

## Research Article

# Application of Regional Culture in Landscape Architecture Design under the Background of Data Fusion

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With the rapid development of urban construction, the process of urban regeneration and new urban development is the process of fully integrating regional culture into garden design. From the current point of view, the landscape design of modern urban construction has become a problem that solves the necessity of thinking and detailed discussion. The purpose of this article is to study how to display the special signs of regional culture in the city and ultimately enable the symbiosis of regional culture and the surrounding environment. This article puts forward the importance of regional culture in landscape architectural design under the background of data fusion and how to let regional culture penetrate into landscape architectural design. Based on the algorithm of investigation method and data fusion, it can be learned from the research results of investigation method that human beings have never stopped exploring the regional culture. In today's globalization, it highlights the characteristics of regional culture and advocates regional design and local culture. The combination of design is very necessary. In the experimental results of the data fusion algorithm, it can be known that when the evidence is the same, even if the weight adjustment is correct, the final conclusion is still close to the actual situation. It can be seen that, based on the data fusion algorithm, we can also know that regional cultural elements are becoming more and more important for landscape architectural design. In the experimental results of this article, in 2019, different age groups have the highest regional culture, which is as high as 38%, which is an increase of 12% over 2018. According to the data of the survey and research, it can be seen that the demand for regional culture for 15–30 years of age is between 30% and 50%, and the demand for regional culture for 50–75 years of age is between 53% and 70%. The demand for this age group is the highest. This shows that only by rationally using urban cultural resources, fully exploring the possibility of regionalization, and expanding the urban culture on the basis of the organic combination of the two can the regional cultural characteristics of the urban landscape be more and gradually clear. The spirit of the city is consolidated, thereby promoting the healthy development of the city. Only by digging the essence of regional culture can we create landscape design works with regional characteristics and significance.

## 1. Introduction

Since the 1990s, with the rapid development of computer networks and the advancement of the global economic integration process, human society has been undergoing earth-shaking changes: with the advent of the information age, economic globalization and informatization have expanded to various fields; and, in its unique way to affect the entire society, human society will gradually usher in a brand new era. Since the beginning of the new economic era in the 21st century, landscape design under China's regional culture has been facing new challenges. In recent years, with the

continuous development of urban resources and the expansion of urban population, urban space has become more crowded. Precious historical and cultural buildings and neighborhoods have been destroyed in various degrees in the acceleration of urban change and development. This will not only destroy the precious regional culture but also make it impossible to inherit. The boundaries between time and space, reality and virtuality, subject and object are getting closer and closer, and the dualistic thinking is gradually blurred.

The data fusion center fuses information from multiple sensors; it can also fuse information from multiple sensors

and the observation facts of the human-machine interface (this fusion is usually a decision-level fusion); extract the symptom information, under the action of the inference engine; match the symptoms with the knowledge in the knowledge base; make fault diagnosis decisions; and provide them to users.

With the development of the real estate market, the land and space resources of various waterfront areas have not been planned as public open spaces in the city to provide services for the public.

The situation of the “global village” has become increasingly clear. The rich material and spirit of folklore, humanities, spirit, customs, and so forth are the prerequisites for promoting the regional cultural landscape. They use the unique time-space relationship as the background to highlight the unique regional personality, thereby promoting the development of the landscape industry and then generating unique regional character. Whether the urban landscape can inherit the regional culture in the urban process is a difficult problem faced by the current landscape design, and the landscape works with regional cultural characteristics are the excellent carriers of the regional culture. The landscape design with regional cultural characteristics has the individual characteristics of “this is different from the other.” Landscape design is a comprehensive field including the complex interweaving of aesthetics, ecology, geography, architecture, and other related fields. Regional culture has unique vitality, which has great guiding significance for landscape design. Specifically, the significance of studying this subject has the following points: (1) Protect, inherit, develop, and optimize regional culture, enhance regional memory, and establish regional image (logo). The geographical feature is the accumulation of history and the condensation of culture. It is the organic unity of the external image and internal spirit of the region. It is a complex of material life, national spirit, cultural tradition, geographical environment, and so forth of the city. The creative design of regional culture and landscape and the maturity of conflict determine the personal characteristics and taste characteristics of the region and have an impact, reflect the value of regional memory, can summarize the regional spirit, and establish a regional image mark. (2) By analyzing the lack of regional cultural characteristics in the above urban landscape, we have to consider and analyze the regional characteristics of urban landscape design. The charm of a city depends on whether it has a unique cultural temperament. Analyzing the current situation of domestic urban landscape design research, the research content mainly focuses on the relationship between regional culture and landscape design. From the problems that appear in domestic landscape design today, the purpose of landscape design must reflect culture.

