www.cadanda.com
Computer-Aided Design AND APPLICATIONS™

# The Application and Development of Traditional Residential Building Symbols in Modern Environmental Design

WeiPing Li[1,*] and Pozhang Mei[2]

[1]School of Mathematics and Information Engineering, Xinyang Vocational and Technical College, Xinyang, Henan 464000, China, Liweiping@xyvtc.edu.cn
[2]School of Mathematics and Information Engineering, Xinyang Vocational and Technical College, Xinyang, Henan 464000, China, Manromudran@foxmail.com

Corresponding Author: WeiPing Li, Liweiping@xyvtc.edu.cn

**Abstract.** This paper analyzes the duality of the form and meaning construction of characters in visual communication design. Taking the application of character design as a clue, through the semiotic analysis of design practice, this paper probes into the inherent properties, structure and function of characters from the semantic and formal aspects. Characters have the dual identity of language and graphic expression in the construction of visual information and media transmission, which is determined by the dual attributes of the form and semantics of language symbols, and is also the inevitable result of the visual representation of language characters through graphics. This determines the basic structure of words in visual information transmission, and presents the symbiotic relationship between words of language and images of art. It is an important task to summarize and analyze the cultural symbols and architectural symbols in the region and integrate them into the architectural design naturally.Using computer to design the shape and decoration of packaging and the structure of cushioning packaging can not only shorten the design cycle, improve the design efficiency and accuracy, but also save manpower and material resources. It is imperative to use computers for architectural design. With the help of CAD system, designers have created a new situation in the application of computer technology in architectural design.

**Keywords:** CAD System; Traditional Residential Building Symbols; Modern Environmental Design.
**DOI:** https://doi.org/10.14733/cadaps.2023.S8.159-170

## 1 INTRODUCTION

Cultural design includes many aspects, including not only gardens, temples, Taoist temples, but also traditional residential buildings. In terms of crafts, aesthetics, crafts and art exhibitions, local cultural buildings clearly reflect China's national design style [1]. It is based on traditional

agricultural civilization and shows rich cultural characteristics and strong local characteristics. Of course, it has become a valuable heritage of Chinese ancient architecture and an important cultural resource of Chinese modern architectural design [2]. However, with the modernization and urbanization of the city, the elderly residential buildings are facing significant and gradual challenges. Therefore, according to the needs of modern design and modern aesthetic life, it is very important to excavate and customize the traditional cultural symbols of the region and use them naturally in modern design activities [3].

Although there have been studies and debates about brands around the world since ancient times, semiotics originated in Europe. Semiotics is used for different parts and components, of which structure is a very important part [4]. In the history of semiotics, Saussure and Pierce are two very important foundations, and they have done very important things for the development of semiotics [5].

Building Information Model (BIM) has been proved to be a good tool to support construction actions because it can store all information in a digital model and promote collaboration among all participants in the project. Civil engineering teaching needs to permanently update the procedures and technical knowledge used in the construction industry. In this sense, schools should strive to adjust their curricula to include support for innovation in new technologies. The purpose of the Sampaio [6] study was to disseminate knowledge about the benefits of implementing BIM in several aspects of construction activities. Due to the competitive demands of various application fields and the changing manufacturing technology, it is challenging to develop the field programmable gate array (FPGA) architecture. This is further complicated by the difficulty of fair evaluation of FPGA architecture selection, which requires complex high-quality computer-aided design (CAD) tools to target each potential architecture. Murray et al. [7] described the 8.0 version of the open-source Verilog to Routing (VTR) project, which provides such a design process. VTR 8 extends the range of modellable FPGA architectures, allowing VTR to model many details of commercial and proposed FPGA architectures. The VTR design process also serves as a baseline for evaluating new CAD algorithms. Therefore, for the validity of CAD algorithm comparison and architecture conclusion, it is very important for VTR to produce high-quality circuit implementation. With the continuous development of urban construction, more and more attention has been paid to landscape architecture design, and innovation and research on landscape architecture design emerge in endlessly. As a representative of emerging industries, the combination of computer-aided technology and landscape architecture design can produce very good results. SęDzicki et al. [8] believed that while retaining the aesthetic characteristics of landscape architecture design, computer technology can add scientific and technological elements to make the design more scientific and efficient. Color is an indispensable factor in landscape design. Zhang and Deng [9] established a landscape design model based on the computer aided collaborative design system. This paper focuses on the important role of color matching in landscape design, which can improve the artistry and aesthetics of landscape design. This paper starts with the color extraction of landscape architecture, and discusses the emotional guidance of color in street space design through the study of environmental emotional structure. As the main carrier of modern urban energy consumption, construction engineering is an important factor affecting global energy consumption. As the main analysis tool of modern building energy technology, BIM technology is supported by the main theoretical system of BIM technology. Zhao [10] discussed the applicability of computer aided architectural design and performance analysis. Aiming at the problems in urban architecture design, this paper analyzes the corresponding building energy-saving construction algorithm of BIM technology collaborative design. The whole architectural design process is integrated, and the corresponding architectural design process is analyzed.

