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Retraction

Retracted: Simulation and Application of Urban Road Landscape Based on Geographic Information Data

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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) Manipulated or compromised peer review

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.

References

[1] S. Yu, "Simulation and Application of Urban Road Landscape Based on Geographic Information Data," *Journal of Sensors*, vol. 2022, Article ID 8553193, 12 pages, 2022.

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Research Article

Simulation and Application of Urban Road Landscape Based on Geographic Information Data

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In this paper, we study and analyze the urban road landscape by integrating big data with GIS and designing a simulation system. Underwood is selected as the base model and calibrated for optimal density and capacity. The traffic flow model is optimized, and the minimum flow rate of each class of road is corrected; the traffic volume of highway and expressway in the early morning and at night is adjusted to make up for the discrepancy between the calculated flow rate of the model and the actual situation due to the unstable speed. Investigate and analyze the pollutants produced by enterprises along the road and select suitable and targeted plants to enhance the ecological protection of road landscape and optimize and improve the park environment; combine the regional culture and apply the ceramic culture to the design of road landscape vignettes; select suitable water and moisture-resistant plants for slope protection plant landscape design, to form a trinity of ecological protection, landscape road, and riverfront green space of industrial park road landscape. As a new basic geospatial infrastructure and carrier, 3D city has a unique spatiotemporal view to plan and manage the operation and maintenance information of the whole city. This part of the study takes urban planning, community management, urban publicity, and tourism management as demonstration cases and focuses on the elaboration and verification of how 3D city data and 3D urban geographic information are applied in the refined urban construction and management. Typical road measurement data are selected, and the applicability of the road traffic flow model of each level is judged by numerical analysis. An interactive road model editing method with the help of auxiliary information is proposed. With the help of auxiliary information displayed in different ways, the operation of adjusting road height in three-dimensional space is transformed into operation in a two-dimensional plane, which can effectively simplify the operation process and improve the accuracy of model editing.

1. Introduction

With the development of computer hardware and software technology and geographic information technology, the 5G era of the Internet of everything is coming, and human's ability to process massive geographic information data can be greatly improved. The traditional digital city system with two-dimensional GIS data as the main body can no longer meet the new requirements put forward by the continuous development of application topics in various fields [1]. People need a more realistic, WYSIWYG way to describe the city. At the same time, computer graphics and virtual reality simulation technology are also developing rapidly and the application fields are expanding. At present, virtual reality simulation technology has been widely used in the military, machinery, education, medical, and many other industries. In such a background, the research about 3D visualization of urban scenes has attracted much attention. 3D visualization technology is to restore the real world by constructing virtual simulation scenes through 3D modeling methods [2]. Two-dimensional information is often difficult to intuitively express the actual information of real-world objects, while three-dimensional visualization is more in line with human cognitive habits, and the data is displayed more intuitively.

The urban road network is an important part of the 3D virtual city, and the urban interchange is the connecting hub of all parts of the road network [3]. The modeling of the road network is the basic work of urban scene modeling, and the rapid modeling of urban interchanges is the difficult problem of road network modeling. Using 3D visualization technology to highly restore each object in the city can represent the real information of the object and reproduce the 3D model of the object. Relying on the rapidly developing graphics theory and the realistic visual experience and good interactive experience brought by virtual reality technology, the 3D visualization of urban scenes can be widely used in many fields such as industrial simulation, intelligent city traffic simulation, movie, and game special effect scene production. Relying on three-dimensional visualization, virtual reality simulation technology, road network, and interchange modeling technology can build an urban scene simulation platform, the scale of urban three-dimensional traffic network for real and efficient visualization [4]. This is important guidance for urban planning, traffic flow control, road resource allocation, environmental pollution, and many other issues, which can promote the development of the urban economy in a better and faster direction and promote the harmonious coexistence between humans and nature.