With the development of society, many people are interested in regional cultural characteristics and have conducted research. In order to meet the needs of dynamic graphic design of video packaging, Bond tried to construct a framework for extracting cultural elements with regional characteristics. First, it summarizes the existing methods of extracting regional cultural elements and expands the existing methods from the time dimension. Then a new framework for

extracting cultural elements with regional characteristics is shown, and applying them to the design of cultural video packages in these areas can effectively improve the cultural connotation of the design objects and better display and disseminate effects [1]. With the rapid development of China’s market economy, regional characteristic cultural elements have become more and more important for companies to enhance their market competitiveness and occupy a favorable market share. However, with the development of society and the improvement of people’s aesthetic pursuit, the commercialization of regional culture has become more and more serious. This forced it to change the corporate brand image and regain the favor of the market. Based on this, Park and Gutches combined the relevant knowledge and concepts of fuzzy theory, from the perspective of regional characteristic cultural elements, explored the development of regional characteristic cultural elements, and aimed to design a set of regional characteristic cultural designs that are different from the past competitors, so as to achieve the shaping of the company’s distinctive brand image and improve its market competitiveness. This article first collects a large amount of data through the literature survey method and systematically and comprehensively introduces the fuzzy theory [2]. Hu introduced the design process and main content of Longhu’s Gaobeidian Train New City project, which won the Excellence Award in the 55th International Competition hosted by the International Federation of Landscape Architects (IFLA). Taking into account the separation of traditional cultural heritage from modern society and the disappearance of traditional culture, SUN and Hu proposed the design concept and strategy of connecting traditional culture and modern landscape through flexible landscape design. The genes of traditional culture can raise the awareness of people who respect and protect traditional culture [3]. Everyone’s demand for regional culture and landscape design has increased dramatically, and it has continued to expand in the past few years. Despite the rapid expansion speed, people have not paid enough attention to the quality of landscape design and regional culture according to people’s preferences. Yokoya et al. revealed people’s preference for landscape design quality and regional culture. Using the photo questionnaire, the results point to three main dimensions: the green dimension, the seating dimension, and the quality of landscape design and regional culture, among which the green dimension has obtained the highest preference. The green dimension includes water features, trees, plants, and shrubs. In addition, legibility and continuity affect people’s preference for open space in shopping malls. Compared with the commercial dimension, people prefer leisure space, which involves the commercial equipment of the shopping center. Research suggests that shopping malls should be designed as real public spaces with sufficient public areas [4]. Rochelle and Bigley inspected the research results of the School of Landscape Architecture at North American University and compared them with a 1998 study. A questionnaire was mailed to all 457 assistant professors, associate professors, and professors listed by the Council of Landscape Architecture Education (CELA). The results show that productivity in all categories has improved. The average number of journal articles published by

each faculty member has almost doubled, from 0.48 to 0.93. Compared with the 1998 study, the publication of conference papers has almost tripled, from 0.87 to 2.25 per faculty member per year. In addition, the number of respondents with a doctorate has increased by nearly 15% to 42%. Although productivity has increased, the research tends to focus on topics that are of little interest to practicing professionals. The top five research topics frequently used by professionals and the top five fields where they think more research is valuable do not appear in the top five topics studied by CELA members [5]. Biswas et al. first reviewed the theories and methods of landscape architecture heritage protection at home and abroad and studied landscape architecture heritage from the aspects of policies and regulations, investment management, talent training, and popular science education and then discussed the issue of landscape architecture heritage protection in China: lack of legislation, weak awareness of heritage resources, overexploitation of heritage resources, and gaps in heritage resource management and monitoring. Finally, it is proposed that the Chinese government authorities should pay more attention to heritage management, talent training, and capital investment, combined with advanced management methods in developed countries, and explore a landscape heritage protection management model suitable for China's national conditions from the ideological method and level [6]. As one of the three basic theories of Chinese landscape architecture, landscape ecology provides a powerful tool for leading landscape architecture from experience to evidence-based. By systematically reviewing the literature, Chang et al. discussed the advantages and necessity of the application of landscape ecology theories and methods in landscape design and summarized the research hotspots and progress of interdisciplinary research, including research topics, the scientific basis of planning or design, and the impact of landscape performance on improving humanity, as well as the impact of well-being. We put forward the priority topic of the combination of landscape ecology and landscape architecture to meet the needs of planning and design in practice, study the coupling system of landscape pattern and ecological process, and solve the problem of human settlement environment [7]. The current architecture school is introducing innovative teaching methods, hoping to improve the quality of education. Makowska introduced the modification of the teaching method of the hand-painted course based on a case study of a landscape architecture student from the School of Architecture of the Krakow University of Technology. The choice of innovative themes used there has a significant impact on the development of students' creativity. The independent formation of original opinions taught them how to constructively criticize and promote the search for new and original solutions. The research results prove the following conclusions: Experimental empirical research confirms the hypothesis about the importance of methodology and selected topics for the development of students' imagination [8]. From the scholars' discussion, we can know that, with the rapid development of China's market economy, regional characteristics and cultural elements have become more and more important for companies to enhance their market competitiveness and occupy a favorable market share.

At present, the lack of regional culture has led to a lack of soul in landscape architectural design, and regional culture needs to be taken seriously.

The innovations of this article are (1) how to perfectly integrate regional cultural elements into the landscape architectural design when designing landscape architecture, so that the designed buildings have both modern architectural concepts and local regional cultural characteristics, so that the building has a humanistic sentiment, and (2) applying data fusion algorithms to the research of landscape architectural design. In other applications, data fusion algorithms are often used as a way to solve combinatorial optimization problems. However, this paper specifically aims at the inherent characteristics and advantages of data fusion algorithms, finds out the necessity of complementing regional culture and landscape architecture design, applies the characteristics of the algorithm itself to simulate the behavior of landscape architectural design, and obtains a better landscape architectural design with regional cultural characteristics. In a certain area, the imprint of history and culture always implies the deep friendship of the locals, with strong interpersonal and human running-in power. As an important component of the culture of the dynasty, the garden bred the historical context of the area where it was located and was the cohesion and inheritance point of the culture of the dynasty. In the garden landscape design, respect the local history, culture, and folk customs, and organically combine tradition and modernity.

