvector of the eigenmatrix, and then calculates the value range of data and obtains images. It is very suitable for the design field of handicrafts and can accurately and quickly calculate the layout mode and characteristics of images. The flow chart of fusion algorithm in the field of handicraft design method is shown in Figure 1.

3. Design Method and Evaluation Index

3.1. Design Method of Handicrafts. In our life, as far as handicrafts are concerned, they can be divided into two categories from the design point of view. One is daily handicrafts, and the other is furnishings handicrafts. From ancient times to the present, in the historical evolution and modern society, the characteristics of handicrafts and their artistic forms can be roughly divided into three categories: traditional handicrafts, modern craft products, and folk self-made handicrafts [22]. The handicraft design discussed in this paper only refers to daily handicraft design and modern art craft design. Design has its own peculiar regularity, so we must deeply study the design principle, design method, and design art and guide the design work with this result, so that the multi-intelligent decision-making algorithm can make model construction and fusion calculation for handicraft design. This kind of design is scientific and can improve the

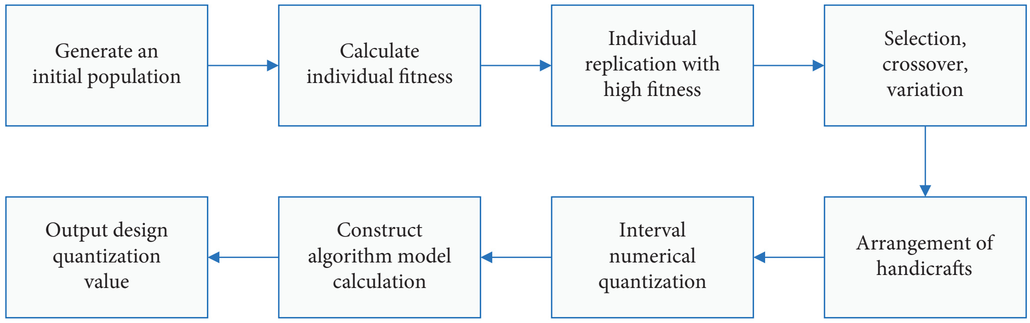


FIGURE 1: Flow application diagram of fusion decision algorithm to handicraft design method.

design efficiency of handicrafts. The goal of process engineering is to obtain high-quality arts and crafts works. For decades, handicraft design has been an individual and handicraft labor. For a question raised, designers can invent a way to solve it at will, without any rules and regulations to follow [23]. But when entering the period of mass production, it is no longer the result of individual but the result of collective labor, so the first problem facing design is discipline and institutionalization. The birth of a design involves many people, including customers and two aspects of designers. There are many people on each side. Everyone has different opinions and understandings. In this way, there will be different solutions to different problems. If the design period is long, even if it is designed by the same person, there will be different understandings and problem solving methods for the design in different periods. Moreover, with the gradual improvement of scientific and technological level, there is more choice to deal with problems. In process design, there is a lack of strong internal discipline, and each person can do his own thing at will, and then this way will be doomed the subsequent development to cause crisis [24]. Therefore, according to the future development prospect of art design, this paper puts forward the research and recommendation of design method integrating multi-intelligent decision algorithm. This makes the design of handicrafts have a sequential, quality, and efficient process algorithm to design. There is also a standard standardized design for the standardized index of a certain art design. Because various design methods have different degrees of flexibility, tentative, design methods cannot solve problems with simple processes like vending machines [25]. But although the design method here can be constructed by using algorithms, the ability to innovate and image needs to be created by people. Therefore, it is not realistic to fully automate the design of handicrafts. Tools are only one aspect, which is only used to assist the design. The design method puts forward clear working steps, workflow, and standard document format, which is the basis of the design tool, so the research method is the forerunner of the research tool [26], and the realization of the tool promotes the development of the method. The combination of method and work is environment. As far as this article is concerned, design method of handicrafts based on fusion of multi-intelligent decision algorithms, a tool transformation, a set of systematic design methods, and a set of supporting design tools are carried out on the design method of handicrafts, which provides a good design environment that can cover the whole design process for the staff, and the designers can produce handicrafts like auto production line in the workshop. The design flow chart of modern handicrafts is shown in Figure 2.

3.2. *Evaluation Index of Mathematical Model.*

In fuzzy theory, for n-dimensional vectors a and b, fuzzy sum operation can be defined as the following mathematical formula model. In this model, we can see the definition and operation mode of fuzzy theory. The number of branches in vectors is obtained, and other functions are constructed by the number of branches, which is somewhat similar to genetic algorithm. In this mathematical model, T_j is a variable, which controls the variable of material selection. In this interval, it can be obtained by dimension index I, and b is a fuzzy subset of a, so that the fuzzy degree of fuzzy subset of W_j can be obtained.

$$\begin{aligned}(a\Lambda b)_i &= \min\left(a_i, b_i\right), \quad i = 1, 2, \ldots., n, \\ T_j &= \frac{\mathrm{I}\Lambda\omega_j}{\alpha + \omega_j}, \quad j = 1, 2, \ldots., N.\end{aligned} \tag{10}$$

In the model, the input of the neuron passes through the weights representing the connection strength, and the weights can be positive or negative. By calculating the weighted input, the neuron ignites under the action of a certain control signal to obtain the output value of y, which depends on the change interval domain of function f. In this interval domain, the value of y changes positively with the change of f, showing a positive trend.

$$\begin{aligned}y &= f\left(w^t x - h\right), \\ u_j &= \max\{u_1, u_2, \ldots..u_m\}, \\ \frac{\partial f}{\partial x} &= w \cdot f \cdot (1 - f).\end{aligned} \tag{11}$$

Because each subsystem is relatively independent, for distributed systems, local decision-making is more trainable, and the accuracy of local decision-making determines the final decision-making of the system. We can train each subdecision administrator, which is often more feasible than the overall situation. Work is simple and easy to learn. The algorithm is divided into two stages: feedforward calculation

