Artificial Intelligence for Innovation

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Abstract

This paper will review certain approaches to artificial intelligence research. Artificial intelligence (AI) is the science and engineering of creating intelligent devices, particularly computer programs. The objective of artificial intelligence is to build computers with intellect that is on par with or better than that of humans. An important area of research involves designing a machine that can adequately improve its own performance as well as solve other problems normally requiring human intelligence. Work in heuristic programming that seems most relevant to this goal will be discussed at length. Important subproblems are devising techniques for self-improvement, the general problem of deciding what task to best work on next in a network of tasks, and the general problem of how to mechanize learning or inductive inference. Some work in linguistics and pattern recognition is directly concerned with the induction problem. Another area of research that will be treated is simulation of organic evolution. AI applications and their benefits are growing in popularity in a variety of fields. With the emergence of competent models using AI approaches, it is certain that artificial intelligence will take all fields **soon**. The computing world has a lot to benefits from various AI techniques.

Keywords- Artificial Intelligence, Machine learning, Deep Learning and Neurocomputation

1.Introduction

The advent of big data, cloud computing, artificial neural networks and machine learning have helped engineers create a machine that can simulate human intelligence. Research based on these technologies refers to machines that can perceive, recognize, learn, react and solve problems as artificial intelligence (AI). Such smart technologies will inevitably revolutionize the workplace of the future. So, while AI can communicate and help people function at a higher level, it is emerging as the next disruptive innovation. Artificial intelligence is now considered by many to be a key driver of the Fourth Industrial Revolution, and it has the potential to trigger a Fourth Industrial Revolution across all sectors. Learning artificial intelligence has also started to be part of the school curriculum. But just as the advent of television and computers were once touted as educational game changers, they have actually been shown to improve access to information without fundamentally changing basic practices. With the growing attention, it is time to review recent AI research to gain an updated understanding of the field for possible changes.

In today's world, technology is growing very fast, and we are exposed to various new technologies every day. Here, IT is an explosive technological artificial intelligence that is ready to create a new revolution in the world by manufacturing intelligent machines. Artificial intelligence is now all around us. It currently works on several subdomains, from general to specific such as self-driving cars, chess, proving theorems, playing music, painting, etc. AI is one of the most exciting and diverse areas of computer science. great dimension in the future. Artificial intelligence makes a machine behave like a human.

2. Related Work

Literature [1] pointed out that the key to product design is a good fit between products and users. Industrial design can be understood as the core of product design, industrial design corresponds to product design, and the objects of product design are mainly industrial products and craft products. According to the literature [1], product design is an innovative and creative activity that allows you to design a real product and further improve its style, function, and internal structure, using the latest research results and other information, and combines social science theory. and practice. Literature [2] finds that the modern division of labour leads to the emergence of industrial design, which is an inevitable consequence of modern production, and the object of design is modern industrial products that satisfy the needs of modern society and people. The practicality and aesthetics of products are the main content of industrial design studies. The literature [1] mentioned that industrial design is a multidisciplinary, multidisciplinary subject, the factors affecting design are complex. Such planning activities must be more innovative. Therefore, innovative design is the core of intelligent design for humans and machines. Literature [1] investigates the characteristics of web-based real-time interaction in product design and analyses the features and characteristics of the Same Data software. In the literature [2], optimization of the design stages of industrial products was proposed based on a genetic optimization algorithm to solve the problem of poor design structure of industrial products. In the literature aimed at the shortcomings of the AI-CAID (Computer Aided Industrial Design) system based on a traditional expert system [2], the artificial neural network model, combinatorial optimization and uncertain reasoning methods of industrial design are analysed and theoretically studied. Literature [1] introduced the idea of comprehensive intelligent industrial design, made a comprehensive study of its key technologies, and introduced and developed a new comprehensive intelligent industrial design mechanism. Literature [2] deals with the concept, category, and properties of industrial design, deals with the modern development of industrial design and applies the theory of artificial intelligence in the field of industrial design. According to the literature [3], artificial intelligence is designed by imitating the human psychological cognition process and following the human creation process, and it is a form of information processing.

Based on a detailed study of related literature and artificial intelligence technology, this article builds a system for industrial design and transformation. In this paper, an improved particle swarm optimization algorithm is used to train the network for complex mapping relationship to ensure faster convergence speed and better convergence effect of the algorithm. This has great advantages in solving complex problems; Especially when used to study observational data in the process of industrial design, it can more accurately simulate human thinking and make problem solving more intelligent. In addition, this article systematically discusses the problems of integration and expression of structured information resources and product design. It has certain technical application potential and provides a new idea for intelligent industrial design.

