Hindawi
Wireless Communications and Mobile Computing
Volume 2023, Article ID 9808367, 1 page
https://doi.org/10.1155/2023/9808367

Retraction

Retracted: Building a Space Model Method Based on the Big Data Map Visual Design

Wireless Communications and Mobile Computing

Received 18 July 2023; Accepted 18 July 2023; Published 19 July 2023

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] L. Yang, "Building a Space Model Method Based on the Big Data Map Visual Design," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 6774922, 8 pages, 2022.

Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 6774922, 8 pages
https://doi.org/10.1155/2022/6774922

Research Article

Building a Space Model Method Based on the Big Data Map Visual Design

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Received 17 June 2022; Revised 9 July 2022; Accepted 18 July 2022; Published 28 July 2022

Academic Editor: Balakrishnan Nagaraj

In order to explore how to realize visual design of building space model, this paper proposes a method of building space model based on big data map visual design. This method explores the research on how to realize the visual design of map by building space model through the key technical problems and solutions of information recommendation based on big data map. The research shows that the building space model method based on big data map visual design can effectively solve the shortcomings of traditional methods, and the work efficiency is about 65% higher than that of traditional methods. From the perspective of big data, apply the thinking and technology of big data to the field of architectural planning, and promote the innovation and development of architectural planning through the data acquisition, analysis, feedback, and evaluation technology of big data.

1. Introduction

Since the study of urban space and morphology was introduced into China in the 1980s, it has been widely concerned by Chinese scholars. Especially since 2000, related disciplines and fields have developed greatly and show interdisciplinary characteristics [1]. From the macrohuman geography to the microarchitectural space, they are all studying the evolution and development law of urban spatial form. With the coming of the era of rapid urbanization in China, the rapid development and changes of cities have led to the changes of urban morphology. Therefore, studying the composition logic and laws of urban spatial form can provide scientific theoretical basis and reference for urban planning and design. Especially at the moment of the development of digital technology, the support of big data provides technical and methodological support for the high-precision quantitative research of urban form.

As an important carrier of urban quality and vitality, the research on urban morphology has become an important problem to be solved in the process of urbanization of new towns in China, and in-depth research on it is of profound significance [2]. However, looking back on the world, most of the studies focusing on spatial form are qualitative, and few are quantitative; Most of the research data are obtained by the traditional methods such as actual survey, sampling questionnaire, and expert interview, and these research methods and data are not enough to meet the urgent requirements of improving the quality of urban morphology.

In the process of the promotion and popularization of digital technology, big data, as a new technical means, has been widely used by academia and industry, and has been rapidly promoted, which has brought a certain impact on the traditional discipline of urban planning. However, this does not mean that the traditional planning discipline is outdated. On the contrary, big data has greatly promoted the further development of the traditional planning discipline, especially in the field of scientific research and project practice. The two complement each other to form complementary advantages [3, 4]. Compared with traditional planning and research methods, big data has its unique advantages. Due to its large amount of data, high precision, and timeliness of data content, big data can complete many studies that could not be completed in the past. Especially for the complex giant system of city, big data can reduce the error caused by the subjective judgment of planners in actual operation, control the results within a certain threshold range, and ensure the correctness and objectivity of research results and data [5].

The building planning program based on big data mainly includes three stages: data acquisition, storage, and analysis and prediction. Among them, for the data storage stage, the interdisciplinary intersection enables us to use the database technology in the computer field for reference to store the data required for the building planning project. For example, the Hadoop system, which has developed the ecosystem for decades, is used to store the project information, and the BIM closely related to the building is combined to further cross integrate [6]. Big data and architectural planning are shown in Figure 1.

2. Literature Review

Chen and Li said that American architectural planning originated in the 1860s. They introduced the theoretical monograph of architectural planning [7]. It can be seen from William Penner's "Problem Search Method - Introduction to Architectural Planning." His planning method is based on the idea of finding and solving problems. The planning is divided into five categories, objectives, current situation, concepts, needs, and problems, and solves the problems of various subcategories such as function, form, economy, and time in each category. After continuous development and improvement, this method has been greatly applied and expanded in the United States. Lv et al. added the relationship between people on the basis of problem search method, emphasizing the value of people [8].