According to the different modeling objects, the corresponding parameters and constraint rules are defined in advance, and then, the computer generates the model mesh and surface texture details, which is collectively called the process modeling method [5]. Process modeling is the most common method in the field of automated modeling. Since it is based on predefined parameters and rules, this type of method tends to control the accuracy of the generated model and therefore performs very well in terms of efficiency in large-scale scene generation. The morphology and topology of objects in real scenes, such as grass, hills, roads, and buildings, have certain commonalities, and this type of procedural modeling method using rules to define shapes is now widely used in virtual cities and road modeling [6]. The road operation state will change with different road conditions, natural environment, and traveler characteristics, so it is necessary to use a large amount of measured traffic data, cluster travel patterns, and analyze traffic flow characteristics qualitatively and quantitatively to achieve the purpose of scientific prediction of traffic volume. However, at present, traffic flow data are mostly obtained through video chokepoints and manual counting, and the coverage of urban roads is limited. The traffic flow data are difficult to collect on urban trunk roads and sub-branch roads due to factors such as traffic lights, nonmotorized mixed traffic, and difficulties in maintaining fixed monitor equipment. Based on the above background, this paper fits the mathematical curve based on the actual measurement data, combines the classical traffic flow model to construct the flow-velocity relationship model applicable to all levels of roads, and conducts the characterization of traffic flow parameters and the study of influencing factors, which can provide the basis for solving the following problems.

2. Related Works

Combining GIS and GPS information collection technology and integrating GSM/GPRS wireless communication technology, we design a comprehensive system that can realise real-time vehicle monitoring, navigation, alarm functions, etc. Based on the study of data transmission protocols, we design modules for vehicle terminals, application servers, business applications, etc. The effective combination of the two provides effective technical support for strengthening vehicle management and theft prevention [7]. The destruction of the ecosystem and the depletion of the water system caused by urban development and environmental changes, the microclimate problems caused by the deterioration of urban ecology, the inhomogeneous population density and pendulum traffic caused by the uncoordinated ratio of urban land planning, etc. In addition, more urban problems and contradictions have emerged [8]. In recent years, urban construction and residents' activities have caused certain impacts on the urban climate environment, and extreme climatic events such as floods, storms, heavy rains, heatwaves, and droughts are frequent, and the study of the relationship between urban climate and urban spatial planning and design has become one of the important urban design research directions. Japan has gradually come up with a set of road landscape design and expression methods suitable for the country through a lot of research on road landscape, in which the role of plants in road landscape design is put in the most prominent position [9].

They believe that the design of road greening landscape is, first of all, to ensure the area coverage of road greening, planting density to be high, the width of the traffic belt to reach one-third of the width of the sidewalk, and the road belt should also be planted plants, trees, and shrubs no large area of lawn; this form of greening to a certain extent ensures the ecological function of the road, while to a certain extent curbs. This form of greening ensures the ecological function of the road to a certain extent and at the same time curbs the trend of urban environment deterioration to a certain extent [10]. In addition, Japan also attaches more importance to the hardscape of the road that the road marking system should be orderly and efficient, more pursuit of detailed and exquisite design, more people-oriented in the road landscape design, and more consideration of the broad landscape to meet the needs of people [11]. In addition, considering the economic development, the influence of the concept, and the historical factors, our research on urban road landscape design started late, and at the same time, there is a lack of in-depth research [10]. The 3D GIS is the top priority in building the industry's visualization and decision-making system and has an irreplaceable and important role to play. It can integrate multiple types of data such as map elements, business management, IoT sensing, and video surveillance into a 3D visualization space, carry out a high degree of integration and mining analysis, and build wisdom management-related applications to assist users in making quick and accurate judgements on various monitoring objects in the 3D space, providing visualization support for urban planning, construction, management, and decision-making. Road landscape design is often used as part of the street design, from the content and methodological point of view are at a relatively primary level, the existing research is limited to the urban road land within the green space for greening and other aspects of the discussion, in the overall landscape issues for a comprehensive and rigorous study of the process has not attracted the necessary attention and attention to the construction of urban road landscape, and make it both into the surrounding urban [12]. Among the architecture, but also the full expression of the local customs, the theme, color, culture, and organic unity of research is still lacking, foreign road landscape industry, the road landscape environment in the general environment to carry out the necessary ecological protection, the previous ordinary greening to upgrade to a kind of ecological greening, and landscape ecological greening [13]. Road landscape should consider the ecological function, beautification function, the relationship with the environment, and other comprehensive factors of coordination in many aspects [14].