3 Industrial Design

With the rapid development of the Internet era, people's financial ability and vision have improved significantly, and consumers have set higher requirements for product design. Modern product design development is based on traditional product design methods and theories, combining product design theory, artificial intelligence, information technology, information technology, information technology and management [2]. The developed industrial countries of the world because they pay more attention to industrial design, have greatly promoted the development of industry and economy, and promoted the social standard of living. The development of high technology has provided many modern design tools and methods for industrial design and application of computers has brought industrial design into a new historical stage. Faced with the rapid development of intelligent products and AI technology, how to turn intelligent technology into products, improve people's lives, and achieve business success is a problem to be solved by designers and enterprises.

At present, computer software and hardware technologies are maturing, and computer graphics, computer-aided design, VR design, and other technologies are developing rapidly. The application of CAD has been further deepened, and the theory and method of modern industrial design have made a qualitative leap. The appearance of many intelligent assistants further proves that the development of AI will be more and more beyond people's imagination and closer to people's thinking mode, thus helping people's work to a certain extent [3]. The application of AI technology to industrial design is one of the research hotspots in the newly developed CAID field, and it is also the development trend of industrial design modernization. It can not only transplant the research results in the field of AI to industrial design but also expand the application field of AI so that they can be perfectly combined and promote common development. Product design process view is shown in below figure-
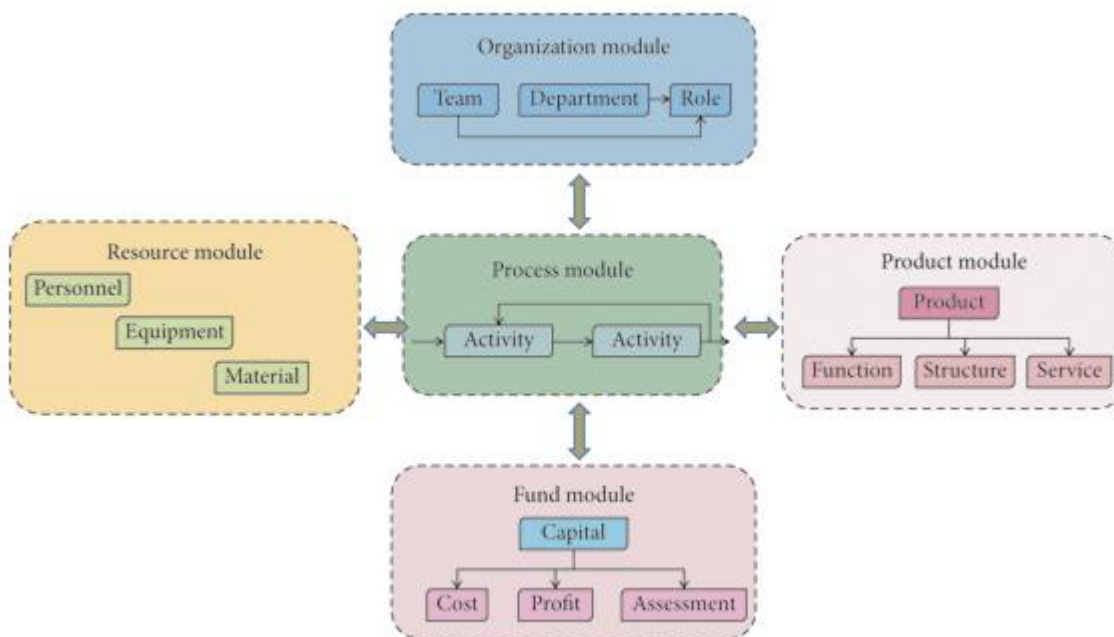
Figure 1 Product design process view

The AI algorithm formula is designed to imitate human thinking and creative space, so AI can be combined with similar art styles in product design. Combining them greatly facilitated the development of some work areas. As market competition intensifies, to thoroughly strengthen companies' rapid response and competitiveness to market demand, people set higher requirements for project automation in the field of industrial design: based on the automation of information processing provided by computers, decision-making can be. automated. to carry out, i.e. to help industrial design experts make decisions in design activities [3]. It is an advanced stage of intelligent design-human-machine intelligent design system. The core problem of a design expert system is pattern design and pattern design. The main problem of human-machine intelligent design system is innovative design. Due to the diversity of market demand, product design is increasingly characterized by comprehensive system design. It is impossible for a designer to fully absorb knowledge from different disciplines and different fields of application, and product design requires a comprehensive, interdisciplinary and interdisciplinary knowledge. Therefore, the systematization and standardization of design knowledge, design principles, and criteria is one of the key problems to be solved in modern product design, and it is also the basis of knowledge acquisition and application. Intelligent design is the application of intelligent engineering in the design field. Industry design is a complex design work, and domain experts and designers have to do a lot of decision-making activities in the design, which are based on extensive domain knowledge.