2022 is a key year for the implementation of the "Fourteenth Five-Year Plan" and an important year for China to enter a new stage of development. In 2021, the government work report proposed "urban renewal" for the first time, and the "Fourteenth Five-Year Plan" also clearly put forward the importance of implementing urban renewal. In the face of the urgent need to promote high-quality urban construction and development, we should actively respond to national policies.

Historical architectural heritage is a valuable cultural asset in the city. It carries the context and memory. The transformation of its architecture and environmental design will bring new vitality to the city. The renovation design of historical building environment has positive theoretical value and practical significance for achieving high-quality urban development.

The integration of architectural environment design and regional culture can not only reflect local folk customs, ecology and traditional culture, but also reflect the aesthetic preferences of local people. Based on this, this paper makes an in-depth analysis of the effective integration of architectural environmental design and regional culture, which is conducive to providing reference for the development of the construction industry.

## 2 STATE OF THE ART

### 2.1 Overview of Traditional Residential Building Symbols

Symbolic symbols mainly refer to the specific symbolic meaning behind the architectural symbols, which is generally recognized by everyone through the meaning people give them. For example, the building colors in the imperial palace are red walls and yellow roofs, which are widely considered as the symbol of the imperial palace. The use of "dragon" in the imperial gardens is very common, and the dragon symbolizes "imperial power and throne". Ordinary traditional dwellings also have symbolic symbols, which are generally reflected in the components of dwellings, and a small part is reflected in the architectural deconstruction itself. For example, the residential buildings in Xidi Ancient Village, because Xidi Ancient Village was a village with many officials at that time, according to the different levels of officials, the opening and closing of the wall at the door are different, and the larger the opening, the higher the official level. Figure 1 shows the development of the traditional architectural style from 2008 to 2013.

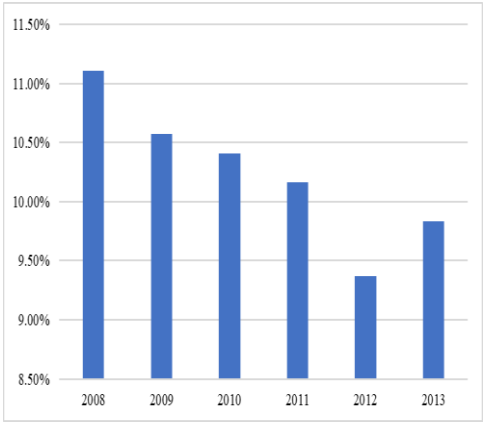


**Figure 1:** Development of traditional building mode from 2008 to 2013.

The indicator is the main part of the building, which is composed of the form, content and meaning of the building. It mainly focuses on the use function of the building, which is embodied in the layout structure and material selection of the building. Indicators are the most important symbols of residential buildings, such as roof, wall, courtyard, structure, layout, etc.

Building gables, when it comes to building gables and horsehead walls, must be indispensable. The horsehead walls originally originated from Huizhou folk houses. There are also horsehead walls in Jiangxi, Zhejiang and other places adjacent to Anhui. In Guangdong, the horsehead walls appear in another form: " ear gables", smart, pink walls and black tiles, and smooth lines of the

horsehead wall walls, undulating in height, well-arranged, almost all kinds of rhythmic beauty. From the blue brick fire-proof wall in the south to the hard mountain in the north, the horsehead wall is the most famous of the Hui-style dwellings, but it is also often used in Guangfu dwellings. The horsehead wall in Guangfu dwellings becomes the "horsehead wall", which has the same function as the horsehead wall in Hui-style dwellings, but has a different shape. The horsehead wall is curved and streamlined, which adds a sense of gentleness to the residential buildings.