## 2. Data Fusion Algorithm

The generation and application of data fusion are based on multiple levels of theoretical and practical knowledge, such as decision-making theory and network technology. Some complex data fusion applications developed in the military application field can also be applied to urban planning, resource management, pollution monitoring and analysis, and climate, crop, and geological analysis in the civilian sector to ensure effective information sharing among different agencies and departments. At this stage, there are still many controversies about this aspect of theories, and the existing systems have varying degrees of loopholes. As the scope of data fusion applications becomes more extensive and its importance gradually becomes more prominent, many scholars have begun to match certain specific fusion theories with real-life application scenarios and put forward feasible algorithms. According to the purpose of data fusion application, it is basically divided into two categories. The first category is to ensure the certainty of the collected data and remove uncertain parameters. This method is to fuse the same environmental information collected by different sensors, which is similar to the parameter estimation problem of mathematical statistics. The second category is to identify and classify the detection target. The root of this type lies in pattern recognition, and the execution process is usually as follows: First, the sensor judges a part of the information and makes a decision, sends all the information after the decision to the fusion center, and makes the final decision. The decision-level fusion mostly uses Bayes discriminant decision-making and Dempster-Shafer evidence reasoning.

## 2.1. Bayes Fusion

**2.1.1. Bayes Rule.** Bayesian classification is a general term for a class of classification algorithms. These algorithms are based on Bayes theorem, so they are collectively called Bayesian classification. Naive Bayesian classification is the simplest and most common classification method in Bayesian classification. Bayes rule means that, on the basis of determining the likelihood ratio, increasing the observed value will update the previous maximum likelihood estimate. According to formula (1), when new observations are added, the posterior probability can be obtained according to the prior probability of the given hypothesis [9].

$$R(E_i|U_j) = \frac{R(A_j|U_i) \cdot R(U_i)}{R(A_j)}. \quad (1)$$

$$R(U_r|U_{d1}, U_{d2}, \dots, U_{dk}, U_{dm}) = \frac{R(U_{d1}, U_{d2}, \dots, U_{dk}, U_{dm}|U_r) \cdot R(U_r)}{R(U_{d1}, U_{d2}, \dots, U_{dk}, U_{dm})}. \quad (3)$$

In the above formula,  $k = 1, 2, \dots, m$  is the discriminant situation obtained by the  $k$ -th sensor. Since all assumptions are independent of each other, we have the following:

$$R(U_{d1}, U_{d2}, \dots, U_{dk}, \dots, U_{dm}|U_r) = \prod_{i=1}^n R(U_{dk}|U_r). \quad (4)$$

## 2.2. Classical Dempster–Shafer Evidence Theory

**2.2.1. Characteristics of Dempster–Shafer Evidence Theory.** The theory mainly comes from two aspects of thinking:

- (1) Starting from a subjective level, judge the probability of occurrence of related problems according to the probability of occurrence of a problem [11].
- (2) When multiple arguments supporting the argument come from multiple independent levels, combining this part of the argument can support the argument more powerfully and obtain more accurate decision-making results. Although this theory is similar to Bayes theory, both are based on the consideration of weighting hypothetical events. But, compared with the two methods, this method has two differences; one is that it can display the “unknown” status. For example, this method can clearly indicate the state of things, and when it is unsure, it can also indicate the intermediate state of not knowing whether there is a car or there is no car [12]. Second, the theory does not require high accuracy of the event probability distribution function. When accurate information cannot be obtained, it can still support detection. Based on the above two differences, D-S theoretical logic is more scientific, and the decision-making process is more realistic.

**2.1.2. Bayes Reasoning.** Assuming that sensors  $1, 2, \dots, m$  collect observations about the target object, the target object is required to have  $n$  hypothetical events, and  $n$  are independent of each other to form a complete set. According to this premise, there are four processes for data fusion. Any sensor can get a judgment based on its own observations and select a hypothetical event for the detection target [10]. According to the classification algorithm for sensor  $k$ , the probability of identifying event  $Er$  under the premise that the actual occurrence of the event is  $Ed$  is

$$R_k(U_d|U_r), \quad (k = 1, 2, \dots, m). \quad (2)$$

In the sensor,  $R_k(U_d|U_r)$  means that there are as many sensors as there are in the  $n \times n$  matrix. After fusing all sensor information, the updated joint probability is obtained, as shown in the following equation:

**2.2.2. Basic Concepts of Dempster–Shafer Evidence Theory.** In the D-S reasoning system, the recognition framework  $\Theta$  contains all mutually exclusive and complete events.

$$\Theta = \{\omega_1, \omega_2, \dots, \omega_n\}, \quad (5)$$

where  $\omega_i = (i = 1, 2, \dots, n)$  represents all events.

In theory, there are three functions: basic probability distribution function, trust function, and likelihood function.

