Research Article

Evaluation of Urban Environmental and Economic Coordination Based on Discrete Mathematical Model

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The urban ecological environment is the material basis and condition for human beings to engage in social and economic activities and the supporting system for the formation and sustainable development of cities. With the acceleration of urbanization and industrialization, urban living environments and economic development have become the focus of people's attention. This leads to the necessity of studying how to improve the quality of the urban living environment and promote the harmonious coexistence of population, natural environment, and social economy. Traditional methods focus on multiple regression models to evaluate the urban environmental and economic harmony, but this method does not consider the weight of each index, resulting in poor accuracy of the evaluation results. This paper proposes a discrete mathematical model to design the evaluation index and evaluation system of urban environmental and economic coordination. It calculates the weight of each index; carrying capacity of the urban environment, the value of each environmental factor, and the comprehensive value of the environment is determined. The static evaluation and dynamic evaluation are used to evaluate the coordination of the urban environmental economy. The experimental results show that the designed evaluation method of urban environmental economic coordination has high accuracy and effectively improves the reliability and evaluation time.

1. Introduction

The city is the product of the development of human society to a certain stage. It is the highly concentrated and rapidly running area of the Earth's surface material and energy. In this sense, a city is also the center of politics, economy, culture, education, science, and technology of a country and a region and the place with the densest population and industry. Therefore, the urban ecological environment is the material basis and condition for human beings to engage in social and economic activities and the supporting system for the formation and sustainable development of cities. With the acceleration of urbanization and industrialization, urban living environments and economic development have become the focus of people's attention. The city is an important activity space for people to live, work, travel, and entertainment. It is an urgent problem for modern city construction and development to coordinate the relationship between urban living environment and economic

development and provide urban residents with a comfortable activity space. The amplification effect of the destruction of human settlements will cause irreversible deterioration in the future development of cities. The rapid development of the economy affects the living environment of the city; therefore, how to improve the quality of the urban living environment and promote the harmonious coexistence of population, natural environment, and social economy has become an urgent problem to be studied and solved by academic circles and government organizations. At present, the country pays more and more attention to the coordinated development of cities.

Some scholars have found that the relationship between economic growth and environmental pollution is similar to the relationship between income level and fair distribution in Kuznets. Li cities in Shaanxi province as the research object, by constructing urban human settlements environment index system and index system of economy system, the use of PCA (principal component analysis) model for the

environment and the comprehensive evaluation on the level of economic development, per capita by using the coordination degree model and the degree of coordinated development model analysis influence the coordinated development of urban human settlements environment and economic factors.

At present, the assessment method of urban environmental economic coordination based on the multiple regression model is most commonly used. Although this method can assess the urban environmental economic coordination, it has the problem of low accuracy. For this reason, an assessment method of urban environmental economic coordination based on a discrete mathematical model is designed.

2. Discrete Mathematical Model

Discrete mathematics is a mathematical discipline that studies the structure of discrete quantities and their interrelations. The meaning of discrete quantities refers to different elements connected. It mainly studies the structure and interrelations based on discrete quantities. The realization process of the model is shown in Figure 1.

As per Figure 1, the cardinality of a set is the number of elements in the set denoted as $n(S)$ of set S which is a well-determined collection of objects that are called members, or elements, of the set. Some basic operations are using sets (i) union, $A \cup B$, whose elements are the elements of set A and the elements of set B, (ii) intersection, $A \cap B$, whose elements are the elements common to A and B, and (iii) difference, $A - B$, whose elements are those elements of set A that are not members of set B. A binary relation on a set A is a set of ordered pairs of elements of A, that is, $A \times A$. There are many ways to specify and represent binary relations, some of which are using (a) mathematical logic such as Matrix and Tuples, (b) predicate logic such as set builder form, and (c) graphs which consists of a set of vertices and a set of edges directed from one vertex to another [1].

3. Evaluation Method of Urban Environmental Economic Coordination Based on Discrete Mathematical Model

3.1. Construction of Urban Environmental and Economic Coordination Evaluation Index System. To comprehensively reflect the relationship between the two subsystems, a comprehensive index containing the main influencing factors should be established, respectively. As there are many indicators in the economic system and the environmental system, the grey correlation analysis method is used to preprocess all the evaluation indicators of urban environmental and economic coordination [2] and obtain representative indicators to achieve data dimensionality reduction. The grey correlation analysis method is used to carry out multifactor statistical analysis on the evaluation index of urban environmental and economic coordination, which can describe the change of correlation degree of each factor in the development process of a system based on the sample data of each factor [3]. If the trend consistency of the

change of different factors in the system is high, the grey correlation degree of the two is large. If the trend consistency of the change of different factors in the system is low, the grey correlation degree is small.

$$\text{calculation formula: } B = \frac{A}{|X \cdot K + I|}. \tag{1}$$

In equation (1), B represents the gray correlation coefficient, A represents the index difference, X represents the sequence discrimination coefficient, K represents the maximum value of the absolute value of the index data difference, and I represents the minimum value of the absolute value of the index data difference.