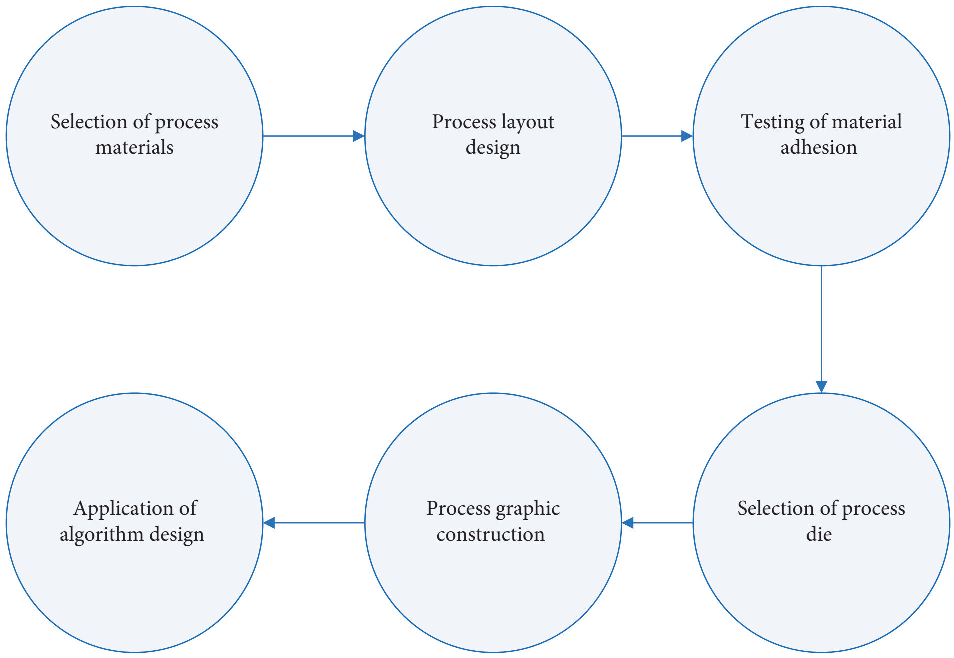


FIGURE 2: Flow chart of handicraft design.

stage and reverse adjustment stage. The weights are adjusted to make the system model conform to the provided samples. The initial weights can be defined as the mean value; that is to say, all kinds of decision models and decision makers have the same weights, and then they are trained from practical experience to improve the system performance.

$$E_j = \partial^2 \frac{\partial f}{\sqrt{u_j^2 + y^2}},$$
$$\sum_{y=1}^{m} u_j = \lim_{x\longrightarrow\infty} \partial^2 \frac{\partial x}{u_j^2 + 1}. \tag{12}$$

Firstly, the fitness value $E(A_i)$ of each code string A_i in the current population is calculated, and the total fitness value F of the population is calculated; then the probability of each code string being selected will be calculated, and the calculation formula is as follows:

$$P_i(A_i) = E\frac{(A_i)}{F} = \frac{E(A_i)}{\sum_{i=1}^{n} E(A_i)},$$
$$F = \{f(x)|x \in X\},$$
$$\sqrt{P_j} = E(A_i)^2 \cdot \partial^2 \cdot w_j (1 - f), \tag{13}$$
$$\text{Min}\, y = w_1 \cdot f_1(x) + w_2 \cdot f_2(x) + \cdots w_k \cdot f_k(x).$$

The advantage of this method is that it is simple, feasible, fast, and effective and it can effectively decompose single-level data. With the effective solution of the fluctuation point value in the normal fluctuation interval domain, in genetic algorithm, the optimal solution can be effectively obtained. When the variable values of F and P_j are not fixed, $\min_y$ generated by fluctuation can decompose the discreteness of the algorithm. Then the weight parameters of $E(A_i)$ can be obtained by corresponding weights and parameter weights. Weight coefficient can be interpreted as other goals. The importance of this goal can reflect the intention of decision-makers. When the importance of multiple objectives is not clear, the decision-maker can solve the problem by changing the structural solution of the weight value in the mathematical model; that is, a set of initial values are given first, and a noninferior solution is obtained by calculation, and then a new noninferior solution is obtained by adjusting the weight coefficient value according to the step increment coefficient.

$$\max_{x\in X} \max\left\{f(x) = \left(f_1(x), f_2(x)\right)^T\right\},$$
$$\frac{df_2}{df_1} = -2f_1 \le 0,$$
$$u = \sum_{i=1}^{n} w_i \times f_i(x), \tag{14}$$
$$\max f_1 = \frac{x_1^2}{4} + \frac{x_2^2}{4},$$
$$\max f_2 = -\frac{x_1}{3} + \frac{1 - x_2}{3}.$$

Since this problem does not involve weight parameters, the weight values of $f1$ and $f2$ are equivalent by default, so this multiobjective intelligent decision-making algorithm is transformed into a single-objective intelligent optimization decision-making algorithm problem, which can be expressed as follows:

$$\max_{x\in X} f(x) = \max_{x\in X}\left(0.5\times\left(\frac{x_1^2}{4}+\frac{x_2^2}{4}\right)+0.5\times\left(-\frac{x_1}{3}+\frac{1-x_2}{3}\right)\right),$$
$$\mu_F(x) = 1-\left(\sum_{i=1}^{m} w_i^q\right)d_q(x),$$
$$\mu_F(x) = w\left(\frac{4-x}{3}\right)+(1-w)\left(\frac{-(x-3)^2+4}{4}\right). \quad (15)$$

When the difference between the fitness value of the individual with greater fitness and the average fitness value of the population and the average fitness value of the population in the strings to be crossed is small, in order to eliminate a single inferior individual, *Pc* should be relatively large. On the contrary, *Pc* should take a smaller value, so as to prevent individuals with high fitness from being eliminated in the evolution process. When the difference between the fitness value of the string to be mutated and the average fitness value of the population is small, *Pm* should be larger in order to eliminate the numerical individuals with poor fitness; on the contrary, in order to protect the excellent individuals, *Pm* should take a smaller value interval domain appropriately, so that, through different algorithm calculation and experimental research, we can get the crossover probability and effectively reduce the error range and balance the weight parameters with the weight parameter coefficient index. The value can be determined.

$$H(x) = -\sum_{i=1}^{n} p_i \log\ p_i,$$
$$\mathrm{Info}_A(D) = \sum_{j=1}^{v}\frac{\left|D_j\right|}{D}\times Info\left(D_j\right),$$
$$C_\alpha(T_t)_1 = C(T_t)+a(T_t)\cdot w_i^2,$$
$$\alpha = \min\left\{\frac{C(T)-C(T_t)}{(T_t)-1},\alpha_{\min}\right\}, \quad (16)$$
$$p(c|w) = \frac{p(w|c_i)p(c_i)}{p(w)},$$
$$H = -\sum_{i=1}^{n} p\left(x_i \log_2(px_i)\right).$$

This method is a linear regression algorithm for intelligent decision algorithm. $C\alpha$ obtained by this algorithm can be constructed by genetic algorithm. When H is not assigned value, the range of P can be solved, and, on this basis, the regression linear equations can be obtained. By this way, the layout mode of layout matrix of handicraft design can be obtained, and the energy layout matrix can be quantified. Finally, the weight coefficient method of handicraft can be obtained by the solution of variance coefficient.