The DS evidence theory is based on the basic probability distribution function. An evidence corresponds to a function. The evidence function maps the power set of the recognition frame to the  $[0, 1]$  interval, zero elements are mapped to 0, and the full subset of the recognition frame is mapped to 1.

$$S: 2^\Theta \longrightarrow [0, 1]. \quad (6)$$

Formulas can be used to show the nature of the evidence function, as shown in the following equation:

$$\begin{cases} S(\phi) = 0, \\ \sum_{o \in 2^\Theta} S(o) = 1, S(o) \longrightarrow [0, 1] (O \in 2^\Theta). \end{cases} \quad (7)$$

In the formula, if 0 has a nonzero evidence function value, at this time, 0 will become a focal element of  $S$ , and the value of  $S(0)$  represents the degree to which the evidence of  $S$  supports 0. The trust function  $W(O)$  and the likelihood function  $Q$  are shown in the two following equations:

$$W(O) = \sum_{w|w \in o} S(B), \quad (8)$$

$$Q(O) = \sum_{W|W \cap O \neq \phi} S(B). \quad (9)$$

The relationship between the above two formulas is shown in the following formula:

$$\begin{cases} Q(O) = 1 - W(O^Y), & O^Y = \Theta - O, \\ Q(O) \geq W(O). \end{cases} \quad (10)$$

The above formula belongs to the complement set and because it can be based on the second property of the evidence function, it can be inferred that the confidence function can be used to define the likelihood function [13].

**2.3. Summary of Dempster–Shafer Algorithm.** Dempster–Shafer evidence theory has many advantages and disadvantages. The main advantages of Dempster–Shafer evidence algorithm are as follows: (1) This theory supports information that represents an “intermediate state,” and there will be no negative impacts caused by hard decisions. (2) The theory does not need to know the precise prior probability and conditional probability in advance, and the statistical process is relatively simple [14]. (3) The theory does not require that all hypothetical events must be in an independent relationship, and it is more in line with the actual situation. (4) The fusion result will not be affected by the fusion sequence.

The main disadvantages of the Dempster–Shafer evidence algorithm are as follows:

- (1) All lines of evidence are required to be independent of each other
- (2) There is a probability of conflict between different lines of evidence
- (3) There is a potential exponential explosion in the amount of calculation

**2.4. Reliability Fusion Algorithm Based on Data Source.** In order to further improve the accuracy of the final result, different weight values can be assigned according to the reliability of different data sources, instead of treating each data source as equally important. That is, more weight is given to data sources with high reliability, and less weight is given to the contrary. This method is the “Reliability Reevaluated Dempster–Shafer Fusion algorithm” [15].

If the data source conforms to the formula principle, then

$$\begin{cases} S_u(O) \in [0, 1], \\ S_v(O) \in [0, 1], \end{cases} \quad O \in \Theta. \quad (11)$$

In the above formula,  $S$  represents the subset within the framework, and the reliability of  $u$  and  $v$  is expressed by the following formula:

$$r_u, r_v \in [0, 1]. \quad (12)$$

Formula (12) can give the definition of the weight coefficients of data sources  $u$  and  $v$  as  $G_u$  and  $G_v$ , respectively.

$$\begin{cases} \sigma = \max(r_u, r_v), & \sigma \neq 0, \\ F_u = \frac{r_u}{\sigma}, \\ F_v = \frac{r_v}{\sigma}. \end{cases} \quad (13)$$

On the basis of knowing the weight coefficients of  $u$  and  $v$  and the original evidence function, a new evidence function can be obtained:

$$\begin{cases} S'_u(O) = F_u S_u(O), \\ S'_v(O) = F_v S_v(O), \end{cases} \quad O \in \Theta, O \neq Ig. \quad (14)$$

$Ig$  represents the largest subset of  $\Theta$ . In the formula, it means that no evidence is considered. The larger the value of the function, the higher the degree of ignorance of evidence in decision-making. The smaller the value, the lower the degree of ignorance.

**2.5. Use Dempster–Shafer to Make Inferences.** In the context of multiple data sources, any data source can obtain different judgments within the same recognition framework based on the set evidence function, that is, the evidence function. The method of combining the evidence functions in a certain way is called the Combination Rule [16]. The premise of the application of this law is that each data source has high reliability. If this premise is not met, the law does not apply. Refresh the evidence function according to the three following formulas:

$$\begin{aligned} x(o) &= x_1 \oplus x_2 \oplus \dots \oplus x_n(o) \\ &= \frac{\sum_{o_1 \cap o_2 \cap \dots \cap o_n = o} \prod_{i=1}^n 1x_i(o_i)}{1 - y}, \\ x(\Phi) &= x_1 \oplus x_2 \oplus \dots \oplus x_n(\Phi) = 0, \\ y &= \sum_{o_1 \cap o_2 \cap \dots \cap o_n = \Phi} \prod_{i=1}^n x_i(o_i), \quad y \neq 1, \end{aligned} \quad (16)$$

where  $x_i$  represents the evidence function of the data source  $i$ ,  $+$  is the element of the power set, and  $y$  represents the normalization constant.