Through the above calculation, representative indicators are selected, the evaluation index system of urban environmental and economic coordination established is shown in Table 1, and tree structure is shown in Figure 2.

Based on the completion of the above indicators, the weight of the indicators is determined, and the PCA method is used to deal with the above indicators. The PCA method is the use of linear algebra theory, the original many indicators into a few independent, and the original linear combination of individual indicators to represent the comprehensive indicators. Its outstanding advantage is that the determination of the weights of the original indicators does not have the subjective consciousness of human beings and is more objective and scientific, thus improving the reliability and accuracy of the evaluation results. The calculation process of PCA is as follows.

First, considering that the dimensions of the original data [4–7] are different and the orders of magnitude of the indicators are significantly different, the original data should be standardized before PCA. First, the column should be centralized, and then the standard deviation should be standardized.

$$\text{calculation formula : } x = \frac{(t - j)}{b}. \tag{2}$$

In equation (2), x represents the original data of the index over the years, t represents the data after standardization, j represents the average value of the index during the selected period, and b represents the standard deviation of the index.

The obvious feature of PCA is that each principal component depends on the scale used to measure the initial variable, but when the scale changes, different eigenvalues will be obtained. The way to overcome this difficulty is to normalize the initial variable so that its variance is 1.

Secondly, the correlation coefficient matrix of the correlation matrix is obtained by PCA of the standardized data:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1p} \\ r_{21} & r_{22} & \cdots & r_{2p} \\ \vdots & \vdots & \cdots & \vdots \\ r_{p1} & r_{p2} & \cdots & r_{pp} \end{bmatrix}. \tag{3}$$

Corresponding to the correlation coefficient matrix R, the Jacobi method is used to obtain P nonnegative eigenvalues of the characteristic equation, and the corresponding eigenvectors corresponding to the eigenvalues are shown as
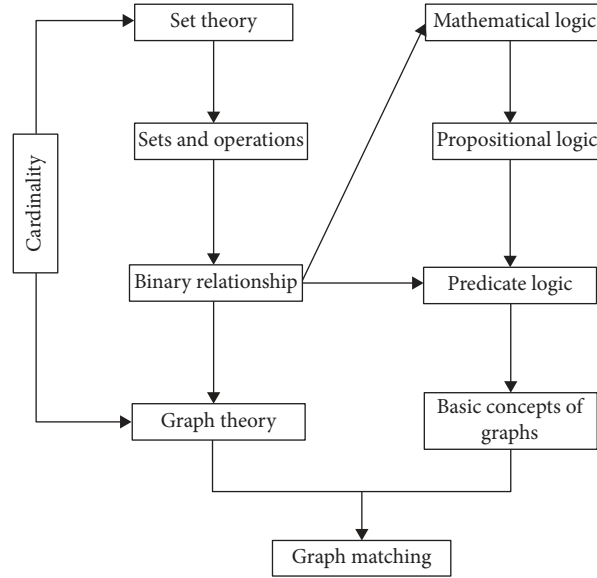
Figure 1: Realization process of discrete mathematical model.

Table 1: Urban environmental and economic coordination evaluation index system.

System layer	Subsystem layer	Index level	Nature
People's environmental system	Living conditions	Gas penetration rate	Positive indicators
		Water penetration rate	Positive indicators
		Daily water consumption per capita	Positive indicators
		Floor area of buildings completed	Positive indicators
		Sewage treatment rate	Positive indicators
		Park area per capita	Positive indicators
	Ecological environment quality	Park area per capita	Negative index
		SO2 annual average concentration	Negative index
		Green coverage of built-up area	Positive indicators
		Number of beds per thousand people	Positive indicators
	Public infrastructure	Every ten thousand people use public vehicles	Positive indicators
		Road area per capita	Positive indicators
		GDP per capita	Positive indicators
	Economic strength	Industrial output per capita	Positive indicators
		Per capita financial income	Positive indicators
		Total import and export trade	Positive indicators
Economic system	Industrial structure	The proportion of secondary industry to GDP	Positive indicators
		Tertiary industry's share of GDP	Positive indicators
		Proportion of tertiary industry personnel	Positive indicators
		Proportion of secondary industry personnel	Positive indicators
		Total retail sales of consumer goods per capita	Positive indicators
		Average annual salary of employees	Positive indicators
	Resident income consumption	Per capita disposable income of urban residents	Positive indicators
		Consumer price index	Positive indicators

$$p_i = \frac{sR}{(y + u)}. \qquad (4)$$

In equation (4), p_i represents the number of indicators, s represents the ratio of indicators to the variance of all indicators, y represents the principal component of indicators, and u represents the variance of principal component of indicators.