The function of industry extends to people's physiological and psychological needs and adaptation to the environment and society. Satisfying people's dual needs of material and spirit and exploring human's reasonable lifestyle and living environment have become the principles of industrial design in the above developed countries and regions. With the continuous improvement and enhancement of the concept of AI, intelligent programs will enter more updated fields. Therefore, in the future, industrial designers should take a longer view and apply AI to the industrial design process so that the unique innovative thinking and convenient design forms of AI can be fully applied to industrial design, and the intelligent development of science and technology can be truly combined with industrial design. This is more conducive to designers to jump out of the only way of thinking, refer to the design scheme of AI to stimulate design inspiration, and create more products that are beneficial to social development. The framework of the CAID system is shown below.
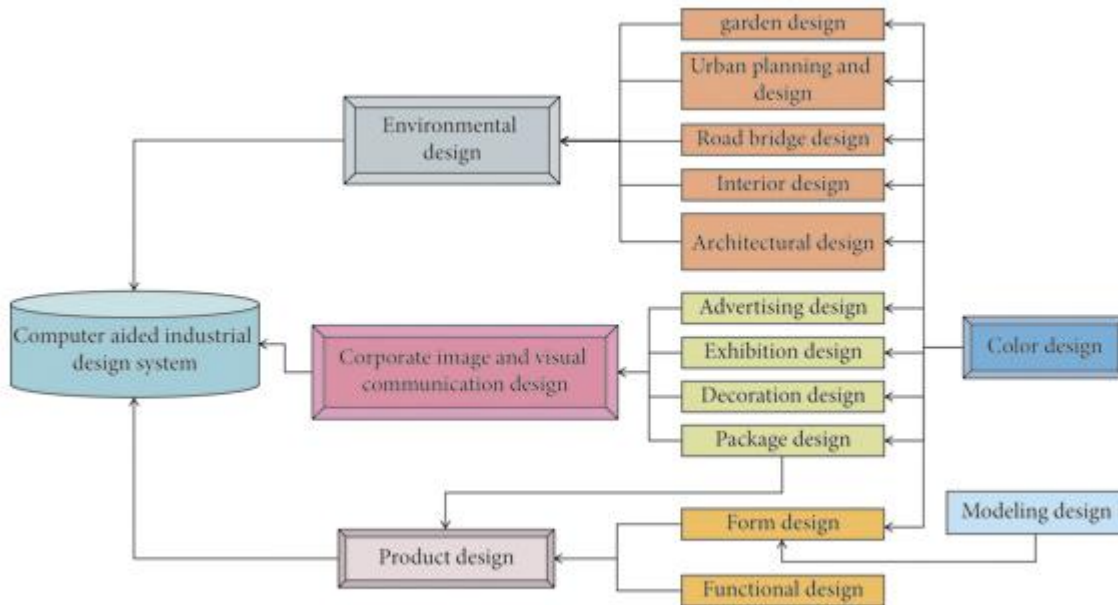
Figure 2 The framework of the CAID system

The entire industrial design process inevitably involves creative design thinking and frequent human-computer interaction. Applying artificial intelligence to industrial design can help designers create better products. AI can not only calculate extremely complex shapes that humans cannot calculate, but also provide designers with innovative styles and patterns. This is the soul of innovative industrial design. Whether it is innovations in design technology, design tools or design thinking, it directly affects the quality of the final product and the competitiveness of the market. Designers can combine their ideas with their design style and use the AI system to combine the above requirements into a preliminary design plan and design graphics. AI can provide designers with a broader way of thinking and more creative directions so that designers can create more complete works. The combination of the two makes it possible to realize the automation and intelligence of design decision-making, make product design quickly respond to market demand and improve market competitiveness. Creating safe and reliable design information resources is the foundation of modern industrial design. The most important task of information engineering is the standardization, standardization and systematization of design information. So that different design platforms and different application fields can realize the understanding and application of information resources. Artificial intelligence can calculate the optimal working data in the process of industrial design, which can greatly save production costs. Artificial intelligence can work according to the needs of different customers to design different products that meet the customer's requirements as best as possible, which also significantly reduces material waste. Therefore, combining industrial design and artificial intelligence can save not only time, but also a lot of work and material resources.

## 3.2. Design and Implementation of Industrial Design and Retrofit Systems

Modern industrial design increasingly incorporates the characteristics of large-scale system design. Products are becoming increasingly complex and many technologies must be integrated. Design encompasses more and more competencies, and the rapid development of knowledge and technology requires sharing and collaboration in industrial design. When designing products, industrial designers must determine the product design plan according to several factors, such as product functions, users, environment, production process conditions, economy, environmental protection, and market conditions. This is decision making. Artificial