*2.6. Ways to Make Decisions about Goals.* For the 0 interval, its size is mainly defined by the values of the two functions. Judging by evidence, the possibility of event 0 exists in the interval. Based on the conclusion of the function, the best decision estimate can be obtained. According to the theoretical content of the trust function, determine the maximum trust function and obtain  $Q_i$ , so as to maximize the value of the function [17].

$$X_{\max} = Y(O_i), (O_i \in 2^\theta). \quad (17)$$

According to the theoretical content of the likelihood function, determine the maximum likelihood function and obtain  $Q_i$  to maximize the value of the function.

$$X_{\max 1} = Y_1(O_i), (O_i \in 2^\theta). \quad (18)$$

*2.7. Regional Cultural Elements and Landscape Design Complement Each Other.* With the rapid development of today's society, is it feasible to continue to use the past design techniques in modern design? Traditional design urgently needs the integration of local cultural characteristics to meet the needs of modern design development. In response to this situation, some Chinese experts and scholars have put forward new insights on urban landscape and regional cultural construction [18]. For example, Ma Xiao edited "Traces of the City-Regional Culture and Urban Landscape," "Urban Landscape" was edited by Wei Xiangdong and Song Yanhuan, and "Architectural Culture and Regional Features" was edited by Zhao Xinliang. They all elaborated on their new theories and methods and provided a reference for us to better study regional culture and landscape design in the future.

The technical path of this article is to first investigate, measure, analyze, summarize, and classify regional urban landscape design cases, as shown in Figure 1, and then conduct on-site investigations, collect physical pictures, and make written records, as the basic data for the research of this subject. Then, it conducts an effective rationality analysis of existing cases and studies feasible methods that combine regional culture with urban landscape design [19]. The frame of Figure 2 is the general process of this paper.

In Figure 3, the land must be coordinated with nature, modernity, and history and culture. Landscape design should not be limited to regional nature. The expression and innovation of regional characteristics must be based on the region. When implementing landscape design, the principles that need to be followed are as follows: First is the principle of integrity. The landscape is a complex environmental system composed of multiple elements. Because the transformation of one of these elements will affect the overall effect of the landscape, the landscape design must grasp the overall situation. Second, consider the principle of multiple goals. Landscape design can not only design the "landscape"



FIGURE 1: Regional cultural landscape map.

level but also cover water management technology projects, landscape shape art projects, and people's psychological and physical needs. The landscape area, as a cognitive place where people have a psychological consensus, can get a sense of belonging and security from it. Third is the principle of sustainable development. Landscape design should be guided by ecological principles, adjust the relationship between natural environment and artificial landscape, maintain waterfront biodiversity and landscape diversity, and respect natural geography and climate. The land and materials are properly planned to create a sustainable landscape. Fourth is the principle of hydrophilicity. In the landscape design, a hydrophilic landscape facility is designed with the waterside as the center, so that the surrounding people can experience the landscape space.

With the acceleration of China's urbanization process, the development of social economy, and the increasing living standards of the people, people are paying more and more attention to the environment, focusing on ecology, and yearning for nature and are eager to have a green space of their own. As an artificial natural space, the courtyard has become people's dependence.

As shown in the hand-drawn drawing of landscape architectural design in Figure 4, in the process of landscape construction, it is necessary to inherit the historical background of the region, construct the coordination of urban culture, and inherit the characteristic culture. Regional landscape design is mainly based on the search for executable and convenient elements to construct the landscape and then expand the space utilization rate, improve the environment, and search for historical memory on the basis of landscape tracking and development. In this principle, the main points of this article also reflect the region.

As shown in Figure 5, Suzhou gardens use a metaphorical approach to create landscape elements. The design of regional landscapes can also adopt this approach to metaphorically transform landscape design elements including regional culture to express the meaning of regional culture. In modern landscape design, abstract metaphors are often integrated with specific things such as historical culture, historical legends, and celebrities, giving the landscape a cultural connotation and expressing the spiritual connotation of the landscape more clearly.

As the saying goes, "the world's famous mountain monks account for more." It can be seen from Figure 6 that Buddhism