Thirdly, the factor scoring function g of each principal component is obtained:

$$g = \frac{xh}{(c_1 + c_2 + c_3 + \cdots + c_n)}. \qquad (5)$$

In equation (5), c_1, c_2, c_3, ..., c_n represent the standardized index value of index 1, index 2, index 3, and index n and h represents the load value of index principal component.

Fourthly, according to the factor score function of each principal component and the variance contribution rate of each principal component, the comprehensive score of the system is calculated, and the comprehensive evaluation index of each year is obtained:
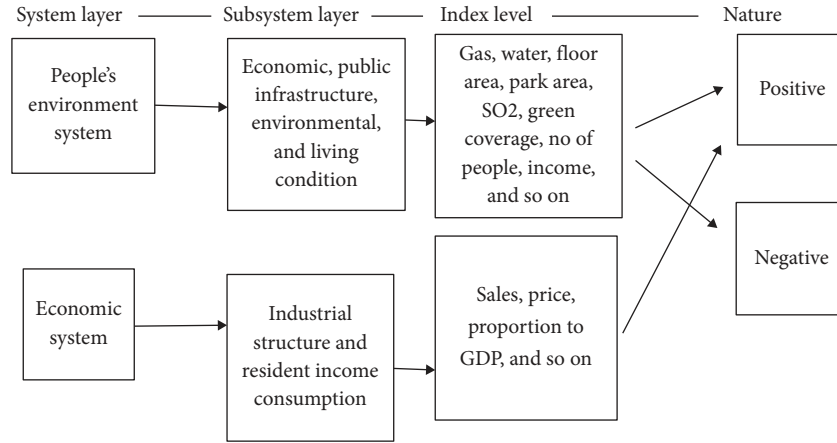
Figure 2: Urban environmental and economic coordination evaluation index system tree structure.

$$F_i = \frac{a_{im} + g}{d_{im}}. \tag{6}$$

In equation (6), F_i represents the comprehensive development evaluation index of all indicators in year i, a_{im} represents the contribution rate of the m principal component in year i, and C represents the scoring function of the m principal component factor in year i.

According to the above calculation, the assessment index of urban environmental and economic coordination is determined and processed.

3.2. Calculation of Urban Environmental Carrying Capacity.
Based on the completion of the above indicators, the urban environmental carrying capacity is calculated. The resource carrying capacity refers to the quantity and quality of resources of a country or region, which supports the basic survival and development of the population in the space. The population, resources, and economy of a region interact and influence each other, and there is a certain matching pattern. The diagram of the interaction between the economic system and the urban environmental system is shown in Figure 3.

From the above diagram, it can be seen that the rapid economic development may bring about environmental deterioration in a specific period, but on the contrary, when the economic development reaches a certain inflection point, the economic development can become the driving force for the improvement of environmental quality, and the relationship between economic development and environmental protection is not unchanged.

If the economic volume is also regarded as a kind of resource, the carrying capacity of a certain number of natural resources and economic resources to the population is limited. The quantitative relationship between them can be evaluated by the following equation. The calculation formula of relative natural carrying capacity [8–11] is

$$v = \frac{\lambda I + BU}{U}. \tag{7}$$

In equation (7), v represents the relative carrying capacity of A natural resource, λ represents the carrying
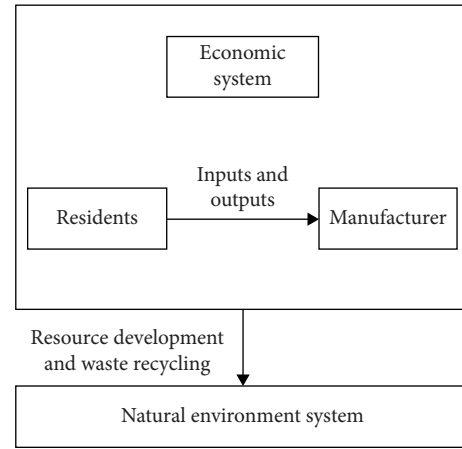
Figure 3: Schematic diagram of the interaction between the economic system and urban environmental system.

capacity index of the natural resource, and U represents the population of the reference area.

The expression of the carrying capacity of relative economic resources is

$$m = vF_i \times d. \tag{8}$$

In equation (8), A is the relative carrying capacity of m certain economic resource, and d is the amount of the economic resource in the evaluation area.