The screen wall is also a type of indicator. In geomantic omen, it is unlucky to open the door and see the inner hall directly. Therefore, the screen wall in the folk house plays a very good role. In ancient times, there is also a saying that ghosts can't take detours. Therefore, the screen wall has another spiritual function of pursuing good fortune and avoiding evil. In the folk houses, the shadow wall is mostly used at the entrance of the gate, and some folk houses are used on the side wall of the folk houses, or in the backyard. In modern times, the screen wall can be used for decoration, not only in residential buildings but also in garden landscapes. Figure 2 shows the statistics of the number of Chinese construction enterprises from 2010 to 2020.

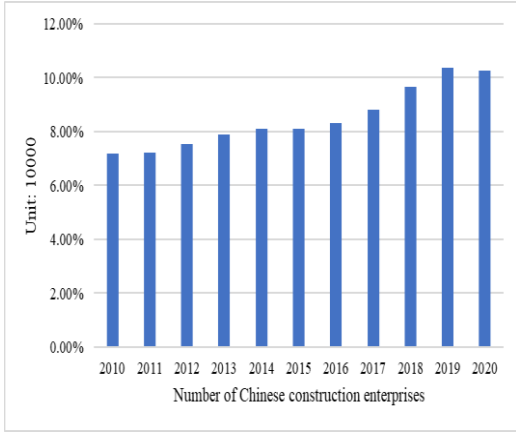


**Figure 2:** Statistics of the number of Chinese construction enterprises from 2010 to 2020.

## 2.2 The Value of Traditional Residential Building Symbols

Traditional folk houses have accumulated many years of ancient art. The formation of traditional residential building symbols, through the design, calculation and improvement of historical culture for a long time, has gathered the wisdom of predecessors, which can be passed down, developed and reused in the way of architecture, with the purpose of enabling more people to learn and understand our own excellent building history and culture.

For traditional folk houses, it is not only the carrier of materialization in the process of practice, but also the essence of national culture in the accumulation of the times, containing the whole process of local living habits, folk customs and their evolution and development. In the face of the current situation of rapid social development, traditional villages and dwellings have been destroyed to a great extent, leading to the erosion of relevant culture. People lack a sense of identity for culture in their hearts. Without the refinement of spiritual culture, they also lack the attraction of regional characteristic resources, which is very unfavorable for the development of tourism. Therefore, arousing people to return to their own village residential buildings is the embodiment of the recognition of the village's own cultural value.

Before using the methods of borrowing and borrowing, we need to select traditional architectural symbols according to the creative thinking of modern architecture. In the process of

modern architecture creation and design, its main purpose is to make modern architecture have regional characteristics. In the use of traditional Chinese style symbols, the design of Shenzhen Vanke Fifth Garden is a relatively successful attempt. It extracts the concept of "village, wall, courtyard, plain, cold and quiet" from traditional Chinese gardens. We can see the shadow of Huizhou architectural elements, but they are not simply copied, but rather inherited and developed. For example, there are no traditional horsehead walls, cornices, etc., but there are white walls and black tiles, flexible small windows, fine wall feet, dense bamboo forests, patio greening, hollow walls, bluestone paved alleys, semi-open courtyards, etc.

At present, there are many other buildings that use the borrowing method in the renovation of residential buildings. For example, in the scenic area of Yaoli Ancient Town, in order to maintain the overall style and unity of the ancient town, the newly built residential buildings also have the characteristics of traditional residential building symbols. Not only commercial stores, many residential buildings also use the borrowing method to maintain the local flavor. Borrowing is the most basic method in residential buildings, and it is also popular in public buildings. For example, Qiyunshan Expressway Service Station extracts local traditional residential building symbols and applies them to buildings.