4. Method Comparison

4.1. Data Selection of Handicraft Design Experiment. Among the numerous handicrafts in the market, the random variable extraction method is used to select several popular handicrafts at present, and three different materials of handicrafts, namely, iron handicrafts, modern handicrafts, and copper handicrafts, are selected in turn to study and analyze them. At present, most iron handicraft production enterprises specifically complete the selection, design, production, and sales of iron handicrafts. In this way, its corresponding raw materials are a kind of iron handicraft mold with rectangular shape with relatively fixed parameters in length, width, and height. The design and birth of every handicraft have all its meanings. First of all, they all need designers to design a structural model of handicrafts in advance. There is a general design idea and concept. It is expanded from the designed model to get its platform diagram. Then, according to the number of all materials at present and the image distribution interval displayed after the plane figure is expanded, as well as the proportion and image size of the image distribution law, the layout of the layout image and the calculation of the number and cost of the consumed materials are, respectively, carried out on the rectangular thin plate mold prepared in advance, and then the handicraft is cut and constructed according to the accurate layout result just obtained by the layout step by step, and finally the handicraft is assembled and processed. In all the design and manufacturing processes, the problem we need to deal with is some ordered layout of all the lumps and irregular shapes of the handicraft model after large-scale plane unfolding. The goal is to greatly improve the speed of nesting, and, compared with the original manual nesting material, utilization rate increased by about 3%. Through this, it is obvious that it is very difficult to get the optimal solution interval of the layout matrix problem. As soon as I looked at it, the solutions to irregular layout can be roughly divided into three categories, which all use the array sequence equivalent to matrix shape to carry out regular and planned layout. The layout method based on this matrix sequence and the nested intelligent decision algorithm are presented. Considering the complexity of layout of irregular shapes, through the analysis of the steps, a relatively successful and simple way will be firstly used to solve the layout problem, that is, to use the matrix shape layout method to solve the layout area problem of the selected handicrafts. Therefore, the first problem to be solved is how to transform irregular layout into rectangular layout. At this point, we once again go through the simple way of cycling step by step. The operation steps of orderly combination are carried out on some irregular places, so that the irregular arrangement figures think the rectangular array as closely as possible, and make them look like a rectangular arrangement as much as possible. The layout of three different materials will be different. In the layout of copper handicrafts, there will be some deviation in the layout graphics using the optimized multi-intelligent decision-making algorithm. All the histograms for the selection quantity of handicrafts with three different materials are shown in Figure 3, which shows the quantity and scale selected in the handicraft design method for intelligent decision-making algorithm.

4.2. Performance Index of GA-PSO Fusion Algorithm. Particle swarm optimization (PSO) is a very common intelligent algorithm, which can be decomposed into some characteristics, such as the average particle saturation degree. Some basic processes are to calculate the sum of the external values of related particles and the corresponding weights in the surrounding area of particle activity and then get the result value. The weights of each relative particle in the average saturation of particle swarm are the same, and the weights of particles are scattered according to the distance from the relative test distance to the termination distance. This data processing method cannot distinguish the edge activity information of particle swarm optimization. For example, after the particle activity is intense, a simple improvement method is to set a certain threshold. When the distance between the number of particles in the active interval and the difference between the central particles is greater than the threshold value, the weight is set very small, even zero. Therefore, it is slightly different from the original algorithm for the relatively close particle activity region itself. For the edge region, when the particle weight value changes greatly, it can effectively retain the original information, reduce the activity frequency, and retain the edge distance weight information. Genetic algorithms usually do not need search and other external information about the evolution process but use evaluation functions to evaluate the advantages and disadvantages of individuals or solutions, which is only the basis of future genetic operations. In genetic algorithm, the fitness function must be compared and classified, and then the selection probability is calculated to make the fitness function positive. In many cases, we need to map the objective function to the function with maximum and nonnegative values. The operation of selecting higher individuals from the population and excluding lower individuals is called selection. The selection operator is sometimes called the regeneration operator. The purpose of selection is to transfer the optimized individual directly to the next generation or to get a new individual through pairing and crossover operation with the next generation. This selection operation is based on the evaluation method of individual fitness index area in the group, and the most commonly used selection operators are fitness proportion method, random sampling method, and local selection method. Artificial neural network is also a common intelligent algorithm. Neural network can be known from its algorithm name as a kind of data simulation of human brain. It contains similar neuronal structure with the human brain, and its mode of action is close to imitating the human brain, but it is only a rough imitation, far from reaching a comprehensive level. Different from the tentative construction put forward by scientists, neural network calculates an intelligent algorithm model which is nondigital, imprecise, and highly parallel and has self-learning function. Generally speaking, common nerve cells are generally called neurons, which are the most basic unit of the whole neural structure. Every nerve cell has some internal connections, so neurons are intricately connected together to form artificial nerves. Signals are transmitted to each other, and the transmitted signal can go to the range of change interval of neuron potential, so once the potential is higher than the given prevalue, it will cause intense movement of each neuron, and the induction of this neuron will transmit electrical signals through axons in each neuron. GA-PSO fusion algorithm is obtained by data function fusion of genetic algorithm and particle swarm optimization. As shown in Figure 4, GA-PSO fusion algorithm has superior calculation mode and computational complexity and can deal with some problems in handicraft design more effectively.

It can be seen from Figure 4 that the correctness of artificial neural network is only 14%, and the structure is only 34%, but the robustness and finiteness are relatively high, reaching 52% in a relatively saturated state, and the readability and structure are relatively stable. The correctness of genetic algorithm is relatively high, reaching 63%, but the readability is poor, only 11%. Particle swarm optimization algorithm is average in all aspects, but the robustness is low, only 17%, the correctness is not high enough, only 52%, and the finiteness is only 12%. On the other hand, as regards the performance numerical index of GA-PSO fusion algorithm after the fusion of the two intelligent algorithms, it can be seen that the performance indexes of the four algorithms are very excellent and average, with only 61% relatively poor structure, which is 10% higher than the second highest genetic algorithm compared with the three algorithms. It can be seen that the GA-PSO fusion algorithm, which is based on the fusion of artificial neural network, particle swarm optimization, and genetic algorithm, effectively expands the performance indexes such as correctness, readability, robustness, structure, finiteness, and certainty of the algorithm. It can be used to construct mathematical model and function in the field of handicraft design, and it can show a positive trend for the problems in handicraft design.