intelligence is a higher level of development of product intelligence, but one of the conditions for the creation of intelligent products is that products must have a certain independent calculation and performance and interact with users to a certain extent. Product intelligence is product intelligence, which is the materialized expression of intelligent technology. Intelligent products are products that can collect information, process information, provide feedback, actively regulate and control, and implement real-time and effective communication with people. In modelling the knowledge of industry experts, product information is refined and abstracted into a formal description, i.e. into corresponding data modules, so that the computer system can recognize and automatically process those data modules, which realizes IT automation. process of planning and decision making. A key factor and difficulty in this process is the acquisition and organization of domain knowledge. This shows the need to involve domain experts in an intelligent design system. Artificial intelligence technology is used to create an industrial data model, and industrial data is stored as an "instance" of an object in a database or engineering database. Product rules are used to provide industrial decision information and decision control information because this information describes the relationship between object classes and their attributes. Therefore, this information is integrated as a "method" of the object class into the object-based industrial data model of the object class. Industry is a typical complex problem involving many types of knowledge and expertise. Therefore, the functions of the system can be divided into industrial information, industrial data, industrial decision-making information, decision-making management information, etc. A data model is a pattern used to abstract, represent and manipulate data resources in the real world. The purpose of data modelling is to describe the structure, function, attributes, and other related data of the physical world. Since the computer is an indispensable tool in modern product design, the purpose of data resource modelling is to store all data modem information in the computer in a form that can be understood and processed by the computer, i.e. to get digitized data model. Adaptive traits are important traits smart products compared to traditional products. Traditional products do not have the ability to make their own decisions and change the behaviour of the product, while smart products with adaptive functions can learn and analyse the user's behaviour based on data. In the field of industrial design, the design expert system usually solves some problems only from one aspect, which is isolated and closed, and it is difficult to integrate with other information systems. The human-machine intelligent system covers the entire design process and is an open architecture. Therefore, the human-machine intelligent design system can not only apply to conventional design, but also supports innovative design. This means that it can meet the automation and intelligent requirements of industrial design to the greatest extent. The properties of the perception layer of smart products include connection attributes and scene awareness. Traits of scene perception refer to the ability to perceive the external world and receive external information. The properties of the connection attribute refer to the ability to connect products to products. Data is a key component of smart products. Smart products are not only the key to data collection, but also a data changer. Data collection and exchange is the basis of all communication and scene observation. Functional genes are at the heart of product design and search indexing. The functional genes that meet the requirements are matched according to the degree of corresponding function, and the search process for product functional genes is designed by genetic optimization algorithm.

3. Result Analysis and Discussion

Industry is to design a feasible scheme to realize a specific idea, and it follows a series of design behaviours. It mainly uses modern means to design products and other industries, especially product design, which is mainly based on people's functional and sensory needs for products, including tools, machinery, interior decoration, and packaging. Excellent enterprises have strong R&D efforts in industrial product design. In order to ensure a certain forward-looking, numerical analysis is carried out on each data during the experiment. Integrate the sample description and semantic scale into a questionnaire and conduct a questionnaire survey on the target object. In the process of investigation, we should ensure the authenticity of the data and try to avoid the interference of external factors in the investigation. In order to prevent users from interfering with the