### 2.3 Architectural CAD system

The building CAD system is developed and researched by the CAD Engineering Department of the Chinese Academy of Building Sciences, and is currently the most widely used computer-aided design system in China. The change after the computerization of architectural design is a revolutionary change and a leap in the technological revolution. The emergence of computers has turned text, graphics, images, and sounds into x, J images that can be easily produced, transmitted, and reproduced. Computerized design makes architectural design no longer limited to graphics and words on paper. It is preliminarily concluded that the building CAD system has the following main features:

The information carrier has undergone a qualitative change. Architectural design is no longer limited to paper as the main carrier, but expanded to magnetic, optical and electrical carriers with computers as the main body. The information rate and volume weight rate of these carriers have been greatly improved. The technical problems that can be explained by figures and graphics, the 3D color space technology and the demonstration of the integration of graphics, text and sound are more intuitive, making the architectural design scheme clear at a glance. The current computerized design is only to adapt to the traditional drawing method. The further development of multimedia technology will make the drawings no longer the main product medium of the design institute, but will be replaced by multimedia disks or optical disks. The owners, construction units and relevant government departments facing the designers will welcome and gradually adapt to the design products expressed in the multimedia way, and the drawings will become auxiliary products. This new form of expression will make the architectural design more intuitive, clear and realistic in terms of use function, space modeling, scale, traffic greening, light and shade color, materials and equipment, and even urban skyline.

The amount of information has increased dramatically. The change of information carrier and expression form with computer as the main body has led to a large increase in the amount of information. The depth and directness of the design are stronger. The information exchange between the designer and the owner and the construction unit is more convenient and thorough. The change of information carrier and expression form makes the amount of information may increase arbitrarily with the needs of the design.

Information processing is accurate and convenient. In the architectural design with paper as the main carrier, the production, storage and transmission of information are difficult, so a lot of simplification and concentration must be made in the form of design expression. Computerized design and production, based on its powerful functions, high speed and large storage capacity, can effectively combine multimedia technology with CAD technology to enable architectural design products to be edited, produced, modified, transmitted and displayed faster and better.

The operation mode tends to be simplified. The designer can use computer keyboard, mouse, digital instrument, etc. to get rid of the drawing board. The workload of the past few days can be completed in a few hours now. The scheme design has become a simple and intuitive computer operation. The increasingly mature computer architecture painting has appeared on the stage and is welcomed by architects and owners. With the support of rich professional engineering design databases and software, it is not difficult to compare multiple schemes and analyze multiple factors comprehensively. More full creative thinking, more detailed construction design and more comprehensive optimization design will become possible. The development and application of computer technology have brought great changes to the architectural design, and also made the architectural design more dependent on technical equipment. The processing, processing, storage, retrieval and reuse of information will become a vital and regular work of the design unit.

### 2.4 Environmental Design

Environmental design is the overall design for the purpose of creating a better production and life for the people and developing the environment. It is a design committed to creating an ideal living space. The architectural environment design includes the external environment design and the internal environment design. The architectural environment design covers a wide range of contents, including architectural design, interior environment design, exterior environment landscape design, public art design, garden design, square design, road and bridge design, etc. The design of external environment refers to the use of building entities to form space in the regional environment around or between buildings to define the surrounding environment of people; The design of the internal environment includes relevant art furnishings, furniture design, etc., so as to create a satisfactory living space for customers. Figure 3 shows the market size of China's green building materials industry from 2016 to 2021.

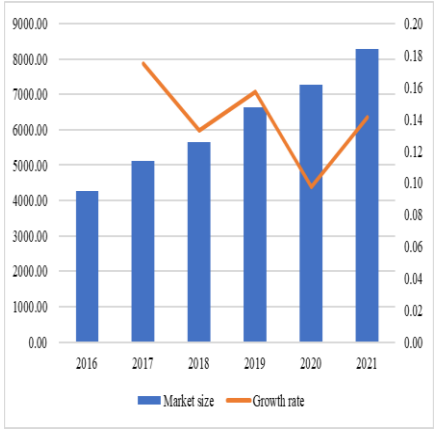


**Figure 3:** Market scale of China's green building materials industry in 2016-2021.

Only by flexibly analyzing and integrating regional culture into the architectural environment design can we maximize the overall function of the building. If we neglect the integration of regional culture in the design of architectural environment, and only focus on the structure and function of design and construction, it will eventually lead to the contrary to the actual needs of the local people, which is not conducive to the development of the region, but also will have a certain impact on the overall shape of the building and environmental construction. In the modern architectural environment design, it is easy to neglect the regional culture by using intelligent means. In order to obtain better architectural environment design effect and make it have higher use value and aesthetic value, we must effectively combine the architectural environment design

and regional culture. The two complement each other, which can not only meet people's functional requirements for the building environment, but also effectively reflect the local cultural characteristics, thus forming a unique modern building environment. Figure 4 shows the area and ratio of newly built prefabricated buildings in 2011-2017.