4.3. Experimental Comparison of Fusion Algorithm. There are some problems in contemporary handicraft design; these are often caused by people who cannot control them artificially. In this paper, the algorithm and fusion algorithm for layout problems encountered in contemporary handicraft design are used to simulate handicraft design, so as to improve the design level of handicrafts. Compare the simulation experiment data of layout gap, image processing, handicraft design effect, and so forth, build algorithm model, build function to process the plane structure of handicraft materials, form simulation diagram in the machine through algorithm function calculation, and then carry out typesetting design and pattern simulation design for handicraft design. Layout problem is a complete data problem with the highest complexity. For the layout of rectangular sheet metal, its complexity is closely related to the geometric characteristics of the layout object. At present, there is no

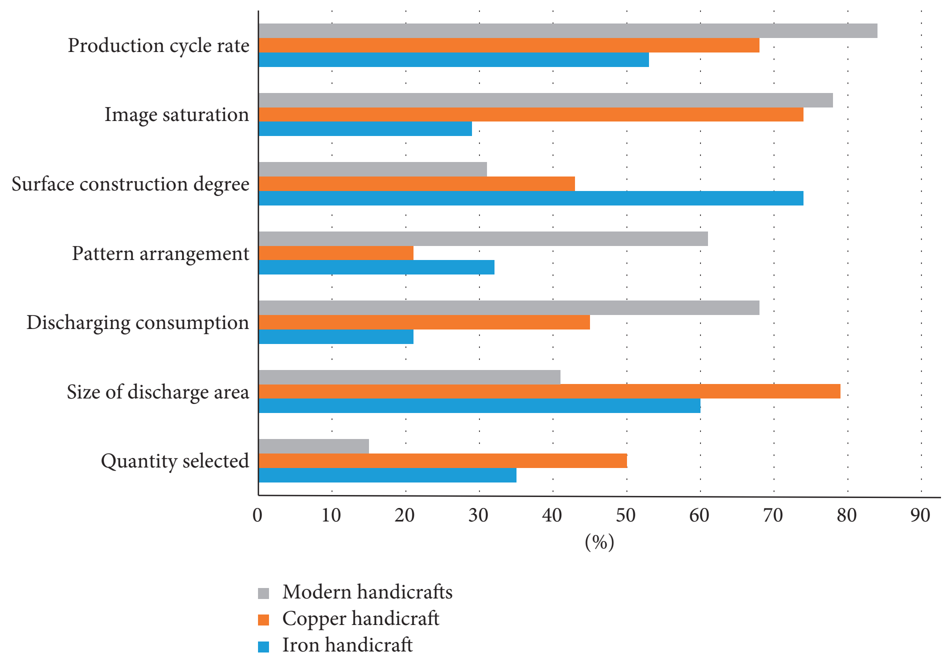


Figure 3: Artwork selection and layout data diagram.

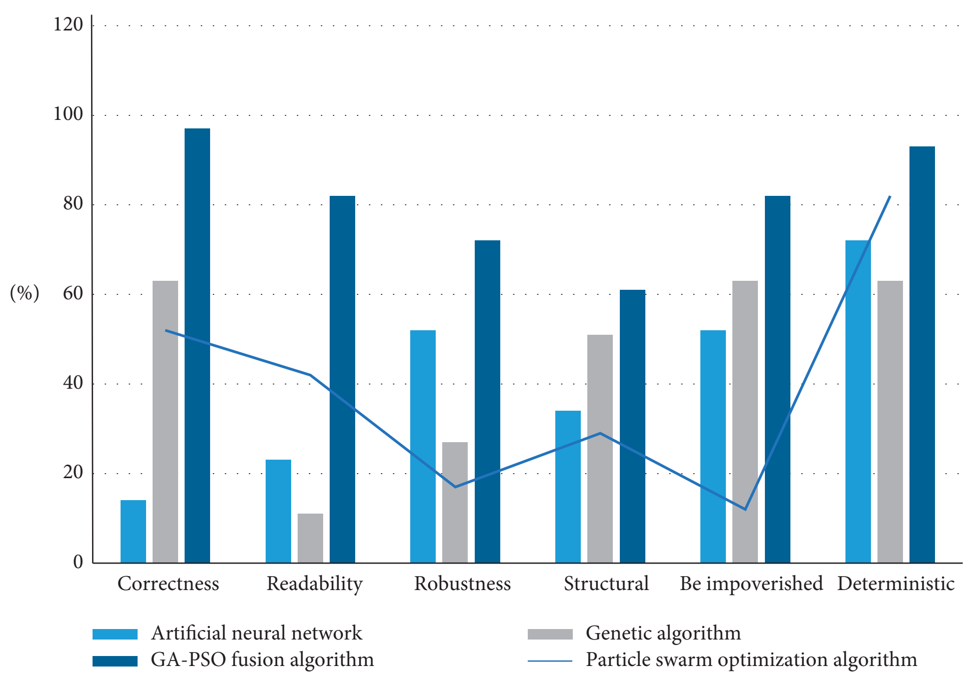


Figure 4: Comparison of experimental data of performance index between intelligent algorithm and GA-PSO fusion algorithm.

effective solution for irregular layout, but, in practical application, it is necessary to get the optimal solution in the shortest possible time or a feasible solution close to the optimal one. Aiming at genetic algorithm, particle swarm optimization, artificial intelligence network, and GA-PSO fusion algorithm, the design efficiency, image distribution rate, image optimization, layout gap, surface smoothness, image clarity, color filling, and other issues of handicraft design are embedded and calculated to calculate the corresponding numerical values for data comparison and analysis. According to genetic algorithm, several problems in handicraft design are built and embedded, and the data obtained are shown in Figure 5.