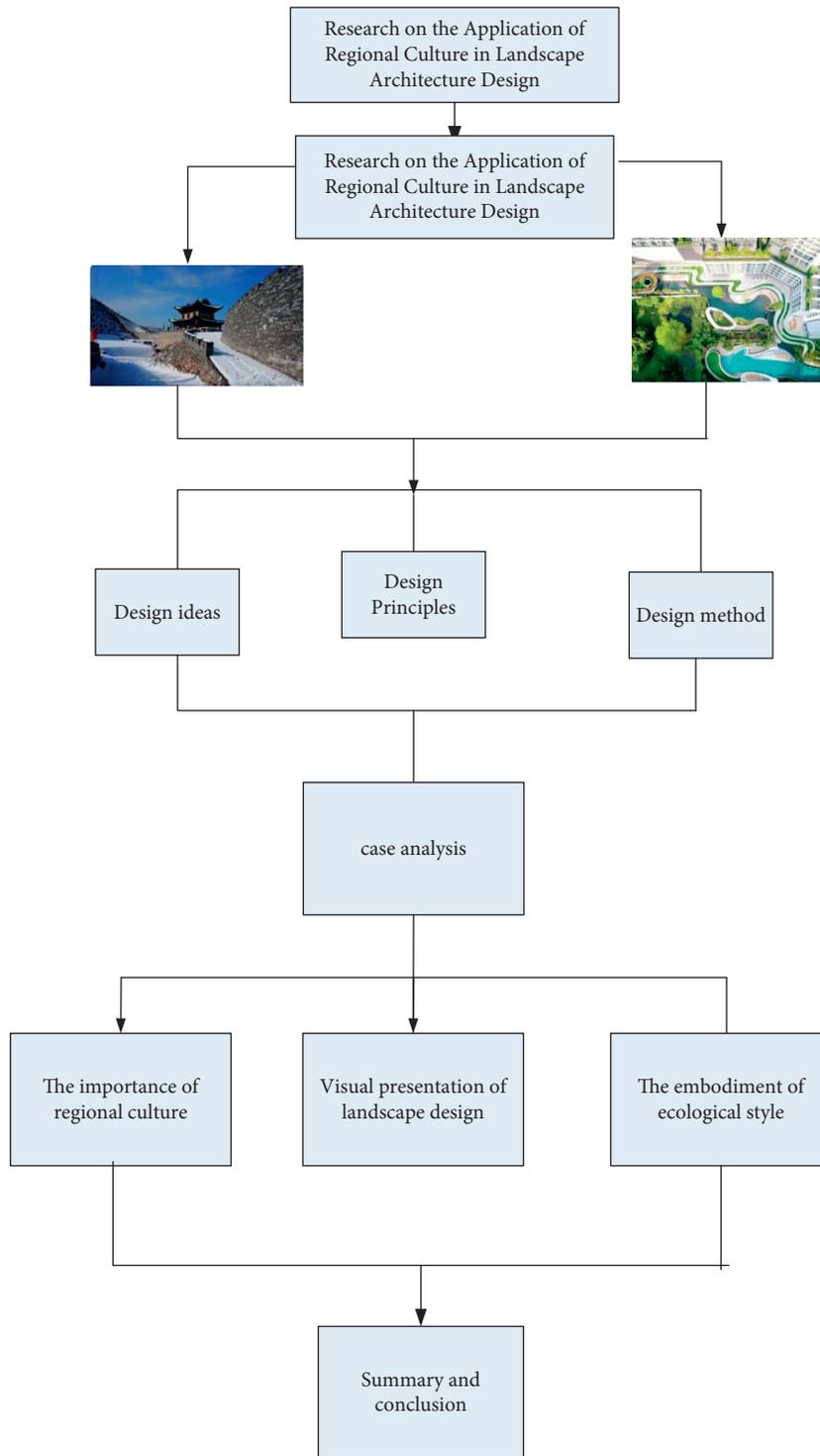


FIGURE 2: Research framework flow chart.

has developed in China for thousands of years, and its architecture has always followed the laws of Sinicization, emphasizing historical style and ancient architectural art according to the architectural form, style, and function of each historical era. Nowadays, there are many buildings that are famous tourist attractions. In terms of site selection and environmental planning, special consideration is given to the

coordination and integration of human landscapes and natural landscapes, with nature as the prerequisite, seeking a symbiosis plan with the environment and the unity of the environment.

Landscape symbols generally refer to symbolic landscapes. The landscape form is related to and corresponding to a specific meaning. It can be a combination of complex factors or a single-factor landscape.

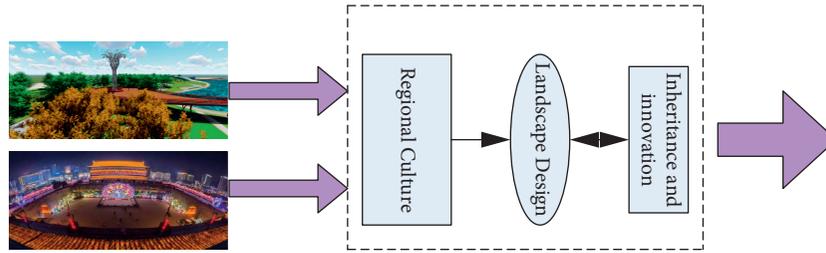


FIGURE 3: The relationship between regional culture and landscape architecture design.



FIGURE 4: Hand-drawn drawing of landscape architecture design.



FIGURE 5: Suzhou gardens.

As shown in Figure 7, design symbols have always been an art language recognized by people, a medium of communication and information, and a carrier of artistic creation. This article starts with related semiotic concepts and mainly discusses the artistic characteristics and application of symbols in landscape design.

### 3. Experiment and Analysis

*3.1. Investigation and Analysis of Landscape Design.* Generally speaking, social survey research can be divided into four stages, namely, preparation stage, investigation stage, analysis stage, and summary stage. The preparation



FIGURE 6: Buddhist landscape architecture map.

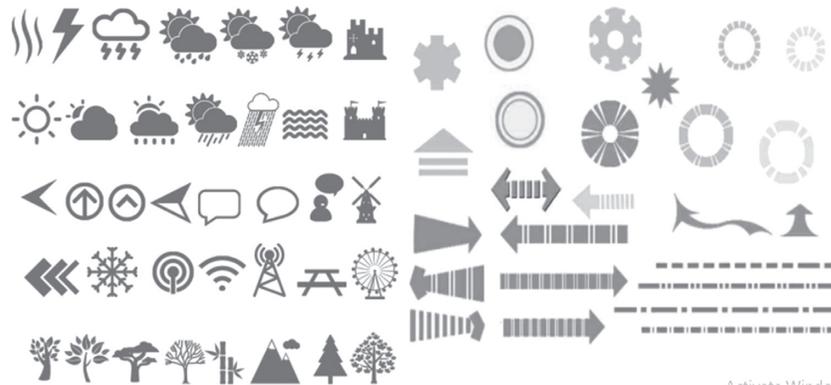


FIGURE 7: Landscape symbol.

stage includes three aspects of work: determining the subject, designing the survey plan, and making specific preparations. The essence of landscape design is to present the deep cultural, ideological connotation and atmosphere of the site and even the region. The ethnic culture, customs, and traditional crafts in the region are transformed into landscape symbols and used in landscape architectural design [20]. Due to the nostalgia of history and the memory of the past, some scenes of historical events and sacred stories can be expressed in flat or three-dimensional space [21]. What it conveys may be a certain era, environment, scene, or event, which makes the viewer’s understanding of the concept of regional culture more concrete, as well as the memory, nostalgia, thinking, and perception of the information conveyed by the landscape during the viewing process. Figure 8 is the result of a survey of nearby tourists of different ages.