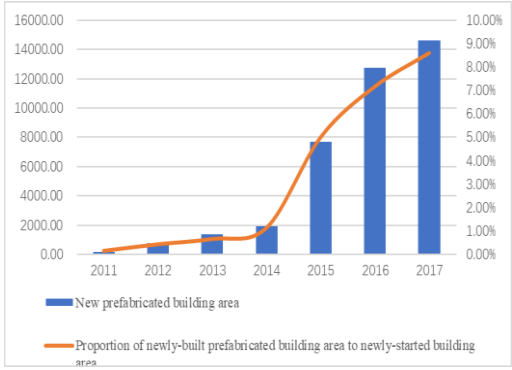


**Figure 4:** Area and ratio of newly built prefabricated buildings in 2011-2017.

## 3 METHODOLOGY

### 3.1 Environmental Design Image Acquisition

Assuming that the grayscale pixel set of the space environment design image is (i, j), and taking this as the pixel center, the feature visual reconstruction model of the space environment design image is constructed by using the sharpening template block combination method. For the grayscale value Iswk of the space environment design image collected in the k-th sub-band, in the gray pixel feature distribution space, the corresponding gradient feature components of the environment design image are obtained as follows:

$$P_{rk}=(\frac{\sum_{j=1}^{c}I_{swk}(1,j)}{c},\frac{\sum_{j=1}^{c}I_{swk}(2,j)}{c},\frac{\sum_{j=1}^{c}I_{swk}(3,j)}{c},...,\frac{\sum_{j=1}^{c}I_{swk}(r,j)}{c}) \tag{1}$$

$$P_{ck}=(\frac{\sum_{j=1}^{r}I_{swk}(1,j)}{r},\frac{\sum_{j=1}^{r}I_{swk}(2,j)}{r},\frac{\sum_{j=1}^{r}I_{swk}(3,j)}{r},...,\frac{\sum_{j=1}^{r}I_{swk}(i,j)}{r}) \tag{2}$$

### 3.2 Image Feature Fusion and Reconstruction Model

$$G(\vec{x})=\sum_{j=1}^{p}G_j(\vec{x}) \tag{3}$$

$$fitness(\vec{x})=f(\vec{x})+(Ct)^{\alpha}\sum_{j=1}^{p}G_j^{\beta}(\vec{x}) \tag{4}$$

Assuming that the environmental design PN coordinates are (XPN, YPN), compare the coordinates of all environmental design edge points (xk, yk) on L with PN:

When xk>xpn，iL=iL+1;

When xk<xpn，iL=iL-1;

When xk=xpn，iL=iL+0;

$$fitness(\vec{x}) = \begin{cases} f(\vec{x}), yes \\ 1+rG(\vec{x}), else \end{cases} \tag{5}$$

The space environment vision feature reconstruction model is obtained as follows:

$$W_u(a,b) = e^{i2\pi k \ln a} \times \frac{K}{\sqrt{a}} \left\{ \left[ \frac{ae^{\frac{j2\pi f \min}{a}(b-b_u)}}{f_{\min}} - \frac{e^{\frac{j2\pi f \max}{a}(b-b_u)}}{f_{\max}} \right] \right\} + j2\pi(b-b_a)\left[Ei(j2\pi f \max(b-b_a))\right] - Ei\left(\frac{j2\pi f \min}{a}(b-b_a)\right) \tag{6}$$

Ei (·) represents the recombined output of environmental visual information features, combined with the model recognition method.