The expression of comprehensive bearing capacity is

$$m' = \frac{F_i \times d + BF_i}{\lambda}. \tag{9}$$

In equation (9), m' represents the comprehensive bearing capacity of the evaluation area. The comprehensive carrying capacity mainly considers that, under the market economy, natural resources and economic resources can be interchangeable and complementary to a certain extent. Of course, there is a certain limit to this kind of interchange and complementarity, and the lower limit is that the resource environment economic system can run stably and effectively.

The comprehensive bearing capacity pressure index of the evaluation area is calculated:

$$P_z = \frac{m'(r+e+y)}{x}. \tag{10}$$

In equation (10), P_z represents the comprehensive bearing capacity pressure index of the evaluation area, r represents the actual population of the evaluation area/the ideal bearing population of the natural resources, e represents the actual population of the evaluation area/the ideal bearing population of the economic item, and y represents the actual population of the evaluation area/the ideal bearing population of the evaluation area.

It should be pointed out that, compared with the surrounding areas, the evaluation area is an open and dynamic complex regional system, and the flow and exchange of various resources can be carried out inside and outside the area. Therefore, the actual bearing capacity of the evaluation area can be slightly larger than the comprehensive bearing capacity of the evaluation area. However, due to the limitation of interregional resource circulation and exchange and its positive correlation with the resource carrying capacity of the evaluation area, there is a comparative reference relation between them. Therefore, the evaluation of carrying capacity can be used as a criterion to evaluate the sustainability of regional population development.

Based on the completion of the comprehensive bearing capacity calculation, environmental value assessment [12–17] is a bridge connecting economy and environment. Therefore, the method of using environmental value assessment to study regional environmental ecosystems has been widely accepted and adopted. According to the theory of compensation value in economics, the total economic value of environmental assets includes use value and nonuse value, as shown in Figure 4.

Firstly, for the value accounting of a single environmental factor, the value of environmental resources reflects the relationship between people and the environment, and the corresponding environmental resources have temporal scarcity and social attributes. The accounting formula is

$$l = \delta P_z (K + L). \tag{11}$$

In equation (11), δ represents the changing parameters of environmental resources over time, place, and social environment, K represents the population density index, and L represents the environmental resources index.

Because each environmental factor in the ecosystem plays a different role in the cycle of the whole ecosystem and each environmental factor affects and restricts each other, the change of any ecological environment factor will have an impact on other factors related to it. Due to this overlapping influence, the value of ecological environment factors is superposition and repeatability. At the same time, each ecological environmental factor itself contains many environmental factors, and its value is multiple. Considering the above situation, the total value of ecological environmental resources is
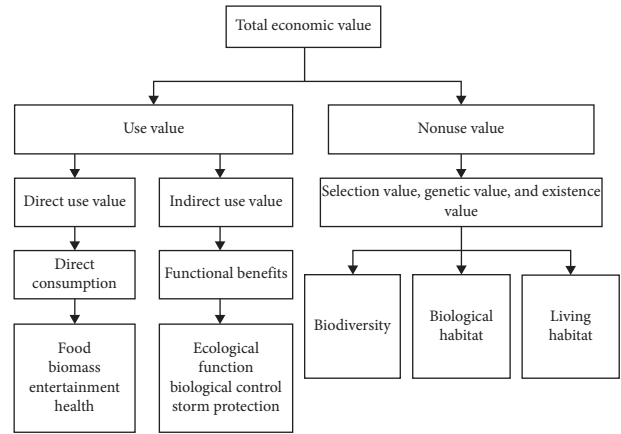

Figure 4: Economic value classification of environmental assets.

$$G = dl(w_i + w_n). \tag{12}$$

In equation (12), G represents the total value of ecological environment resources, d represents the weight coefficient, w_i represents the value weight of the i ecological environment factor in the overall environment, and w_n represents the influence weight of the n ecological environment factor.

Based on the above calculation, the urban environmental carrying capacity of the evaluation area is obtained, and the initial evaluation of the environmental value of the evaluation area is completed.

3.3. Assessment of Urban Environmental and Economic Coordination

3.3.1. Static Coordination Assessment. Based on the establishment of the above assessment index system and the completion of the calculation of urban environmental carrying capacity, the assessment of urban environmental economic coordination mainly includes static and dynamic evaluation.