It can be seen from this that, in the construction of genetic algorithm function for several design problems and optimization of handicraft design, compared with the traditional handicraft design, there is a particularly obvious improvement and optimization, which improves the method of handicraft design and the art of handicraft design to a certain extent. In four important design problems, the

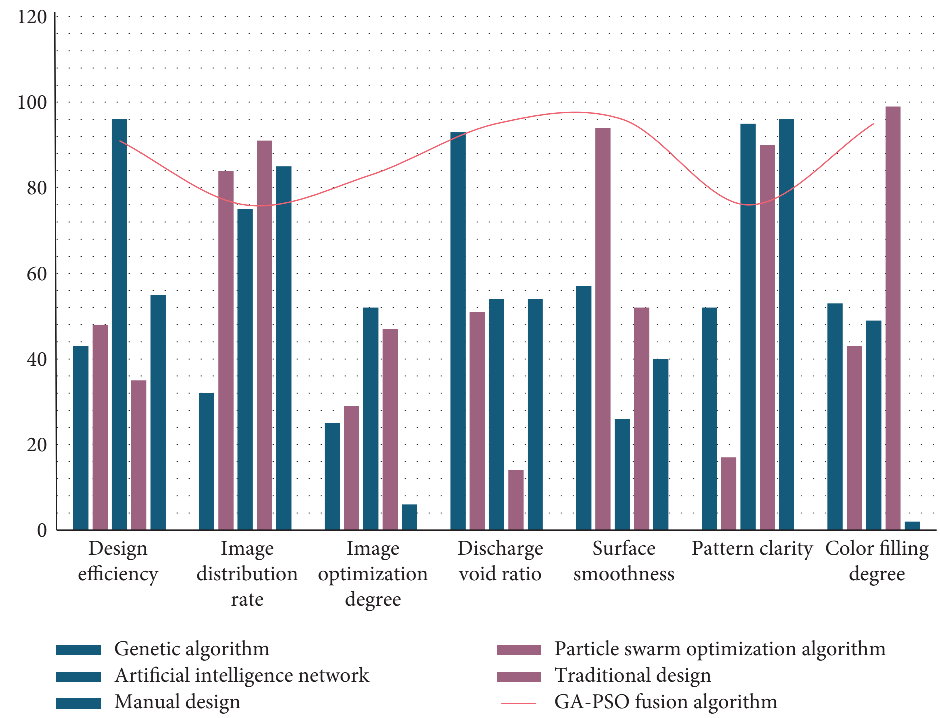


Figure 5: Data comparison diagram of integrating multi-intelligent algorithm in dealing with handicraft design problems.

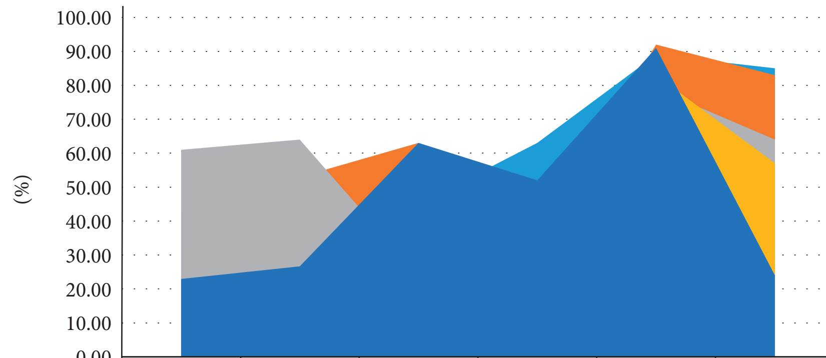
design efficiency of genetic algorithm is improved by 19.9%, the image distribution rate is improved by 18.5%, the image optimization degree is improved by 19.1%, and the layout void rate is improved by 40%. The data of artificial neural network, particle swarm optimization, and genetic algorithm in these seven design problems are relatively stable. Compared with the three algorithms, GA-PSO fusion algorithm is more excellent and has obvious improvement in seven design problems of handicrafts. Compared with traditional design process and manual design, GA-PSO fusion algorithm has more leading data value, only 87% in image distribution rate and image clarity but more than 90% in the other five aspects.

Combining artificial neural network with genetic algorithm, in particle swarm optimization and GA-PSO fusion algorithm, there are many problems in handicraft design. Aiming at the image problems of handicrafts, such as image integration, pattern running-in degree, material combination rate, pixel fusion degree, and art design degree, it needs to invest a lot of manpower and financial resources to construct the algorithm model of traditional algorithm and manual design and production. Therefore, for the image problems of these handicraft designs, the algorithms are built and embedded, and finally the results are shown in Figure 6.

It can be seen from Figure 6 that, in the comparison of simulation experimental data of handicraft design between GA-PSO algorithm and manual design, in the problems of design efficiency and image distribution rate, the manual design method is lower than the construction design method of GA-PSO fusion algorithm. Manual design is only 85% of the image integration. In the problem of pattern running-in degree, manual design is only 83%, but it is higher than the other three intelligent algorithms in these two aspects. In pixel fusion degree and material combination degree, manual design reaches 57% and 64%, which are higher than those of the other three intelligent algorithms. The GA-PSO fusion algorithm performs better in these five problems. In the algorithm combination rate, due to the complex structure of GA-PSO fusion algorithm in the combination, it can not only fully show the ability to deal with problems, but it shows a better ability to deal with the other four handicraft design problems.

There are many problems need to be optimized in the design of craftwork, such as the stickiness of the layout, the turnover rate of the layout, the local polishing degree, the cost of the material, and the composite degree of the material. However, the traditional design methods are often ignored or have many loopholes. The GA-PSO fusion algorithm is obtained by fusing the multi-intelligent algorithm and the other three intelligent algorithms. By solving these problems in genetic algorithm, particle swarm optimization, and artificial neural network, we can get the data comparison diagram shown in Figure 7, and we can see the performance and some special features of intelligent algorithm and GA-PSO fusion algorithm in dealing with these problems.

It can be seen from Figure 7 that genetic algorithm and artificial neural network are relatively average in dealing with the layout problem in handicraft design. The data comparison between the two intelligent algorithms is relatively smooth. There is little volatility. Compared with these two intelligent algorithms, particle swarm optimization has some advantages in dealing with layout problems. It is just not too much. The local polishing degree is even lower than those of the two algorithms. However, GA-PSO fusion algorithm can also show the advantages of processing speed and data in the



	Traditional design	Genetic algorithm	Artificial neural network	Particle swarm optimization algorithm	GA-PSO algorithm	Manual design
Image integration degree	42.20%	31%	45%	63%	89%	85%
Pattern running-in degree	32.40%	53.00%	63%	34%	92%	83%
Material combination ratio	61.00%	64.00%	24%	35.00%	79.00%	64%
Pixel fusion degree	11%	25%	21%	42%	83.00%	57%
Degree of art design	23%	27%	63%	52%	91%	24.00%

Figure 6: Comparison of experimental data of GA-PSO fusion algorithm for handicraft design problem.