It can be seen from Figure 8 that although young tourists have less demand for regional culture than those aged 30–50 and 60–75 years, they are more inclined to integrate regional culture into landscape architectural design. The higher age group has more demand for regional culture than the lower age group, but, on the whole, everyone tends to incorporate regional cultural elements into landscape architectural design.

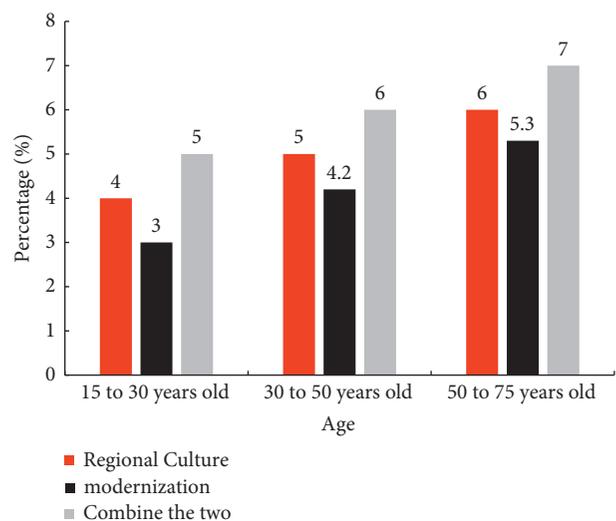


FIGURE 8: Tourist survey bar chart.

With the continuous development of urban cultural construction, cultural landscape has become an important part of urban cultural construction. The article starts with the extraction of regional cultural elements and summarizes the application methods of regional cultural elements in

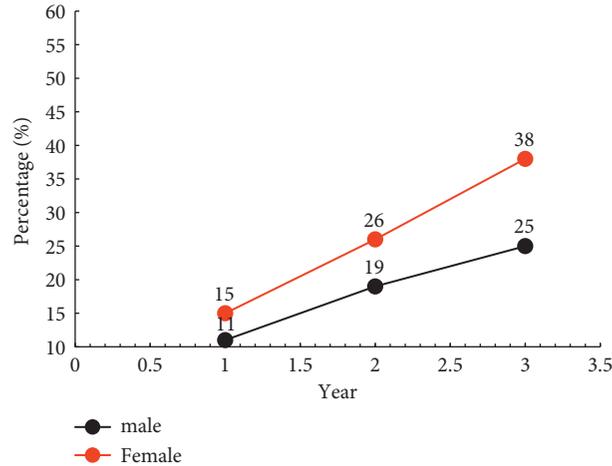


FIGURE 9: 2017–2019 broken-line statistical chart of the needs of different genders for regional culture.

landscape design and provides specific details for urban cultural landscape design. The implementation provides constructive theoretical support. In recent years, with the continuous development of urban resources and the expansion of urban population, urban space has become more crowded. Many precious historical and cultural buildings and blocks have been damaged in various degrees in the acceleration of urban change and development [22]. The wave of urban construction and the alternation of the old and the new will not only destroy the precious regional culture but also make it impossible to inherit it. This article uses the demand of different gender groups for regional culture in the three years from 2017 to 2019 to form the broken-line chart in Figure 9.

It can be seen from Figure 9 that, with the growth of the years, the demand for regional cultural elements to be added to the landscape architectural design is also increasing, with the highest in 2019. Human beings have never stopped exploring the regional culture. In today's globalization, it is necessary to highlight the characteristics of regional culture and advocate the combination of regional design and local cultural design [23].

**3.2. Results and Analysis of Data Fusion Algorithm.** When the reliability coefficient changes, the evidence function and confidence function will also change [24]. Adjust the coefficient to 0.9 to 0, and the results are shown in Table 1. When the reliability coefficient is 0, it means that, in the entire function, the data source  $e$  is completely ignored. At this time, only the data source  $i$  plays a role, and the final result is also determined by its evidence function [25].

As shown in the specific data shown in Table 1, when the reliabilities of the two data sources are equal, the evidence function after the fusion gives fact "1" the trust degree, and the evidence function of the data source  $i$  gives the support of "1" as 0.972. The reliability of data source  $e$  is reduced to 0.4; then  $S(1)$  is increased to 0.2, and  $Bel(1)$  is also significantly improved, from 0.514 to 0.816. Therefore, according to the situation before and after comparison, it can be seen that, after reducing the  $e$  reliability coefficient of the data source,

the final result is more in line with the actual situation [26]. In addition, there is another assumption if the two data sources themselves are the same, as shown in Table 2.

Then, after changing the reliability of  $e$  under this condition, the results obtained are shown in Table 3.