Static coordination degree [18, 19] refers to the system coordination status at a certain time in the research period or state coordination degree, which reflects the coordinated development and changes of a certain year. Static coordination degree model and static coordination analysis aimed at more objectively grasping the overall living environment subsystem and economic subsystem trajectory of similarity degree, laying a foundation for subsequent coordination analysis and prediction, the two together, and constituting the system to measure the overall coordination. Before conducting the coordination analysis, the regression analysis of the two systems should be carried out. Regression analysis is a statistical analysis method to determine the interdependent quantitative relationship between two or more variables. That is, when the value of one factor is fixed, the value of the other factor should be gradually approached to the value it needs to reach. If only one independent variable and one dependent variable are included in the regression analysis and the relationship between them can be

approximated by a straight line, the regression analysis is called unary linear regression analysis. DPS statistical analysis software was used to conduct regression analysis on the comprehensive development index of the human settlement environment and economic system. The regression fitting equation was obtained by taking the human settlement environment system as the independent variable and the economic system as the dependent variable, and the regression fitting equation was obtained by taking the economic system as the independent variable and the human settlement environment system as the dependent variable:

$$E = X + Y. \tag{13}$$

In equation (13), E represents the comprehensive score, X represents the score of the economic system, and Y represents the score of the people's environmental system.

By using the method of membership degree in fuzzy mathematics, it is assumed that the living environment and the comprehensive development level of economy are $f(x)$ and $f(y)$, respectively, and the state coordination degree function is established. The calculation formula is

$$V(i, j) = \frac{(W - w)^2}{E}. \tag{14}$$

In equation (14), $V(i, j)$ represents the state coordination degree of system i to system j, W represents the actual value of system j to system i, w represents the coordination value of system j to system i, and E represents the actual variance of the system.

According to the significance of systematic coordinated development and regression analysis, the model of urban living environment and economic coordinated development is synchronous development in an ideal state. However, in practice, it is rare for the two to completely synchronize. Therefore, the coordination value can be determined by regression equation, and the coordination degree between systems can be evaluated by state coordination degree $V(i, j)$. The calculation method is shown in the following formula:

$$V' = V\left(\frac{i}{j}\right) + V\left(\frac{j}{i}\right). \tag{15}$$

In equation (15), V' is the coordination degree index of two systems, $V(i/j)$ is the state coordination degree of system i to system j, and $V(j/i)$ is the state coordination degree of system j to system i.

The closer the values of $V(i/j)$ and $V(j/i)$ are, the greater the value of V is and the higher the degree of coordinated development between the two systems is. On the contrary, the greater the difference between values of $V(i/j)$ and $V(j/i)$ are, the smaller the value of V is and the lower the degree of coordinated development between systems is. The two systems are perfectly coordinated in $V = 1$.

3.3.2. Dynamic Coordination Assessment. To determine the development trend and degree of the whole system coordination degree in a certain time series, it is necessary to calculate the dynamic coordination degree. Only by the combination of dynamic and static, can we better reflect the whole process of coordinated development of human settlements and economic system, find out the causes of incongruity, and put forward corresponding coordination measures. Dynamic coordination degree refers to the changing trend of all indexes of the system in the whole research period, reflecting the overall coordinated development and change. Based on obtaining the static coordination degree of different time points, to reveal the changing trend of the static coordination degree of each time point and further apply it, it is necessary to establish the dynamic coordination degree reflecting the coordinated development degree of the two systems, and the calculation formula is

$$J = \varphi(t + n). \tag{16}$$

In equation (16), J represents the dynamic coordination degree, and φ represents the static coordination degree at time t and time n.

If $t < n$, it is considered that the system has been on the track of coordinated development during this period. If $t > n$, it is considered that the two systems are not on the track of coordinated development during this period.

In order to improve the accuracy of the evaluation, the coordination level and classification standard are proposed to reflect the degree of coordinated development of urban living environment and economy. The discrete mathematical model is used to establish the fuzzy coordination level and classification standard, as shown in Table 2.

Through the above process, the evaluation of urban environmental economic coordination based on discrete mathematical model is completed.

4. The Experimental Contrast

By experimental verification based on a discrete mathematical model of the design of city environment, coordinated economic evaluation method is effective, the experimental assessment includes two aspects, the static coordination degree evaluation and dynamic coordination degree evaluation, dynamic coordination degree reflects the system of the indicators in the whole period of change trend, and the static coordination degree reflects the coordination of every year. To ensure that the experimental results are more comparative, the traditional method is compared with the method of this design.

The static coordination between the urban living environment system and the economic system in a certain city in 2000 and 2019 is shown in Table 3.

The dynamic coordination degree between urban living environment system and economic system is shown in Table 4.

4.1. Experimental Data Processing. Due to the large amount of data involved in the experiment, to effectively manage the data involved in the experiment, computer hardware and database management technology are used to process the experimental data, to realize the unified and integrated

TABLE 2: Coordination degree grade and classification criteria.