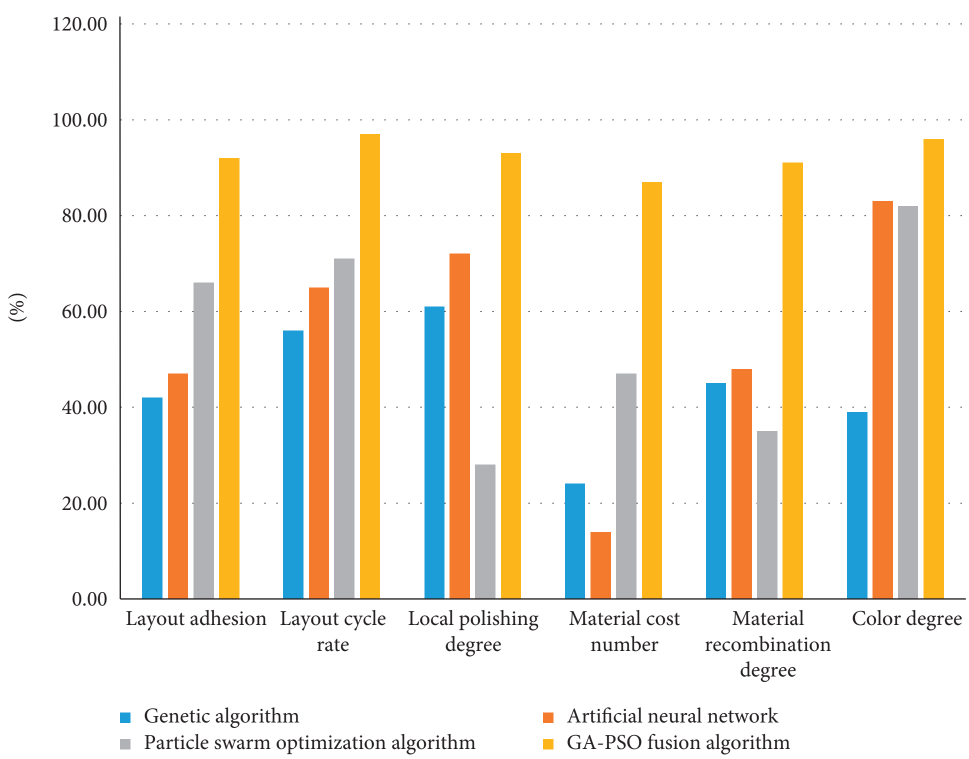
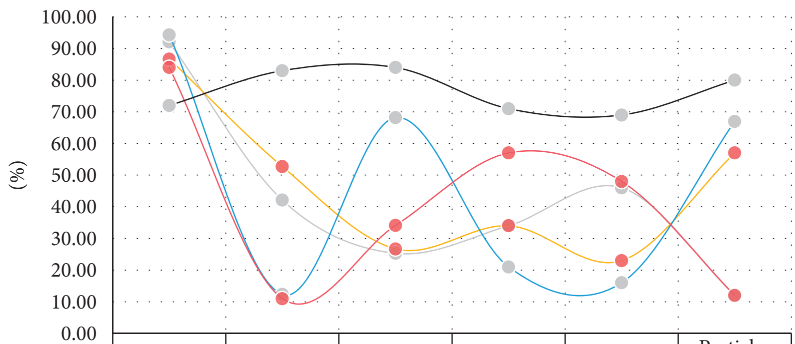


Figure 7: Data comparison graph of fusion multi-intelligent algorithm in handicraft design problem.

layout problem, both of which reach about 90% of the data. When the three intelligent algorithms deal with the most difficult problem of material cost, GA-PSO fusion algorithm can also approach saturation with 87% of the data.

GA-PSO fusion algorithm is obtained by data fusion of particle swarm optimization and genetic algorithm. The multi-intelligent fusion algorithm is embedded in handicraft design after mathematical model modeling and function construction fusion. On the issue of handicraft design, the traditional design, and manual design, three other intelligent algorithms are compared by simulation experiments. The experimental data diagram is shown in Figure 8. From the diagram, it can be seen whether the multi-intelligent GA-PSO fusion algorithm can improve some overall processing



	GA-PSO fusion algorithm	Traditional design	Manual design	Genetic algorithm	Artificial neural network	Particle swarm optimization algorithm
Image inkjet degree	92.10%	42.10%	25.30%	34%	46%	12%
Resin separation rate	86.70%	52.70%	26.70%	34%	23%	57%
Degree of resin painting	94.30%	12.30%	68.20%	21%	16%	67%
Model engraving rate	84%	11%	34.10%	57%	48%	12%
Overall polishing degree	72%	83%	84%	71%	69%	80%

Figure 8: Data comparison diagram of integrating multi-intelligent algorithm to deal with handicraft processing problem.

problems in the handicraft design method and whether the design method can be optimized and the design effect can be improved. Therefore, the simulation experiments are carried out on the image inkjet degree, resin separation rate, resin painting degree, model engraving rate, and overall grinding degree.

From Figure 8, we can see the design of handicrafts after GA-PSO fusion algorithm formed by fusing genetic algorithm and particle swarm optimization algorithm. The fusion algorithm combines the functions of genetic algorithm and particle swarm optimization algorithm, which shows the advantages of the two algorithms. In the application field of handicraft design, the fusion multi-intelligent algorithm far exceeds the traditional design method and manual design method in dealing with five handicraft design problems. This makes GA-PSO fusion algorithm faster and more accurate in handicraft design method and more accurate and delicate in image processing. GA-PSO fusion algorithm reaches 92.1% in image inkjet degree, 86.7% in resin separation rate, 94.3% in resin painting rate, 84% in model engraving rate, and 72% in overall polishing degree. Therefore, it can be seen that the fusion of multi-intelligent algorithm is quite effective for the model building of handicraft design method. It can also bring a positive development trend to the current handicraft design.