Daissaoui et al. believe that the task of architectural planning is to help architects reflect the values of eternity, institution, and environment [9]. He divided these value orientations into eight aspects, namely, people, environment, culture, technology, time, economy, aesthetics, and safety. Through further research on the projects listed in the list of value levels, architectural planners can have a comprehensive understanding of the respective topics of different planning projects. The "architectural planning" written by Salisbury, a British scholar, mainly expounds the work to be undertaken by various stakeholders in the actual project and the available methods from the perspective of the owner, which has a very useful reference for the operation of the architectural planning method system.

The "big data era" written by scholar Victor Mayer Schoenberg is the first work of big data research in the United States. Mixajlovna et al. believe that the core of big data is reflected in three aspects: the sample of data is equal to the total cost, and there is no need to pursue accuracy and pay attention to the correlation between data [10]. The "big data era" introduces in detail the great changes brought about by big data to life, work, and thinking through a wealth of practical cases, emphasizing the thinking and application of big data, but rarely involving its specific supporting technologies. Santana et al. created the concept of "forgotten rights" that has been widely used in the media and legal circles [11]. This book focuses on the issue of information security, that is, how people should make reasonable choices about the information they have in the era of big data. Radhakrishnan et al. believe that human behavior factors are not accidental but also have the nature of "outbreak" behind them [12]. In the era of abundant data and information, the expected behavior of human beings can be predicted by using Internet resources, mobile phone data, email text content, and other means. Priyadarshani et al. believe that China's architectural planning started relatively late compared with Europe and the United States. Since the 1980s, China has just begun to study the theories and methods of architectural planning [13]. In the "modern architecture theory" edited by Chinese scholar Liuxianjue, it gives a general introduction to the theory of architectural design planning.

Vasistha and Ganguly believe that the architectural planning theory is mainly based on the Japanese architectural planning theory. In 1990, Vasistha went to Chiba National University to study abroad. After returning home, he wrote the "Introduction to Architectural Planning" according to his doctoral thesis [14]. In the book, the procedure of architectural planning is summarized into seven stages: determination of objectives, investigation of external environment, investigation of internal conditions, space conception, technical conception, economic planning, and report formulation.

3. Method

3.1. Spatial Data Characteristics. According to the first law of geography, the characteristics of spatial data are spatially dependent: geographical objects with near spatial location are more similar than those with relatively far spatial location, which reflects the spatial dependence of spatial parameters, that is, the value of a variable at a certain location K is related to the observed value at its nearest neighbor location J. Because spatial data are often affected by these two essential characteristics, which leads to the invalidity of the regression analysis model whose error obeys the assumption of normal distribution, some global statistical analysis methods cannot be directly applied to spatial modeling. The first law of geography by Tobler can be described as shown in the following equations [15].

$$y(k) = f(y_k), \tag{1}$$

$$y_k = p_k \beta_k + \sigma^2. \tag{2}$$

The global spatial autocorrelation index is mainly used to explore the spatial characteristics of attribute values in the whole region. Indicators indicating global spatial autocorrelation mainly include GlobalMoran's index I, Global Geary's index, and Geti's index G. The Moran index is usually used to measure the relationship between spatial elements. Its value is similar to the correlation coefficient in general statistics, with a value of ±1. Judging the global Moran index can conduct quantitative analysis on the spatial pattern. For example, the position of the observation index between ±1 can judge the spatial correlation of the observed

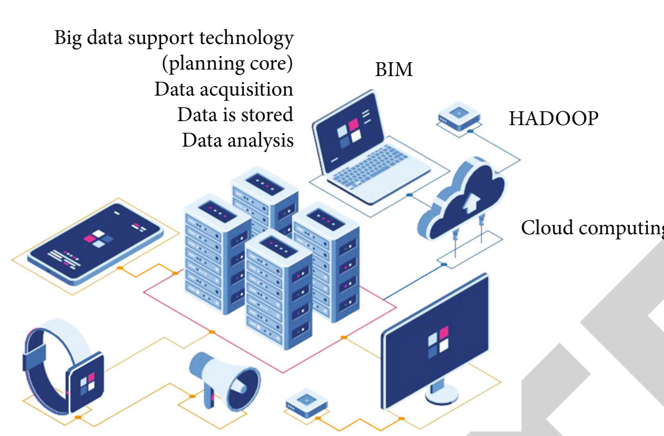

FIGURE 1: Big data and architectural planning.