High-quality coordinated development	Coordination level	Type notation	Basic type
0.900–1.000	High-quality coordinated development	A	High-quality coordinated development type of economic lagging type High-quality and coordinated development of human settlement environment and economic synchronization High-quality and harmonious development type of living environment lagging type
0.800–0.899	Good coordination development	B	Economically lagging type with good coordinated development Well-coordinated development type of human settlement environment and economic synchronization Well-coordinated development of lagging human settlement environment
0.700–0.799	Intermediate coordinated development	C	Intermediate coordinated development economic lagging type Intermediate coordinated development of human settlement environment and economic synchronization Intermediate coordinated development human settlement environment lagging type
0.600–0.699	Primary coordinated development	D	Intermediate coordinated development human settlement environment lagging type Primary coordinated development type human settlement environment and economic synchronous type Primary coordinated development type of living environment lagging type
0.500–0.599	Barely coordinated development	E	Barely coordinated development of economic lagging type Barely coordinated development of synchronous human settlement environment and economy Barely coordinated development of lagging human settlement environment
0.400–0.499	On the verge of imbalanced recession	F	Economic losses and gains on the verge of imbalanced recession Habitat environment gains and losses on the verge of imbalanced recession
0.300–0.399	Extremely dysfunctional recession	G	Extremely imbalanced recession human settlement environment and economic loss Extremely dysfunctional recession and loss of human environment

TABLE 3: Static coordination degree and grade division between the living environment system and the economic system in the experimental city.

Years	Static coordination	Coordination level
2000	0.5896	Barely coordinated
2001	0.6603	Primary coordination
2002	0.7050	Intermediate coordination
2003	0.7594	Intermediate coordination
2004	0.8161	Well coordinated
2005	0.8600	Well coordinated
2006	0.8822	Well coordinated
2007	0.9421	Quality coordination
2008	0.9489	Quality coordination
2009	0.9637	Quality coordination
2010	0.9847	Quality coordination
2011	0.9922	Quality coordination
2012	0.9990	Quality coordination
2013	0.9872	Quality coordination
2014	0.9473	Quality coordination
2015	0.9254	Quality coordination
2016	0.8647	Well coordinated
2017	0.7572	Intermediate coordination
2018	0.6497	Primary coordination
2019	0.5432	Barely coordinated

Table 4: Dynamic coordination degree of urban living environment system and economic system.

Years	Dynamic coordination	Coordination level
2000	0.5896	Coordination level
2001	0.6250	Primary coordination
2002	0.6517	Primary coordination
2003	0.6786	Primary coordination
2004	0.7061	Intermediate coordination
2005	0.7317	Intermediate coordination
2006	0.7532	Intermediate coordination
2007	0.7768	Intermediate coordination
2008	0.7960	Intermediate coordination
2009	0.8127	Well coordinated
2010	1.8288	Well coordinated
2011	0.8420	Well coordinated
2012	0.8541	Well coordinated
2013	0.8636	Well coordinated
2014	0.8692	Well coordinated
2015	0.8727	Well coordinated
2016	0.8722	Well coordinated
2017	0.8658	Well coordinated
2018	0.8545	Well coordinated
2019	0.8389	Well coordinated

management of the experimental output graphics and related attribute data and realize the sharing of experimental data.

The spatial database system used in the experiment includes Microsoft operating system, GIS basic software, and database management system (DBMS) software. Among them, the most important is the choice of GIS basic software platform. At present, the relatively mature GIS software platforms in China include ArcGIS software, Map Info software in the United States, and Map GIS and Supper Map software in China. Among them, ArcGIS software has become the first choice for many GIS application projects due to its excellent spatial data management ability and spatial analysis ability. Therefore, Arc Info was selected as the GIS basic software platform for the development of this experimental spatial database system, including Arc Info DeskTop, ArcSDE, Arc IMS, and other components.

ArcSDE is a main function in relational database management system and application ACTS as a gateway between the geographic information system, namely, the middleware, with the aid of the middleware, spatial data can be added to the relational database system, and use the inherited from a relational database environment powerful database management functions of experiment attribute data and spatial data in unified and effective management. The storage model of experimental data is Geodatabase, which is used to organize and manage the spatial data. The database management system selected Microsoft Access and Microsoft SQL Server as two kinds of software. In the early stage of the experiment, the amount of data was small; to better play the advantages of personal Geodatabase with low requirements on the system environment, Microsoft Access database was used for data storage. After a certain stage of the experiment, if the personal Geodatabase cannot meet the requirements of the system with the increase of data volume,

the original access data can be converted and stored in the SQL server database, and the connection between spatial data and attribute data can be established through ArcSDE (ARC spatial database engine) module of ArcGIS software to build the multiuser Geodatabase. The organizational structure of experimental data processing used in the experiment is shown in Figure 5.