4.4. Spatial Complexity Comparison Experiment. The model construction based on GA-PSO algorithm after merging the two algorithms is complicated. Function fusion is easy to change dimensions, so, based on the fusion multi-intelligent algorithm obtained after fusing the two algorithms, the spatial complexities of the three intelligent algorithms are compared, and the dimensionality reduction processing degree and the error index interval of the weights of the four algorithms can be obtained. In order to minimize the small errors in the application of the algorithm in the field of handicraft design, the stability of handicrafts produced fluctuations and scattering. Therefore, the experiment of space complexity is carried out to reduce the error as much as possible, so that the multi-intelligent algorithm can better show the advantages and efficiency of handicraft design in the field of handicraft design. The experimental data for comparing the spatial complexity of the multi-intelligent fusion algorithm with those of the other three algorithms are shown in Figure 9.

From Figure 9, we can see the GA-PSO algorithm obtained by fusing the two algorithms. Although the spatial complexity increases to 11.42, the performance of dispersion does not increase much, but it is only 1.41 higher than particle swarm optimization, and it is also relatively stable in dimension reduction. In artificial intelligence network, the space complexity is not high, only 4.37, but the dispersion reaches 8.32, and the dimension reduction is low, which can make the calculation of function relatively stable. Therefore, in the fusion of multi-intelligent algorithm for the application of handicraft design, algorithm construction can be carried out, which is suitable for solving the problem of handicraft design method and can effectively optimize the design effect of handicrafts. The performance parameters of GA-PSO algorithm are compared through simulation experiments. By comparing the correctness, readability, robustness, and experimental data with

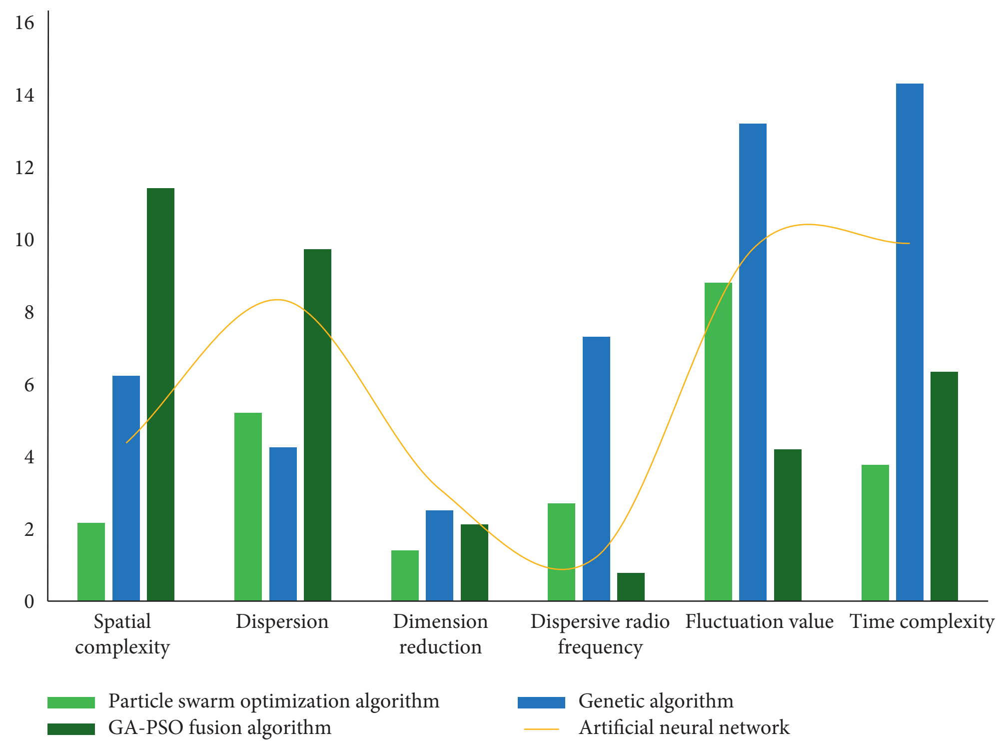


Figure 9: Spatial complexity comparison data graph between multi-intelligent fusion algorithm and three algorithms.

structured and finite certainty, it is concluded that GA-PSO fusion algorithm has 97% correctness, 82% readability, and 72% robustness and 61% structure, and the main performance parameters of this algorithm are much higher than those of the other three algorithms. It makes the advantages of the algorithm play a better role in solving some common problems in the handicraft design method.

5. Conclusion

In this paper, the three intelligent algorithms are compared with GA-PSO algorithm, which is a fusion multi-intelligent algorithm for data fusion of genetic algorithm and particle swarm optimization algorithm. The performance parameters of GA-PSO algorithm are compared by simulation experiments. Through the correctness, readability, and robustness of the algorithm, the experimental data are compared with the structural and finite certainty. It is concluded that the GA-PSO fusion algorithm has 97% correctness, 82% readability, 72% robustness, and 61% structure, and the main performance parameters of this algorithm are much higher than those of the other three algorithms, which makes the advantages of the algorithm play a better role in solving some common problems in handicraft design methods. In the particle swarm optimization algorithm, genetic algorithm, artificial neural network, and other intelligent algorithms combined method with the traditional design and manual design in the handicraft design efficiency, image distribution rate, image optimization degree, and discharge porosity are compared and analyzed. The simulation experiments on many problems in handicraft design, such as image clarity, show that the three intelligent algorithms are far inferior to GA-PSO fusion algorithm in dealing with problems in handicraft design, and the GA-PSO fusion algorithm can improve the design effect of handicraft design with a high degree of image optimization of 94.3%, improve the design method with a design efficiency of 92.1%, and improve the aesthetics of image distribution with a distribution rate of 86.7%. The problems in the design of four handicrafts are better than the traditional design methods and manual design methods in the design of handicrafts at present. Finally, the GA-PSO fusion algorithm obtained by fusing the two intelligent algorithms is compared with the particle swarm optimization algorithm, genetic algorithm, and artificial neural network and is used to analyze the spatial complexity. Simulation experiments of several algorithms include scattered radio frequency and fluctuation in different periods. The experimental data results are obtained. After GA-PSO fusion algorithm is used, a high space complexity of 11.42 is reached. However, in terms of discrete type, only 9.73 is relatively stable. In the aspect of dimension reduction, it also reaches the normal value range, which can tend to be stable in the calculation of function construction based on multi-intelligent algorithm, which is very beneficial to the application field of handicraft design at present and can bring positive trend, higher efficiency, and more optimized design effect to handicraft design. In the future development, the structure and function construction of fusion multi-intelligent algorithm will be relatively complex and lengthy. If the fusion mode of multi-intelligent algorithms can be better optimized, the GA-PSO fusion algorithm will be applied to more fields, including military, science and technology, and industrial manufacturing. The fusion of multi-intelligent algorithms can maximize their advantages and bring people more development prospects.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding this work.