### 3.3 Environmental Vision

After extracting and traversing all edge points on L, set δ 21 Design the local variance of the image for the space environment, δ two η Optimization coefficients for designing images for the environment.

$$\beta = \max\left[\frac{\delta_1^2 - \delta_n^2}{\delta_1^2}\right] \tag{7}$$

The gradient descent method is used to reconstruct the spatial environment vision in blocks, so that the sparse eigenvalues of the environment design image meet C ∈ S. According to the sparse prior representation results, the optimal visual reconstruction threshold at frame m (x, y) of the environment design image Fm (x, y) is obtained. Based on the approximate sparse representation method, the template matching of the environment design image is performed, and the matching coefficient is:

$$g_i^* = \begin{cases} Rs_j, z \le i \le x-y \\ g_i, else \end{cases} \tag{8}$$

The maximum gray value of the landscape space environment design image analysis department is:

$$n_{pg} = \frac{\mu_{pb}}{(\mu_{00})^{\gamma}} \tag{9}$$

The information reconstruction model of space environment design is expressed as:

$$g(x,y) = f(x,y) + \varepsilon(x,y) \tag{10}$$

Where f (x, y), g (x, y) ε (x, y) represents the original environment image, reconstructed image and grayscale image respectively. Based on the above analysis, interactive genetic optimization design of design is carried out.

The environmental art feature expression model is constructed. Under the genetic evolution optimization, the information fusion expression is obtained as follows:

$$\eta_{ij} = \eta g_i \times \eta f_{ij} \tag{11}$$

The convolution operator is used to fuse the collected environment design image with vector set, and the environment vision feature decomposition model is constructed. The best resolution feature value of environment vision is:

$$s_{PPM}(t) = \sum_{i=-\infty}^{\infty} \sum_{j=0}^{N_p-1} p\left(t - iT_s, -jT_p - c_j T_c - a_i \varepsilon\right) \tag{12}$$

$$s_{PPM}(t)=\sum_{i=-\infty}^{\infty}(t-iT_s) \tag{13}$$

$$x(t)=\sum_{m=1}^{M}\sum_{k=1}^{K(m)}w_{nk}s\left(t-T_m-T_{mk}\right) \tag{14}$$

$$\begin{cases} x=R\sin\eta\cos\varphi 0\le\varphi\le 2\pi \\ y=R\sin\eta\cos\varphi 0\le\varphi\le\pi \\ z=R\sin\eta\cos\varphi R=D/2 \end{cases} \tag{15}$$

## 4 RESULT ANALYSIS AND DISCUSSION

### 4.1 Experimental Data and Environment

Expansion and contraction factor β It is the only control parameter in PSO algorithm, and its value directly affects the optimization effect of particle swarm optimization. To explore β For the influence of parameters on particle swarm optimization effect, 4 typical optimization test functions are selected for experiment. The four functions are multimodal functions. The global optimum values of F3 and F4 are located in the center of the search space, and there are four local optimum values in the diagonal direction of the search space, which are close to the global optimum values, and are easily trapped in the local optimum trap.

### 4.2 Experimental Results and Analysis

The correlation sample data between the design objective and the design variables is substituted into the genetic algorithm in the method in this paper, and the results are output through training. Figure 5 shows the sum of error squares of the output results under different genetic algebra conditions. According to the analysis of Figure 5, after the algorithm is inherited to 17 generations, the sum of squares of errors quickly decreases from 3.6 to 2.4; With the improvement of genetic algebra, the decline rate of the sum of error squares slows down. After 27 generations, the sum of error squares decreases to about 2.1, and remains at about 2.1 in the subsequent genetic process, which is in line with the practical application standards. Traditional architectural symbols have certain regularity in the process of formation and combination. Deconstruction is to break this rule or inherent pattern in modern architectural design and reassemble it. This process includes two aspects, one is to decompose the traditional architectural symbols, and the other is to reorganize with different order and modern aesthetic principles. Irregular and incomplete architectural images can stimulate people's imagination, make people focus highly and form a series of associations. In the deconstruction of architectural symbols, it is not simply no theoreticism, but emphasizes the introduction of accidental, random and natural irrational things.

Select the change of the global optimal value within the first 100 iteration steps in a certain optimization process for comparison, as shown in Figure 6. Although a part or segment of the traditional civil architecture can be borrowed for the modern reproduction of the traditional civil architecture symbols, because the modern lifestyle and technical requirements are very different from the past, it cannot simply rely on the reference of the traditional architectural symbols as the basis, it should be exaggerated and enlarged After the abstract transformation methods such as scaling, stretching and simplification are applied to modern architecture to seek the continuation of traditional architectural culture.