The above database is used to collect experimental data, process experimental data, and generate experimental data. The specific comparison results are shown as follows.

4.2. Comparison of Evaluation Results of Static Coordination Degree of Urban Environmental Economy. In order to make the experimental results more intuitive, the actual coordination degree is presented in the form of a curve in the experimental diagram. The evaluation results of the two methods are shown in Figure 6.

As can be seen from Figure 6, in 2002, the actual result of the static coordination evaluation of urban environmental economy was 0.7, the value of the traditional method was 0.65, and the value of the method in this paper was 0.7. In 2018, the actual result of urban environmental economy costatic tonality evaluation is 0.78, the traditional method of urban environmental economy static coordination evaluation value is 0.42, and the method of urban environmental economy static coordination evaluation value is 0.40. On the whole, the actual value of static coordination degree shows a trend of gradual increase at first and then a trend of gradual decline. The difference between the evaluation results of urban environmental and economic coordination calculated by this design method and the actual results is small. However, there is a certain gap between the traditional evaluation method and the actual evaluation result, which is relatively large, and the evaluation stability is poor, indicating that the traditional evaluation method is susceptible to the impact of evaluation indicators and other factors, resulting in the low accuracy of the evaluation.

4.3. Comparison of Evaluation Results of Dynamic Coordination Degree of Urban Environmental Economy. The evaluation results of the traditional coordinated evaluation method and the designed evaluation method are shown in Figure 7.

As can be seen from Figure 7, in 2000, the actual result of dynamic coordination assessment of urban environmental economy was 0.6, that of the traditional method was 0.5, and that of the present method was 0.58. In 2016, the actual result of dynamic coordination assessment of urban environmental economy was 0.9, the value of dynamic coordination assessment of urban environmental economy by traditional methods was 0.62, and the value of dynamic coordination assessment of urban environmental economy by this method was 0.95. On the whole, the method in this paper is more consistent with the actual value. However, there is a large gap between the evaluation results obtained by the traditional method and the actual evaluation results, and the application effect is poor in these years, which indicates that this method is not suitable for the evaluation of urban environmental and
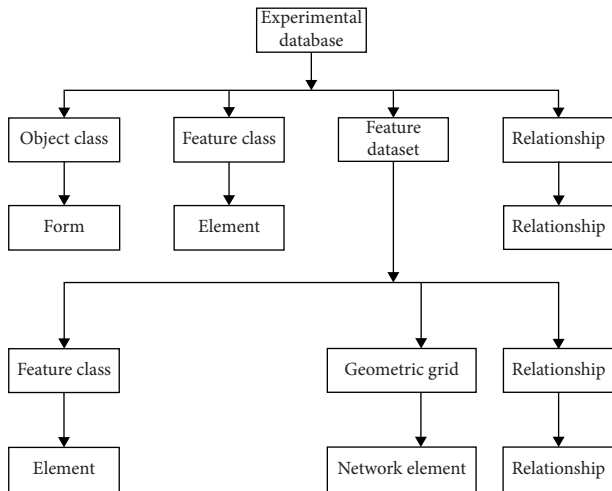
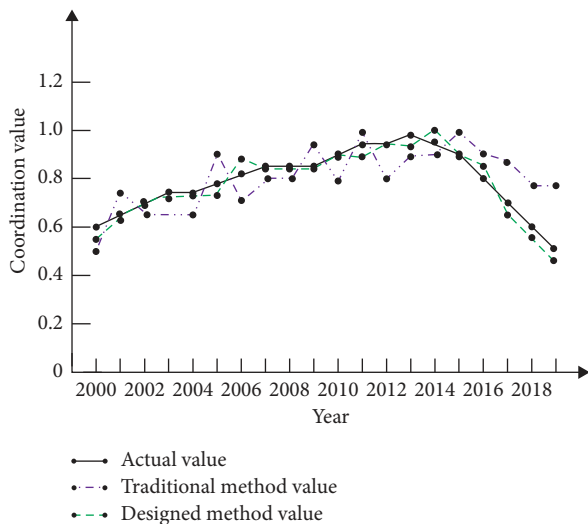FIGURE 5: Organizational structure of experimental data.

FIGURE 7: Comparison of evaluation results of dynamic coordination degree of urban environment and economy.