References

[1] G. Chen, W. Guo, and Y. Chen, "A PSO-based intelligent decision algorithm for VLSI floorplanning," *Soft Computing*, vol. 14, no. 12, pp. 1329–1337, 2010.

[2] K. G. Jolly, K. P. Ravindran, R. Vijayakumar, and R. Sreerama Kumar, "Intelligent decision making in multi-agent robot soccer system through compounded artificial neural networks," *Robotics and Autonomous Systems*, vol. 55, no. 7, pp. 589–596, 2007.

[3] Q. Wu, M. Zhu, and N. S. V. Rao, "Integration of sensing and computing in an intelligent decision support system for homeland security defense," *Pervasive and Mobile Computing*, vol. 5, no. 2, pp. 182–200, 2009.

[4] T. Chen and R. Xiao, "A dynamic intelligent decision approach to dependency modeling of project tasks in complex engineering system optimization," *Mathematical Problems in Engineering*, vol. 2013, no. 4, pp. 321–341, 2013.

[5] X. Li, J. Jiang, H. Su, and J. Chu, "Identification of abnormal operating conditions and intelligent decision system," *Frontiers of Mechanical Engineering*, vol. 6, no. 4, pp. 456–462, 2011.

[6] R. Krolikowski and A. Czyzewski, "Noise reduction in acoustic signals using the perceptual coding and intelligent decision systems," *Journal of the Acoustical Society of America*, vol. 105, no. 2, p. 975, 1999.

[7] X. M. Meng, P. L. Ling, and X. H. Gong, "Research on techniques and tactics intelligent decision support system of net antagonistic event competitions project," *Computer Engineering*, vol. 38, no. 21, pp. 148–152, 2012.

[8] Y. Yang, W. Tan, T. Li, and D. Ruan, "Consensus clustering based on constrained self-organizing map and improved Cop-Kmeans ensemble in intelligent decision support systems," *Knowledge-Based Systems*, vol. 32, pp. 101–115, 2012.

[9] H. Leung, Y. Huang, and C. Cao, "Locally weighted regression for desulphurisation intelligent decision system modeling," *Simulation Modelling Practice and Theory*, vol. 12, no. 6, pp. 413–423, 2004.

[10] X. Li, Z. Zhu, and X. Pan, "Knowledge cultivating for intelligent decision making in small & middle businesses," *Procedia Computer Science*, vol. 1, no. 1, pp. 2479–2488, 2010.

[11] J.-f. Yao, C. Mei, X.-q. Peng, A.-l. Zhou, and D.-h. Wu, "Intelligent decision support system of operation-optimization in copper smelting converter," *Journal of Central South University of Technology*, vol. 9, no. 2, pp. 138–141, 2002.

[12] Z. H. Zhang and X. Zeng, "Multiple-project selective planning model with inheritance and multi-resource constraints and its intelligent decision scheme," *Mathematics in Practice and Theory*, vol. 19, no. 19, pp. 9–19, 2009.

[13] X. Zhao, X. Zhang, P. Wang, S. Chen, and Z. Sun, "A weighted frequent itemset mining algorithm for intelligent decision in smart systems," *IEEE Access*, vol. 6, pp. 29271–29282, 2018.

[14] G. F. Cox, "The correlation of design and handicraft," *Teachers College Record*, vol. 30, no. 8, pp. 783–787, 2005.

[15] W. Wang, J. Wei, F. Wang, X. Zhang, and X. Ren, "Preference analysis of traditional handicraft brocade pattern in fashion art," *Journal of Physics: Conference Series*, vol. 1790, no. 1, Article ID 12028, 2021.

[16] G. Chen, L. Wang, M. Alam et al., "Intelligent group prediction algorithm of GPS trajectory based on vehicle communication," *IEEE Transactions on Intelligent Transportation Systems*, vol. 22, no. 7, pp. 3987–3996, 2020.

[17] G. Sun and C.-C. Chen, "Influence maximization algorithm based on reverse reachable set," *Mathematical Problems in Engineering*, vol. 2021, pp. 1–12, 2021.

[18] X. Ning, K. Gong, W. Li, and L. Zhang, "JWSAA: joint weak saliency and attention aware for person re-identification," *Neurocomputing*, vol. 453, pp. 801–811, 2021.

[19] K. Dasgupta, B. Mandal, P. Dutta, J. K. Mandal, and S. Dam, "A genetic algorithm (GA) based load balancing strategy for cloud computing," *Procedia Technology*, vol. 10, pp. 340–347, 2013.

[20] A. Sarkar and J. K. Mandal, "Energy efficient wireless communication using genetic algorithm guided faster light weight digital signature algorithm (GADSA)," *International Journal of Advanced Smart Sensor Network Systems*, vol. 2, no. 3, 2012.

[21] G. Chen and Z. Chen, "Regional classification of urban land use based on fuzzy rough set in remote sensing images," *Journal of Intelligent and Fuzzy Systems*, vol. 38, no. 2, pp. 1–10, 2020.

[22] W. Qin, Y. Hu, J. Lei, and Y. Wang, "Comfort design and optimization of direct expansion multi-connected radiant air conditioning based on 3D flow field simulation," *Displays*, vol. 69, Article ID 102054, 2021.

[23] M. H. Kim, J. Y. Bae, and S. R. Lee, "A development of the inference algorithm for bead geometry in the GMA welding using neuro-fuzzy algorithm," *Nihon Yakurigaku Zasshi Folia Pharmacologica Japonica*, vol. 122, no. 4, pp. 301–308, 2003.

[24] L. M. Sztandera, L. S. Goodenday, and K. J. Cios, "A neuro-fuzzy algorithm for diagnosis of coronary artery stenosis," *Computers in Biology and Medicine*, vol. 26, no. 2, pp. 97–111, 1996.

[25] S. R. Lee, Y. J. Choo, T. Y. Lee et al., "A quality assurance technique for resistance spot welding using a neuro-fuzzy algorithm," *Journal of Manufacturing Systems*, vol. 20, no. 5, pp. 320–328, 2002.

[26] R. K. Pandey and S. S. Panda, "Optimization of bone drilling parameters using grey-based fuzzy algorithm," *Measurement*, vol. 47, pp. 386–392, 2014.