evaluation value, the traditional method of calculation formula test and the design method of optimization algorithm in this paper are used to retrieve the product gene matching degree. In order to make the results more convincing, the convergence trend diagram of this network is derived in the process of solving, as shown in Figure 3.
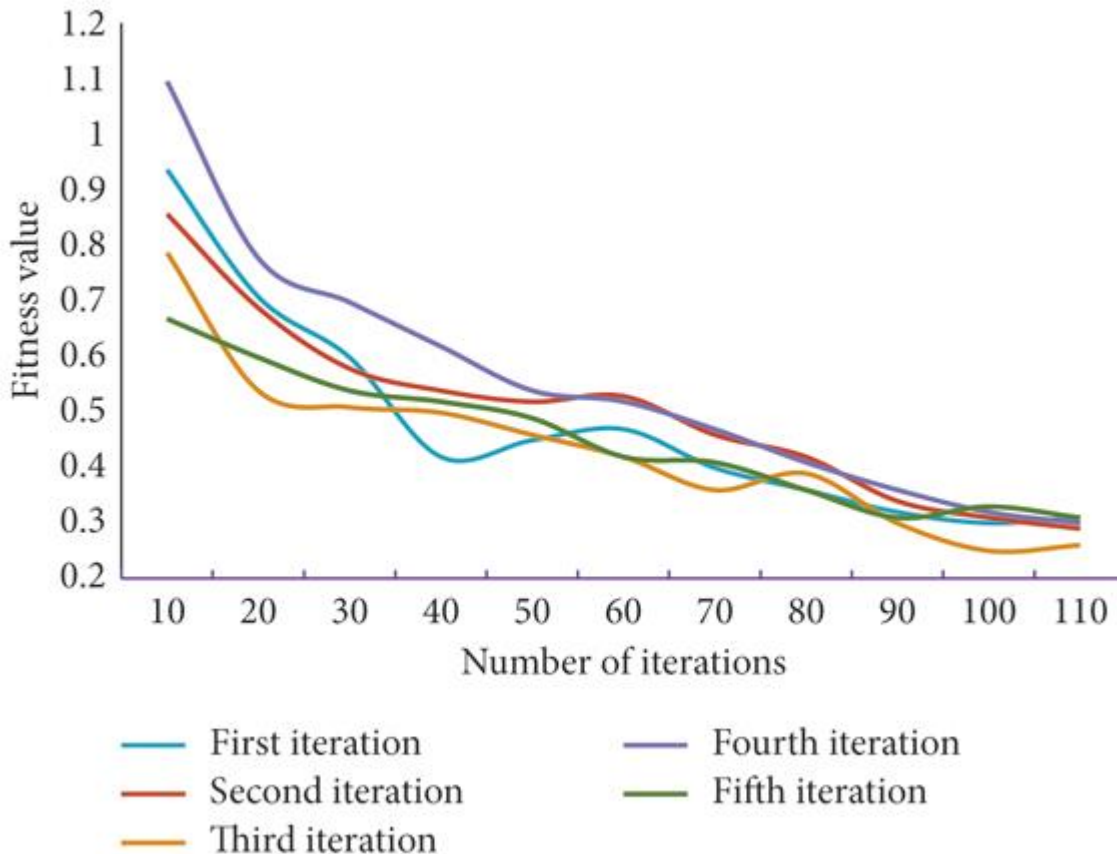
The figure shows that after 50 iterations, the output error of the network has converted to a certain degree as the value of the particle condition. If the accuracy requirement is higher, the number of repetitions can be increased depending on the situation. In this article, 50 repetitions can meet the requirements. For users to facilitate the management of industrial design and industrial information and to ensure the standardization and integration of industrial information, it is necessary to define the value limits of some characteristics. 20 samples were randomly selected for the database. In the experiment, considering the relationship between the test samples, the order of the experiment should be determined first, and functionally independent product genes should be placed first. Product design is an iterative process, and a preliminary design can only be done after several revisions. Here, change issues are usually presented by designers or customers, and the system records the proposed issues in the form of a problem report as a basis for design changes. Regular users must participate in the product verification phase together. Taking typical users as the research target, through product inspection and testing based on real scenes, we can test whether the product model meets the needs of users and whether there are other potential problems, so that we can provide support for product iteration and improvement design . . In this experiment, product genes are first introduced, the assignment algebra of the randomly generated initial product gene population is set to 0, and the fitness function value of each product gene is calculated. Then get optimal product genes according to the design process. Create a set of evaluation indices to evaluate the quality of selected product genes using two methods. Finally, the fuzzy evaluation method is used to compare the traditional method, the genetic algorithm, and the industrial product. design

algorithm in this paper to retrieve the gene matching degree. Line graph is used to analyse the relationship between numerical values, and the experimental results are shown in Figure 4.
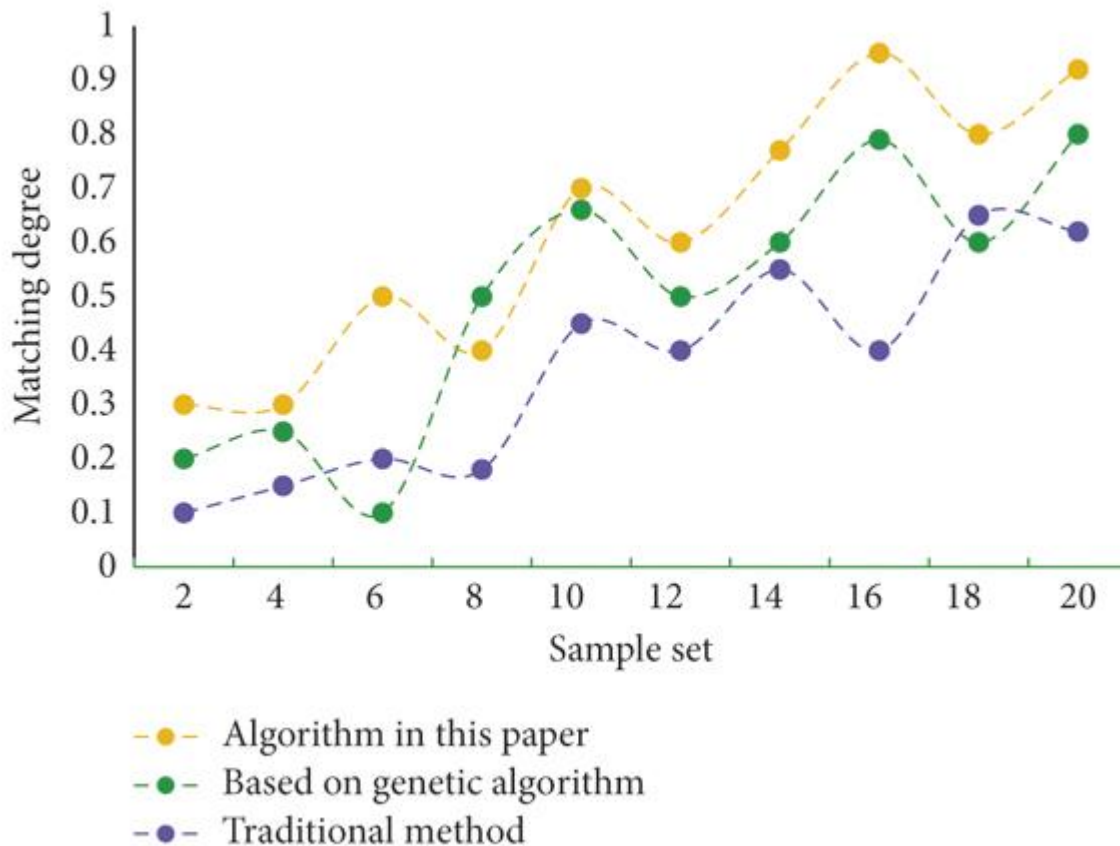
From the results shown in the figure, the product gene matching degree retrieved by traditional methods is low. The reason for this phenomenon is that the product structure efficiency of traditional methods is low, and the optimal solution cannot be obtained. However, the algorithm used in this paper is based on the pattern theorem, and the gene matching degree of the retrieved products is higher. It is proved that the industrial product design method of the algorithm established in this paper meets the design requirements.