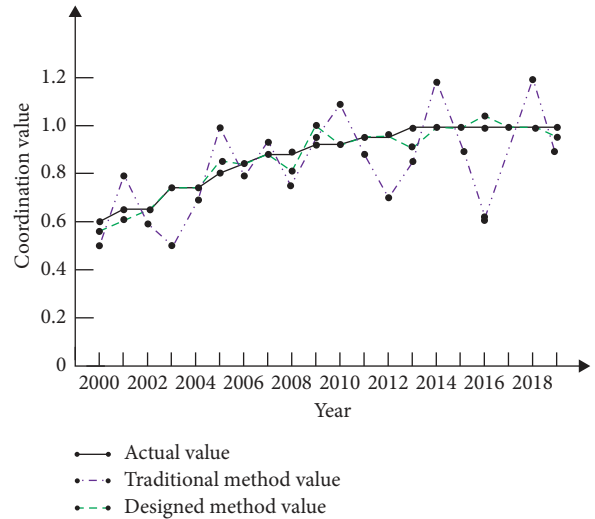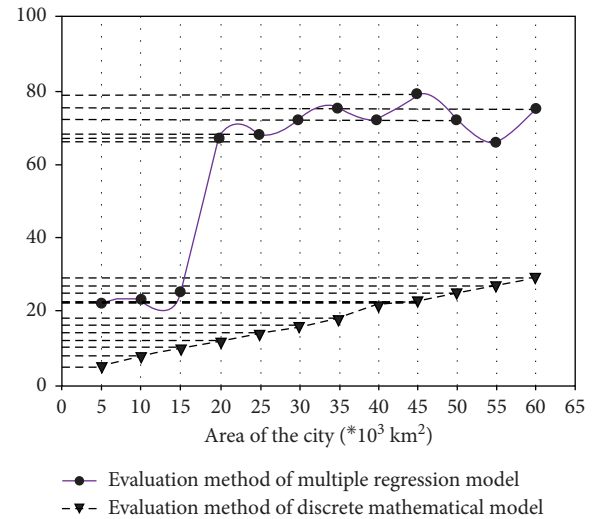FIGURE 6: Comparison of evaluation results of static coordination degree of urban environmental economy.

FIGURE 8: Time used to evaluate the coordination degree of different methods.

economic coordination. However, the difference between the designed evaluation method and the actual evaluation results is relatively small. Although there is a certain gap in some years, the gap is relatively small [20].

Therefore, the above experiments can prove that the designed evaluation method is more accurate than the traditional evaluation method and has practical significance.

4.4. Evaluation of Dynamic Coordination Degree of Urban Environmental Economy. The evaluation efficiency of dynamic coordination degree of urban environmental economy was verified by the evaluation method of multiple regression model and discrete mathematical model. The results are shown in Figure 8.

According to Figure 8, the city evaluation time of different methods is related to the city area. When the urban area is $15 * 10^3$ km^2, it takes 25 min to evaluate the urban economic coordination of the multiple regression model and

10 min to evaluate the urban economic coordination of the discrete mathematical model. When the urban area is $40 * 10^3$ km^2, it takes 72 min to evaluate the urban economic coordination of the multiple regression model and 22 min to evaluate the urban economic coordination of the discrete mathematical model. When the urban area is $60 * 10^3$ km^2, the assessment of urban economic coordination of the multiple regression model takes 75 min, and that of the discrete mathematical model takes 29 min. The evaluation time of the method in this paper is always lower than that of the traditional method, which indicates that the method in this paper has higher evaluation efficiency.

5. Conclusions

To solve the accuracy of traditional methods in evaluating urban economic coordination, a method of evaluating urban

economic coordination based on a discrete mathematical model is proposed. The following conclusions are drawn from the experiment:

(A) The method in this paper can obtain accurate evaluation results of urban economic coordination, and the evaluation reliability is high.

(B) When the urban area is $60 * 10^3 \, \text{km}^2$, the evaluation of urban economic coordination of the discrete mathematical model takes 29 min. The evaluation efficiency of this method is better. Although the method of this study has some practical significance, it still has some deficiencies, mainly manifested in the following three aspects:

(i) Because the living environment system and the economic system involve the city ecology construction, the infrastructure construction, the public health condition, the social development condition, the economic opening degree, and many aspects, the correlation index is many. The relative evaluation indexes of each city are different, so the evaluation index system of urban living environment system and economic system, which has been established, has some defects and needs to be further strengthened.

(ii) This paper involves many aspects of the social economy, and the amount of data used is large, so it is impossible to obtain all the data from one place. In addition, the difference in statistical caliber may have a slight impact on the results.

(iii) Due to the limitation of data and the delay of statistics, the timeliness of the research lags.

In the follow-up study, the above problems will be designed in detail, to further assess the accuracy of the city's environmental and economic coordination.

Data Availability

The data are available upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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