data attributes, which is usually divided into three relationships: clustering, discrete, and random [16]. Approximately 1 indicates that the positive correlation of data spatial attributes is in a concentrated state, while the negative correlation is in a discrete state. When the index is equal to 0, the noncorrelation is in a random state. The calculation is shown in the following equations.

$$I = \frac{1}{p}\frac{\sum_i\sum_j wi_j(z_i-\bar{z})(z_j-\bar{z})}{\sum_i(z_i-\bar{z})^2}, \quad (3)$$

$w_{ij} = 1$When space unit i is adjacent to space unit j,

$w_{ij} = 0$When space unit i is not adjacent to space unit j.

Due to the multidimensional concept involved, it is also necessary to define concepts such as spatial weighting matrix of adjacent spaces in the research process. Its form is shown in the following:

$$w = \begin{matrix} w11 & w12 & w1n \\ w21 & w22 & w2n \\ wn1 & wn2 & wnn. \end{matrix} \quad (4)$$

Compared with the global autocorrelation, the local spatial autocorrelation assumes that the space is homogeneous. However, in fact, from the internal point of view of the study area, it is rare that the spatial autocorrelation of each local area is completely consistent. There are often spatial autocorrelations of different levels and properties. This phenomenon is called spatial heterogeneity. The spatial heterogeneity of regional elements is very common. The global spatial autocorrelation analysis focuses on studying the spatial distribution state of an attribute value in the whole space. Another key point of spatial autocorrelation analysis is to study the spatial distribution state of the attribute value of a spatial unit in some local locations. The local spatial autocorrelation analysis can effectively detect the spatial differences caused by spatial autocorrelation [17]. The spatial heterogeneity of spatial autocorrelation can be expressed by LISA. LISA is the general name of a group of indexes. Most studies use the Local Moran's I index. In essence, the index local I decomposes the global index I into various spatial units. For a certain space I, the local relationship index can be expressed as shown in the following.

$$I = \frac{z_i-\bar{z}}{p}\sum_{j=1} w(i,j)(z_i-\bar{z}). \quad (5)$$

The SAR model has three main functions for the quantitative study of spatial phenomena: first, to deeply understand the spatial phenomena, and it is possible to evaluate the formulation of policies and determine the corresponding spatial planning measures based on the interpretation of the phenomena. Secondly, predict the development level, and model a certain phenomenon to predict the future development value of the spatial region or the value of other regions with similar spatial characteristics. The basic content is to build a continuous and accurate prediction model [18]. Third, evaluate policies, use regression analysis to explore the development of some assumptions or scenarios, better understand spatial phenomena, and evaluate the possible spatial benefits through the implementation of policies or strategies. In a word, through regression analysis, we can model, predict, and evaluate the spatial relationship. Regression analysis can also help us to explain the internal factors of the observed spatial patterns. The model reflects that the influencing factors of dependent variables will be used in other regions or called regional overflow representation through spatial transmission mechanism, as shown in the following.

$$y = \rho W_1 y + X\beta + e, \quad (6)$$

$$e = \lambda W_2 e + \varepsilon. \quad (7)$$

The combination of the Bayesian model and statistical data can make full use of relevant knowledge and the information of previous sample data, especially when the sample data is sparse or difficult to obtain, which is also a common problem in the field of building energy consumption research. The Bayesian model probability distribution table is used to represent the strength of correlation. Considering the combination of sample knowledge and prior information, it can solve the problems of incomplete data such as missing and missing energy consumption data and improve the accuracy of physical model and geographical model in the study of building energy consumption. The Bayesian model interprets a random event A and random event B in the form of conditional probability and likelihood probability. Its basic expression is shown in the following [19]:

$$p(\theta|y) = \frac{f(y|\theta)p(\theta)}{f(y)}. \quad (8)$$

3.2. Intelligent Planning and Analysis. Intelligent planning and analysis refer to the use of computer technology to intelligently and automatically provide the basis for the spatial conception and prediction of architectural design. In the era of small data, the basic information of the project is generally obtained according to the actual investigation and used as the blueprint to formulate the corresponding construction assignment. Among them, the methods involved mainly include the multifactor analysis method and color card paper method. The data comes from the semantic analysis of basic research, so it is not representative in the type of data. Although the planning analysis is supported by corresponding software, it is still not intelligent [20].