According to Table 3, after changing the reliability of the data source  $e$ , although the evidence function's support for fact "1" is reduced,  $S(1)$  is still greater than the sum, and  $Bel(1)$  is still greater than 0.9. From this, it is concluded that when the evidence is the same, even if the weight adjustment conflicts, the final conclusion is still close to the actual situation [27]. It can be seen that, based on the data fusion algorithm, we can also know that regional cultural elements are becoming more and more important for landscape architectural design.

## 4. Discussion

This paper analyzes the research progress of regional culture and landscape architecture design, expounds the related concepts of regional culture and landscape architecture, studies related theories of landscape architecture design based on regional cultural characteristics, and explores landscape architecture design methods rich in regional culture. Through the analysis of famous landscape cases at home and abroad, the importance of regional culture to landscape architectural design is discussed. Finally, the integration of regional culture in the landscape architectural design of ancient and modern China is taken as an example to explore the relationship between the two.

This article also makes reasonable use of data fusion algorithms. As the scope of data fusion applications has become more extensive and its importance has gradually become more prominent, many scholars have begun to match certain specific fusion theories with real-life application scenarios and propose feasible algorithms. According to the purpose of data fusion application, it is basically divided into two categories. The first category is to ensure the certainty of the collected data and remove uncertain parameters. According to the algorithm, regional culture is an indispensable part of landscape architectural design.

TABLE 1: Fusion results of adjusting the reliability of the data source  $e$  under the conflict of evidence.

Reliability factor	Weight coefficient	Evidence function value	Evidence function value	Evidence function value	Trust function value	Trust function value	Trust function value
		0	1	0 or 1	0	1	0 or 1
$x_i = 0.8$	$Y_i = 1$	0.386	0.386	0.286	0.543	0.543	0.267
$x_e = 0.7$	$x_e = 1$	0.386	0.386	0.286	0.543	0.543	0.267
$x_i = 0.8$	$Y_i = 1$	0.386	0.386	0.286	0.543	0.543	0.267
$x_e = 0.6$	$x_e = 0.66$	0.235	0.864	0.052	0.235	0.843	0.052
$x_i = 0.8$	$Y_i = 1$	0.235	0.864	0.052	0.235	0.843	0.052
$x_e = 0.2$	$y_e = 0.22$	0.235	0.864	0.052	0.235	0.843	0.052
$x_i = 0.8$	$Y_i = 1$	0.2	0.7	0.4	0.3	0.4	0.1
$x_e = 0$	$x_e = 0$	0.2	0.7	0.4	0.3	0.4	0.1

TABLE 2: Evidence of consistency.

Power set	0	1	0 or 1
$s_e$	0.2	0.7	0.2
$s_i$	0.2	0.7	0.2

TABLE 3: Fusion results of adjusting the reliability of data source  $e$  under the condition of consistent evidence.

Reliability factor	Weight coefficient	Evidence function value	Evidence function value	Evidence function value	Trust function value	Trust function value	Trust function value
		0	1	0 or 1	0	1	0 or 1
$x_i = 0.8$	$Y_i = 1$	0.043	0.687	0.021	0.328	0.024	0.023
$x_e = 0.7$	$x_e = 1$	0.043	0.687	0.021	0.328	0.024	0.023
$x_i = 0.8$	$Y_i = 1$	0.043	0.687	0.021	0.328	0.024	0.267
$x_e = 0.6$	$x_e = 0.66$	0.654	0.831	0.082	0.232	0.055	0.074
$x_i = 0.8$	$Y_i = 1$	0.654	0.831	0.082	0.232	0.055	0.074
$x_e = 0.2$	$y_e = 0.22$	0.654	0.831	0.082	0.232	0.055	0.074
$x_i = 0.8$	$Y_i = 1$	0.2	0.7	0.4	0.3	0.4	0.1
$x_e = 0$	$x_e = 0$	0.2	0.7	0.4	0.3	0.4	0.1

Through the various cases in this article, we learned that the use of metaphors to create landscape elements and the design of regional landscapes can also adopt this method to metaphorically express regional cultural connotations with landscape design elements containing regional culture. In modern landscape design, abstract metaphors are often integrated with specific things such as historical culture, historical legends, and celebrities, giving the landscape a cultural connotation and expressing the spiritual connotation of the landscape more clearly.

### 5. Conclusions

This article mainly starts from regional culture and landscape architectural design and discusses the relationship between the two and how to integrate regional culture into landscape architectural design. Based on the data fusion algorithm, it can be learned that only when unique regional culture and historical events are inherited by urban landscape design under the circumstances can landscape design give the most basic cultural importance. Regional culture is essential to garden design. Do not blindly imitate or copy, so as not to cause similarities and repetitions in urban landscape construction. Fully understand the effective integration of regional culture and regional environment, and look for elements with regional characteristics from the regional culture, religious beliefs, and natural environment of urban

landscape design. The research on the application of regional culture in landscape creative design involves a wide range of related scientific fields. The concept of the term culture has always been disputed. The author is not talented, the world is still shallow, the academic theory and business ability are relatively weak, and it is inevitable that there will be fallacies. There are still certain problems in the design work. At the same time, the author is constantly discovering and solving problems and strives to be the best.

### Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

### Conflicts of Interest

The author states that there are no conflicts of interest.

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