Industrial decision knowledge describes the logical relationship between industrial object classes and their attributes, and industrial decision knowledge is closely related to the object model. Production rules are used to represent industrial decision-making knowledge, and rules with the same decision-making function are organized as an object. Multilayer error correction gradient descent method is used for offline learning. After several times of learning supported by the sample set, the weights of each layer of the network are fully adjusted to obtain and express the knowledge contained in the sample. This knowledge representation is not expressed explicitly in the form of rules like the traditional expert system but stored in each weight in an implicit way. When the network is trained for 50 iterations, the prediction trends of the evaluation samples by BP network and the improved network in this paper are shown in below figures respectively.
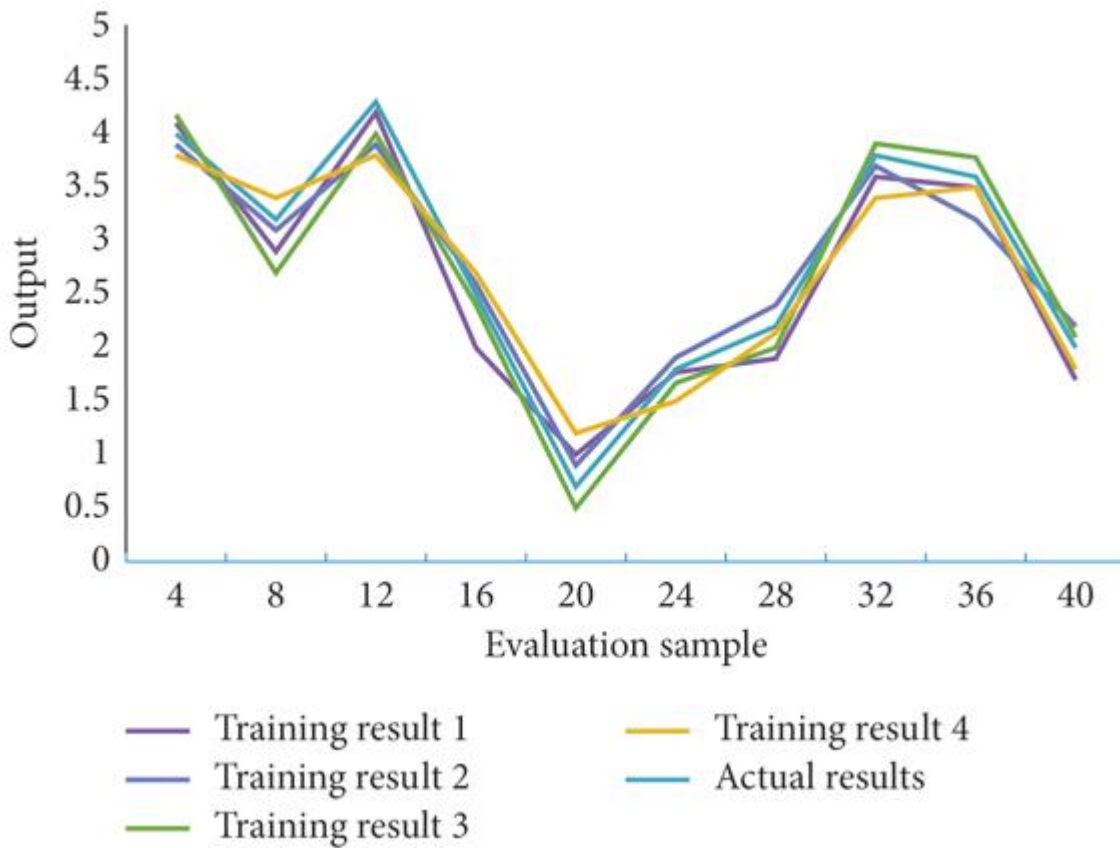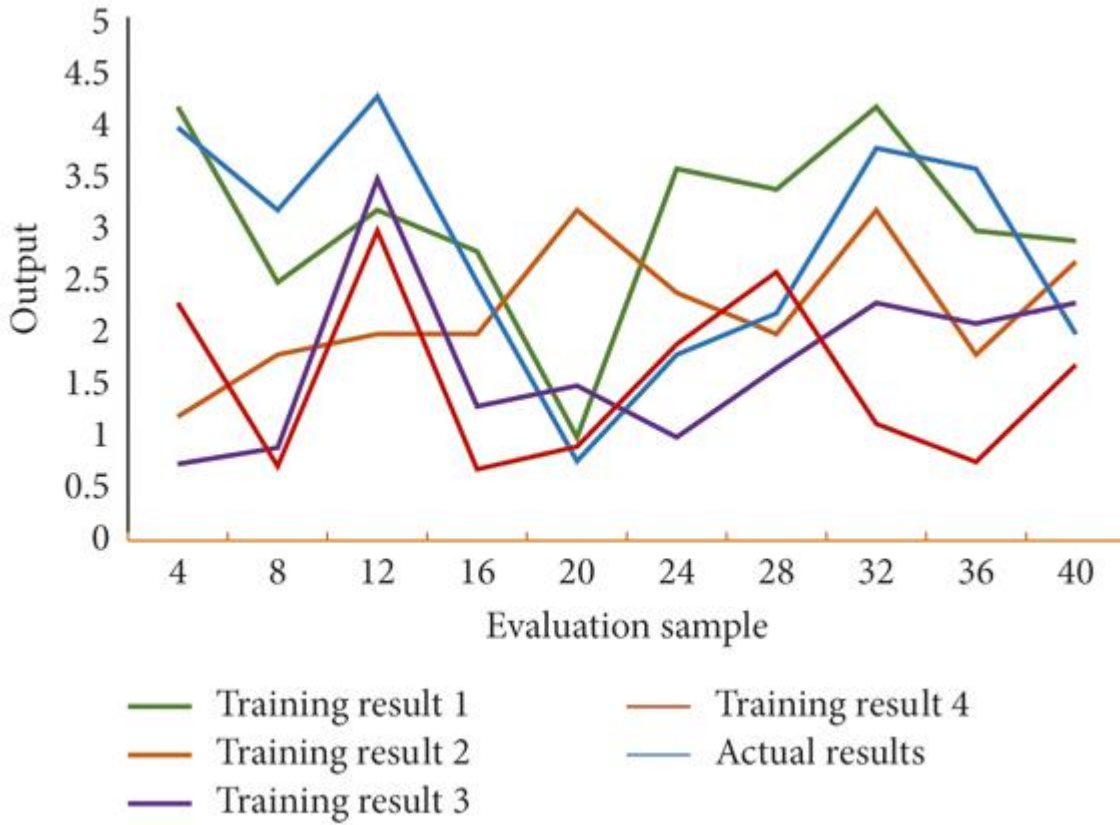
Figure 6
Improved network prediction.