In the era of big data, data sources are diverse and rich in types. The relevance thinking of big data can be used to redefine and mine planning knowledge. At the same time, due to the progress of big data storage technology, the demand data of stakeholders can be accumulated continuously. By analyzing these data, we can master the needs of owners or users. Therefore, planning and analysis show the characteristics of intelligence. For example, SouFun can obtain the views of house viewing users and the satisfied house types of potential buyers, and designers can use this as a basis for house type planning and design. For another example, by knowing the behavior data of residents in the room, we can also understand the advantages and disadvantages of streamline form and space configuration by correlation analysis of the data. Mining the correlation between user demand data can provide different perspectives and ideas for planning [21]. In the massive unstructured data, the possibility of mining planning knowledge is formed through the correlation analysis of data and the corresponding clustering mining algorithm.

Intelligent planning analysis is the further development of computer-aided design/planning. With the further development of artificial intelligence, it will play a more beneficial role in building planning. While planning and analysis are becoming more intelligent, methods are particularly important. While being able to expand, methods are particularly important. The introduction of extension, data mining, visualization, deep learning, machine learning, and other methods will promote the further development of building planning and analysis. To sum up, the intelligence of planning and analysis will become a significant feature in the context of the Internet era and will have further development with the help of computer technology [22]. The intelligentization of building planning and analysis is shown in Figure 2.

3.3. System Flattening Principle. Flattening has two meanings, one is the design interface, and the other is the enterprise management mode. The system flattening principle defined refers to the processing method of operation. As for the management mode of the enterprise, one of them is a set of top-down pyramid management system formed with the expansion of the enterprise scale, which is often easy to cause the problem of low response from top to bottom. Therefore, a flat work organization model is proposed. Compared with the former, this model increases not the vertical management level, but the horizontal management dimension. For example, the working mode of Haier is based on the single, and its purpose is to form a connection with the user market to the maximum extent. In the IT field, the system is in high-frequency iteration at any time, so the user's preference parameters for each version are of particular concern in software development [23]. In order to effectively know user needs and interact with users, a flat working system is required. In this mode, better user experience and better user service can increase their market competition chips. At the same time, because software engineers and end users directly participate in the interaction, they can bring a better experience to the audience, that is, truly make "user data sound."

Big data analysis is the process of running analysis algorithms on a powerful supporting platform to discover potential values hidden in big data, such as hidden patterns and unknown correlations. According to the collected function, form, and economic big data, the specific planning stage is carried out from three aspects: (1) semantic analysis of user needs using Internet data, (2) relevance matching of project space-time data, and (3) real-time monitoring of dynamic data such as construction cost and energy consumption. The analysis of building planning data based on big data is shown in Table 1. The corresponding table of spatial distribution and planning analysis of network requirements is shown in Table 2.

Returning to the field of architectural planning, I believe that a third-party supervision system can be introduced into architectural planning, which solves some problems existing in the contemporary architectural planning industry, ensures the neutrality and objectivity of architectural planning, and enables architectural planning to be effectively evaluated and supervised. It is considered that in the data age, this working mode makes the third-party planning organization need to communicate with architects, project owners, and end users, and the requirements for coordination ability are too high. In specific work links, the third-party system needs to coordinate multiple stakeholders, and the planning efficiency is not guaranteed [24].

With the gradual development and improvement of computer technology, it is practical and feasible to create a system interface for direct dialogue with architects. For example, using platforms such as a WeChat official account, QQ group, and questionnaire star, architects can effectively

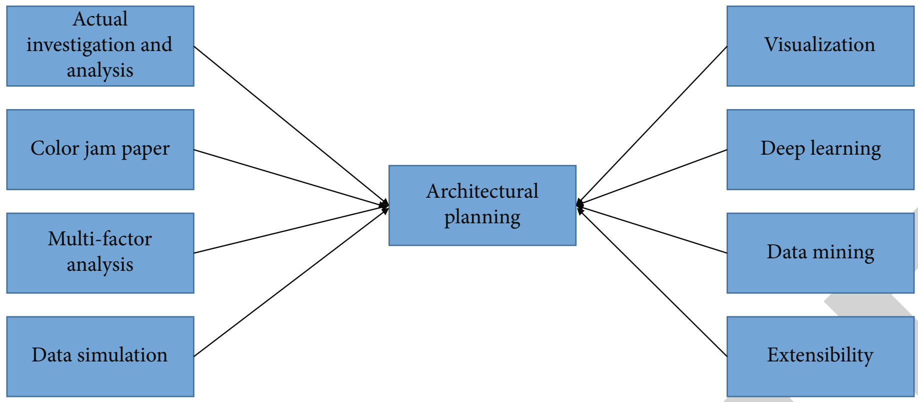

Figure 2: Intelligent building planning and analysis.