To verify the convergence of the algorithm, the root mean square error is used to quantitatively analyze the convergence of swarm intelligence algorithm optimized particle filter method under different particle number conditions, as shown in Figure 7. With the increase of particle number, the root mean square error of each method has an overall downward trend,

among which BAPF, ICSPF and EHHOPF have a continuous convergence trend, and IKHPF and GWOPF have a local convergence accuracy fluctuation.

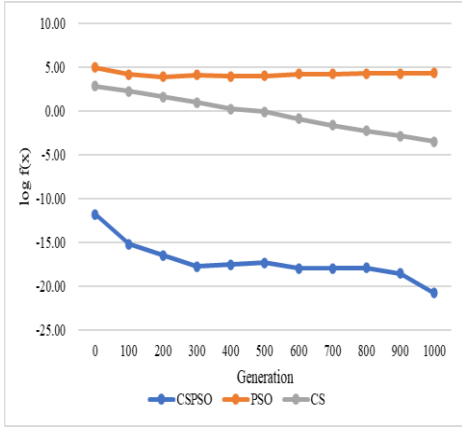


**Figure 5:** Fluctuation of the sum of squares of errors.

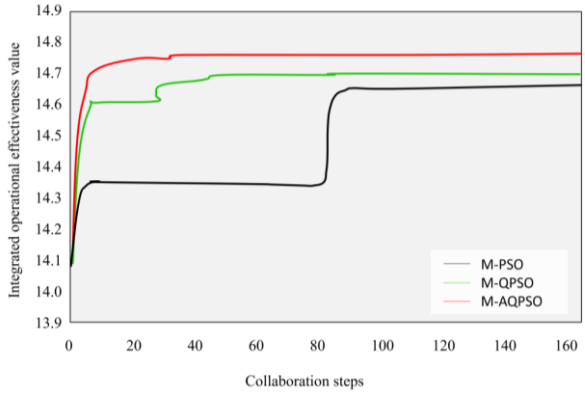


**Figure 6:** Comparison of algorithm convergence curves.

In addition, compared with other methods, EHHOPF can obtain better filtering effect when the number of particles is small. Hyperbole itself is a rhetorical device in language and literature, and hyperbole is derived from it. The exaggeration in architectural symbols is to make architectural symbols achieve certain artistic effects, highlight their essential characteristics, and then exaggerate the objects that want to highlight their characteristics. It can be said that through exaggeration, we can highlight the characteristics of architectural symbols, thus highlighting the essential purpose of architecture. In the process of traditional architectural symbol interpretation, exaggeration is to exaggerate, emphasize and deform the original appearance or part of the architectural symbol itself to produce a new architectural symbol. By increasing the form of its essential characteristics, it can convey the meaning of cultural connotation and cause people's attention and resonance. The process is to extract the architectural symbols in traditional architecture and exaggerate them, such as deformation, splitting, etc. At the same time, they can be exaggerated in terms of material, form, scale, etc., and inject new content and meaning with

the characteristics and aesthetic taste of modern architecture. After a series of changes, the traditional architectural symbols will form a new symbol to arouse people's understanding and memory.