When the iteration times are all 50 times, the root mean square error of the improved network is smaller than that of the standard BP network, which means that its calculation results are better. However, comparing Figures 5 and 6, the stability of the improved network is clearly better than that of the standard BP network. In order to obtain the degree of influence of each sub-performance index of the product on the overall performance assessment, a neural network model must be created. Take the five performance sub-indices as input and the total performance evaluation score as output. The neural network is trained with the data in the table above, and the input weight value for each output is obtained from the trained neural network, which measures the contribution of each sub-performance to the total performance evaluation points. A method is an organizational unit of industrial decision-making knowledge and a set of rules with the same decision-making function. An object can have multiple object methods, and each object method contains multiple production rules to perform a specific decision task. To standardize the representation and handling of production rules, the concept of a rule element is introduced. According to the presentation and reasoning needs of industrial decision rules, some reserved words and command words are provided. General fuzzy evaluation of positioning and fixing schemes should take positioning and fixing schemes as the object of general evaluation, select some candidate positioning and fixing schemes as the object set, and take all the factors affecting positioning and fixing methods for evaluation. factors and then create a comprehensive assessment based on the assessment set. In the user experience test, preliminary testing is done according to the test process and the reasonableness of the test is evaluated. Invite regular users or target users who participated in user photos, experience the design plan by observing and guiding testers, capture the process with videos, photos, and other media, and finally conduct in-depth interviews with participants. to experiment A comparison of design scores of different systems is shown in Figure 7.
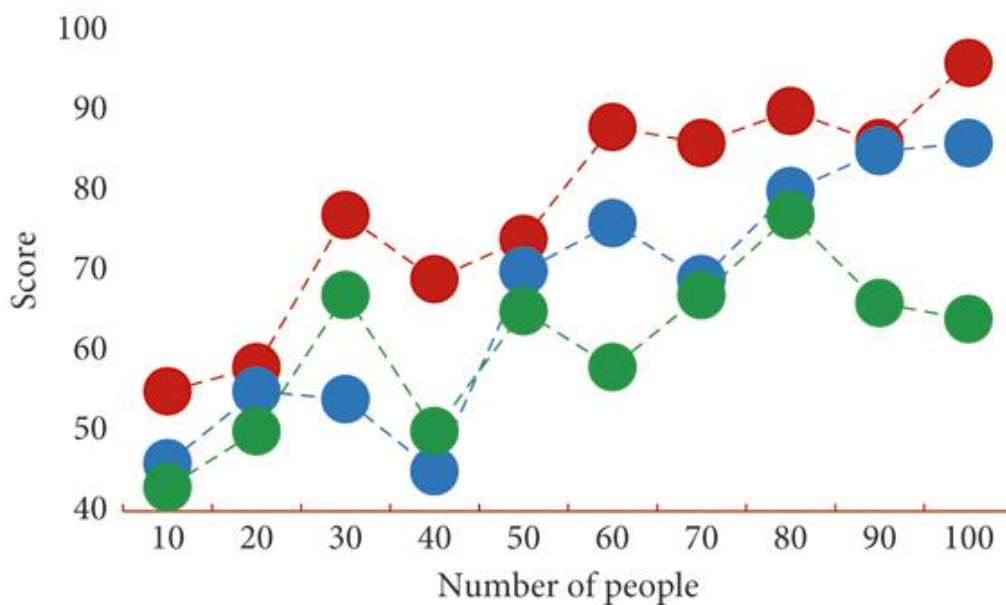
From the data analysis in the figure, it can be concluded that the score of this design is better than the other two system designs, which reflects the superiority and practicability of this method.