Table 1: Analysis of building planning data based on big data.

Category	Analysis content	Analytical method	Coverage planning content
Semantic analysis of user requirements	Mining and analyzing users' needs based on Internet data	Semantic recognition, data mining, and emotion computing	Form planning and function planning
Spatiotemporal data association matching	Behavior space-time correlation degree calculation, user demand space perception correlation degree calculation	Relevance analysis and social calculation	Site planning, scale planning, space planning, function planning, and form planning
Real-time monitoring of dynamic data	Real-time monitoring of construction cost, energy consumption, and other data	Data visualization	Economic planning and technical planning

Table 2: Corresponding table of spatial distribution and planning analysis of network requirements.

Space planning	Concrete content
Entrance selection	Opening towards the place with high density increases vitality and forms positive promotion
Traffic analysis	Based on the real-time road conditions of the site, reasonably select the access between the site and the surrounding area

interact with user owners and other stakeholders. Architects can also discuss the architectural planning scheme through big data analysis at any time. On the one hand, they can understand the needs, and on the other hand, they can get demand feedback to further improve the planning scheme. The whole process forms a loop of continuous circulation, which makes the architectural planning more rational and effective. Through this kind of system construction, architects can really know the needs of users, so as to better formulate design goals [25], as shown in Figure 3.

4. Results and Analysis

Economic planning is an aspect that architects need to consider separately when planning construction projects. William Penner and Mr. Zhuang Weimin both discussed it in their monographs. Economic factors determine the possibility of the implementation of a construction project and will directly affect the quality of the completed buildings [26]. The real estate market pays more attention to premise planning and research. On the one hand, it also considers the economic factors, that is, whether the house price after the comprehensive construction cost can be borne by the target group. For public buildings, the price of building materials and many economic factors are also changing, which will also affect some corresponding factors of the construction industry in real time. In the construction industry, Guanglianda has begun to use big data to integrate the construction market and sort out the real-time project cost of building materials.

The economic analysis of the real estate market is one of the aspects of architectural planning analysis. When making other types of architectural planning, we need to consider not only unilateral issues such as the cost of building materials but also a comprehensive consideration process [27]. The semantic analysis, emotional analysis, and technical planning mentioned above will become part of the comprehensive consideration of economic planning. At the same

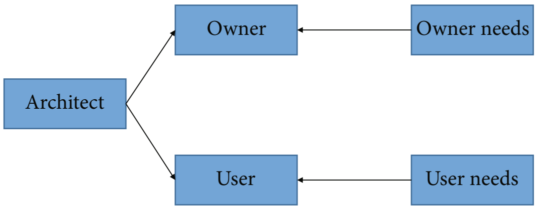

Figure 3: Schematic diagram of flat working mode of building planning.

time, the data of construction economy also needs to be continuously improved, so as to make the big data of construction economy more targeted.

Through real-time monitoring of more than 500 real estate intermediary websites in China, the house price index of the second-hand housing market is compiled. According to this study, it can be gradually extended to many first- and second-tier cities in China. When making specific economic planning, it can provide a good reference for the positioning of construction cost and price [28], as shown in Figure 4.

Understand potential buyers from the demand side. The monitoring and analysis on the activity and attention of the demand side are mainly based on the search proportion, such as the attention of potential buyers on the type of housing supply, geographical location, etc. Among the traces of active Internet users, mining low-density keywords, garden, decoration, and the sense of single family are the three most intuitive perceptions of low-density by Internet users. Therefore, when planning low-density residential types, these three keywords can be used as planning concepts. It can be seen that the second direction is to carry out real-time mining and analysis on the needs of users, so as to provide reference for the construction economy.