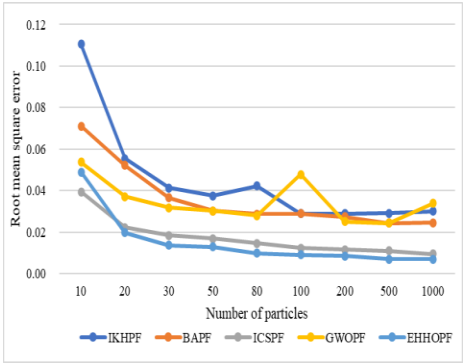


**Figure 7:** Root mean-square error of each filtering method under different particle numbers.

## 5 CONCLUSION

In the process of the development of the construction industry, in order to better improve the overall effect of the architectural environment design, it is necessary to coordinate the building and the environment, and conduct a comprehensive analysis of the culture of the region, so as to meet both people's material needs and people's spiritual needs. The combination of regional culture and architectural environment design can not only improve the design level and enrich the cultural connotation of design, but also achieve the improvement of architectural structure and function, improve the integration of regional culture, promote people's in-depth understanding and understanding of regional traditional culture, and promote the inheritance of regional culture. The inheritance and development of modern architecture to traditional architecture is one of the important aspects to continue regional culture and maintain cultural diversity, and also an important way to promote the sustainable development of modern architecture. The modern interpretation of the symbols of traditional residential buildings not only inherits the diverse traditional culture, but also is one of the important ways for the sustainable development of modern Chinese architecture. While inheriting regional culture, maintain the diversity of regional culture. In the extraction of residential building symbols, we should respect the local historical culture, religious belief, geographical and climatic environment and other external factors, classify and summarize the image symbols, indicators and symbols of traditional residential buildings, and study the extraction methods of residential building symbols. In the application of residential building symbols, we should pay attention to the appreciation of tourism, historical and cultural values, and scientific values. We should apply residential building symbols to modern architecture and landscape design by means of residual increase, expansion and supplement, deconstruction and reorganization. Environmental design should recognize the importance of computer-aided design, focus on the application of computer-aided design, play the role of computer-aided design, gradually improve the design scheme, construction scheme and improve the quality of building decoration, comprehensively improve the decoration level of the enterprise itself, and then enhance the core competitiveness of the enterprise to achieve sustainable development of the enterprise.

*WeiPing Li*, https://orcid.org/0000-0003-4900-7740
*Pozhang Mei*, https://orcid.org/0000-0002-5043-0098

**REFERENCES**


[1] Daemei, A.-B.; Safari, H.: Factors affecting creativity in the architectural education process based on computer-aided design, Frontiers of Architectural Research, 7(1), 2018, 100-106. https://doi.org/10.1016/j.foar.2017.09.001

[2] Liu, H.; Jiao, J.; Zhang, N.: Research on nonlinear thinking of landscape architecture design based on computer-aided parametric model, International Journal of Multimedia and Ubiquitous Engineering, 11(8), 2016, 333-344. https://doi.org/10.14257/ijmue.2016.11.8.34

[3] Musella, C.; Serra, M.; Menna, C.; Asprone, D.: Building information modeling and artificial intelligence: Advanced technologies for the digitalisation of seismic damage in existing buildings, Structural Concrete, 22(5), 2021, 2761-2774. https://doi.org/10.1002/suco.202000029

[4] Heljak, M.-K.; Kurzydlowski, K.-J.; Swieszkowski, W.: Computer aided design of architecture of degradable tissue engineering scaffolds, Computer methods in BiomeChaniCs and BiomediCal engineering, 20(15), 2017, 1623-1632. https://doi.org/10.1080/10255842.2017.1399263

[5] Olave, D.-C.: From Efficiency to Exhaustion: Computer-Aided Architecture at the Madrid Calculation Center (1968–1973), Technology| Architecture+ Design, 6(1), 2022, 59-67. https://doi.org/10.1080/24751448.2022.2040304

[6] Sampaio, A.-Z.: BIM as a computer-aided design methodology in civil engineering, Journal of software engineering and applications, 10(2), 2017, 194-210. https://doi.org/10.4236/jsea.2017.102012

[7] Murray, K.-E.; Petelin, O.; Zhong, S.; Wang, J.-M.; Eldafrawy, M.; Legault, J.-P.; Betz, V.: Vtr 8: High-performance cad and customizable fpga architecture modelling, ACM Transactions on Reconfigurable Technology and Systems (TRETS), 13(2), 2020, 1-55. https://doi.org/10.1145/3388617

[8] Sędzicki, D.; Cudzik, J.; Bonenberg, W.; Nyka, L.: Computer-Aided Automated Greenery Design—Towards a Green BIM, Sustainability, 14(14), 2022, 8927. https://doi.org/10.3390/su14148927

[9] Zhang, M.; Deng, X.: Color effect of landscape architecture design under computer aided collaborative design system, Computer-Aided Design and Applications, 19(S3), 2021, 13-22. https://doi.org/10.14733/cadaps.2022.S3.13-22

[10] Zhao, W.: An application of bim technology in computer-aided building energy saving design, Computer-Aided Design and Applications, 18(S1), 2020, 133-143. https://doi.org/10.14733/cadaps.2021.s1.133-143