Expressing knowledge resources in a neutral and system-independent form is only the basis for realizing that knowledge resources can directly provide services for product design. To realize a distributed integrated information system supporting product design, the knowledge resources in the system are independent of the platform and the specific application system. For a specific designer and design platform, the neutral knowledge model must be introduced into a specific product design environment or platform to have practical significance, which is the realization of the interaction between the knowledge resource information model and the design platform. Rule element is the basic unit of rules, and it is an instruction or judgment with clear meaning. According to the purpose and expression form of rule elements, rule elements are divided into conditional rule elements, command rule elements, assignment rule elements, and so on. Through research and practice, it can be found that the industrial decision-making process can be divided into several decision-making subtasks, and the decision of each subtask is made according to the attribute values of a master object class and its related object classes. Design improvement takes user's demand as the most fundamental starting point, deeply analyses the external structure and internal structure of products and uses industrial design theory knowledge to improve the design of products from the aspects of structure, function, materials, and technology.

This section generates evaluation scores through trained network intelligence and verifies that the new product is better than the original product through comparative analysis so as to verify the effectiveness of this study. The experimental results prove that the system in this paper has good application value for industrial design and is a good way to realize intelligent product design.

5. Conclusions

Now, after decades of development, AI has made great strides in all aspects. Intelligent design adds great vitality to artificial intelligence, which not only expands the research of the entire field of artificial intelligence, but also makes artificial intelligence gradually move from pure theoretical research to applications. With the continuous development of the artificial intelligence industry and the continuous improvement of the level of intelligent technology, artificial intelligence will certainly be applied in more fields in the future to help designers create more and better products. Combining artificial intelligence with industrial design, applying new ideas and technologies of artificial intelligence in industrial design, changing the space of traditional industrial design and improving the efficiency of design are also the development directions of modern industrial design. Focusing on the problems of traditional industrial design, the article builds an industrial design and transformation system based on artificial intelligence technology. The research of industrial product design based on artificial intelligence is complemented by the concept of biological genetic engineering and functional analysis. To ensure the feasibility of the proposed method, randomly select 20 samples from the database and draw a triangular matrix to ensure the reasonableness of the test results. Experiments show that this method can effectively improve the efficiency and quality of industrial design, ensure the integrity and consistency of information, and improve system integration. The industrial product design method based on the system described in this paper meets the design requirements, and the genetic compatibility rate of the products sought is higher. I believe that intelligent industrial design will make industrial design evolve towards diversification, optimization and integration, more natural human-machine interaction, and more advanced and effective innovative design methods. Limited by the relationship between time and energy, the research discussed in this paper is only the tip of the iceberg of intelligent product design, and the industrial design solution and transformation system based on the artificial intelligence technology built in this paper is not optimal the next step is to continue to optimize the industrial design and upgrade the system. I believe that the application of intelligent industrial design has a wider view.

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