Architectural planning has been able to preliminarily support site planning, space planning, image planning, technical planning, and economic planning. In the analysis stage, building planning analysis based on big data should also take the visualization of data as the basis for analysis. Under the intuitive interface, the architect makes corresponding judgments, so that the decision-making stage can be further carried out. For example, in the interface of site visual analysis, assuming that the land is commercial land, it can be seen from the thermal map that the business should gather people as much as possible, and the thermal map can better show the activity of people. Therefore, the planning of commercial land can be based on this. The planning and analysis of space, image, technology, and economy are also based on visual operation, so no more discussion will be made.

From the use of building materials in various countries, concrete is the most frequently used building materials. This is because reinforced concrete plays a structural role in many high-rise residential buildings, so it is widely used in various countries. Steel is commonly used in European and American countries, such as France and the United States. From the case, glass is a material that must be used in all residences. The label refers to the buildings dominated by glass

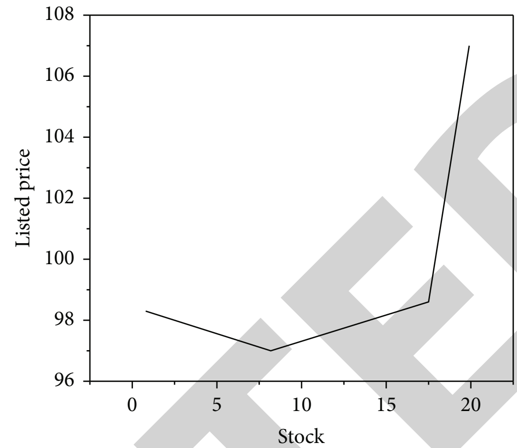

Figure 4: Listing price index of stock housing in four selected first-tier cities.

curtain walls and other glass. As the birthplace of high-rise modern buildings, the United States has become the largest country in the use of glass in its residential buildings. As for the use of wood, it is commonly used in various countries, and the gap is not large, which shows that wood as a building material not only is beneficial to create a building atmosphere but also gives the character of being close to the environment. The use of bricks shows the national character of taking bricks as a historical tradition, such as European countries and American countries.

From the published cases, the use of concrete has shown an upward trend in the past 10 years, reaching two peaks in 2017 and 2018 and then declining after 2021. Steel has the same upward trend, reflecting the demand change of housing construction. The use of wood peaked in 2019 and then fell to the level around 2017 in 2019. The use of glass building materials shows the law of scattered use from top to bottom. The use of bricks has increased and maintained a certain gentle trend. From the use of these materials, concrete and steel, as the main building materials, maintained an upward trend, only slightly decreased in 2016, which may be related to the fact that this year's case has not been released. The use of wood has a downward trend in recent years, and glass also shows an unstable trend, indicating the randomness of glass as a large curtain wall in residential design. Brick is related to the planning concept of housing renovation and housing design in specific countries, so there will be certain practice cases every year.

5. Conclusion

With the further development of the Internet, cloud computing, and the Internet of things in the information age, the total amount of data in various industries is growing at an unprecedented rate. The traditional data statistics and analysis methods have been unable to deal with the structural and unstructured data information with "Pb" as the unit, thus giving birth to the big data technology. As a material construction process, the construction industry also continuously produces various types of relevant data in the whole life cycle of its planning, design, construction, and operation stages, such as survey data, design data, construction data, and operation data. However, the massive and diversified characteristics of construction data have not re integrated the current resource allocation of the construction industry, and the insufficient attention to network data information has made the planning, design, and construction stages more and more tired. How to integrate these big data and store, analyze, and mine knowledge to promote the transformation and development of the construction industry, especially whether reasonable and correct decisions can be made in the planning stage, is an urgent problem for the construction industry.

In this paper, the quantitative research of urban form supported by big data has changed the traditional research ideas, accurately described the characteristics of urban form, and accurately defined the boundaries of various elements of urban form. The traditional qualitative research on the complex spatial form of the city lacks sufficient accuracy. At the same time, because the data is not easy to obtain, it also lacks the grasp based on the overall perspective. The inaccuracy and incompleteness of research and analysis have also led to the lack of understanding of the complexity of urban morphology in urban theoretical research.

Data Availability

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

Conflicts of Interest

The author declares that they have no conflicts of interest.

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