Strengthen the identifiability of road landscape, help people better understand the urban imagery it expresses, cities should vigorously develop greening work, integrate the concept of sustainable development into the landscape design, and optimize the material properties of the design itself to a certain extent, to match the main requirements of people for road landscape; the existing road landscape design is built based on urban design. Part of the urban design has its characteristics, in the process of creating its landscape, not to affect the traffic safety along the route, but also as much as possible to increase the green plants, at the same time, the performance of three-dimensional, multilevel landscape features. The extraction of road information based on remote sensing images is deeply affected by the resolution of remote sensing images. Its automatic extraction mainly targets the geometric features, greyscale features, topological features, and association features of roads in remote sensing images for image processing, eliminating nonroad areas, and retaining road areas to achieve automatic recognition of road network information. In addition, in the construction of Road plant landscape, grasp different elements, so as to carry out extensive landscape design, and use foreign advanced methods to create a design scheme in line with regional culture. Only by adjusting measures to local conditions can the road landscape design have a unique aesthetic feeling.

3. GIS Integration of Big Data System Design

There characteristics of big data in real-time, suitable for the observation of the real situation; you can get the traditional survey difficult to solve or need to pay a high cost of information data, such as cell phone signaling and POI data. By analyzing different types of data resources, such as cell phone signaling data, heat data of crowd gathering, location data of public service facilities, business registration information data of enterprises, and network data of commercial facilities, we can find out the "hot spots" of urban development, the "pain points" that restrict the residents' sense of access, and the "pain points" that affect the residents' sense of access. The analysis of data resources such as location data of public service facilities, the business registration information of enterprises, and network data of commercial facilities can identify the "hot spots" of urban development, the "pain points" that restrict residents' sense of access, and the "key points" that affect the improvement of urban economic quality and livelihood facilities, and provide technical support for urban and rural planning management [15].

One is to assist in acquiring basic data in the urban and rural planning review stage, for example, neural network algorithms can be used to identify and acquire the latest basic data such as building and structure outlines and road status directly from remote sensing data quickly and efficiently. The other is to use remote sensing images in the urban and rural planning implementation stage for planning implementation evaluation and detection of unauthorized construction, such as automatic identification of urban status quo, extraction of topographic status quo information, and comparison of urban image changes before and after planning. The basic spatial geographic information data in urban and rural planning management can be divided into four categories, namely, basic geographic data, planning result data, planning management data, and departmental thematic data. The basic spatial geographic information data are large in volume and variety and need system software based on a GIS platform to be better applied in the whole process of urban and rural planning management. Basic spatial geographic information data can also be integrated with other data to provide data support for scientific decision-making in urban and rural planning management. Road landscape environment design refers to the aesthetic point of view, and fully consider the coordination of road landscape and natural environment, so that drivers and passengers feel safe, comfortable, and harmonious landscape design. Road landscape design is used to repair the damage to the natural environment of the road, and through the circulation of local customs along the route, artificial landscape embellishment, increase the cultural connotation of the road environment, to have the appearance of the image of beauty, strong environmental protection function, and cultural atmosphere.

Traffic flow data is the data generated by long-term human travel, and human daily activities have stability and regularity, so it can be clustered and analyzed to dig the traffic travel characteristics. The morning and evening peaks are the two most concentrated periods of daily road travel traffic, so the congestion of morning and evening peaks is a hot issue of people's concern [16]. The traffic flow information obtained by applying the traffic flow model and computer data analysis tools can further dig out the vehicle hour information. The data collection of the new energy vehicle product testing working condition research and development project utilizes the autonomous driving method, i.e., the driver drives independently according to their respective purposes, and the driving area, route, and time of the test are not limited. Therefore, to ensure that the constructed working conditions can accurately reflect the actual operation of urban vehicles, it is necessary to weigh the massive amount of raw data according to the driving area, road type, etc, and determine the corresponding weighting factor before data analysis, and the common weighting basis internationally is to project the number of vehicle hours through traffic volume. By studying the distribution of vehicle travel time in different speed zones, the distribution of vehicles in different speed zones can be better studied, as shown in Figure 1.

Expressways are used for cars to travel at higher speeds, and expressways undertake the task of communication and exchange between cities; expressways are mainly used for commuter transportation in the city in the morning and evening and are set less in the city road network; main roads are used to connect major subdivisions and are the main arteries of the city; secondary feeder roads are closely related to people's travel and are the connecting routes between neighborhoods.

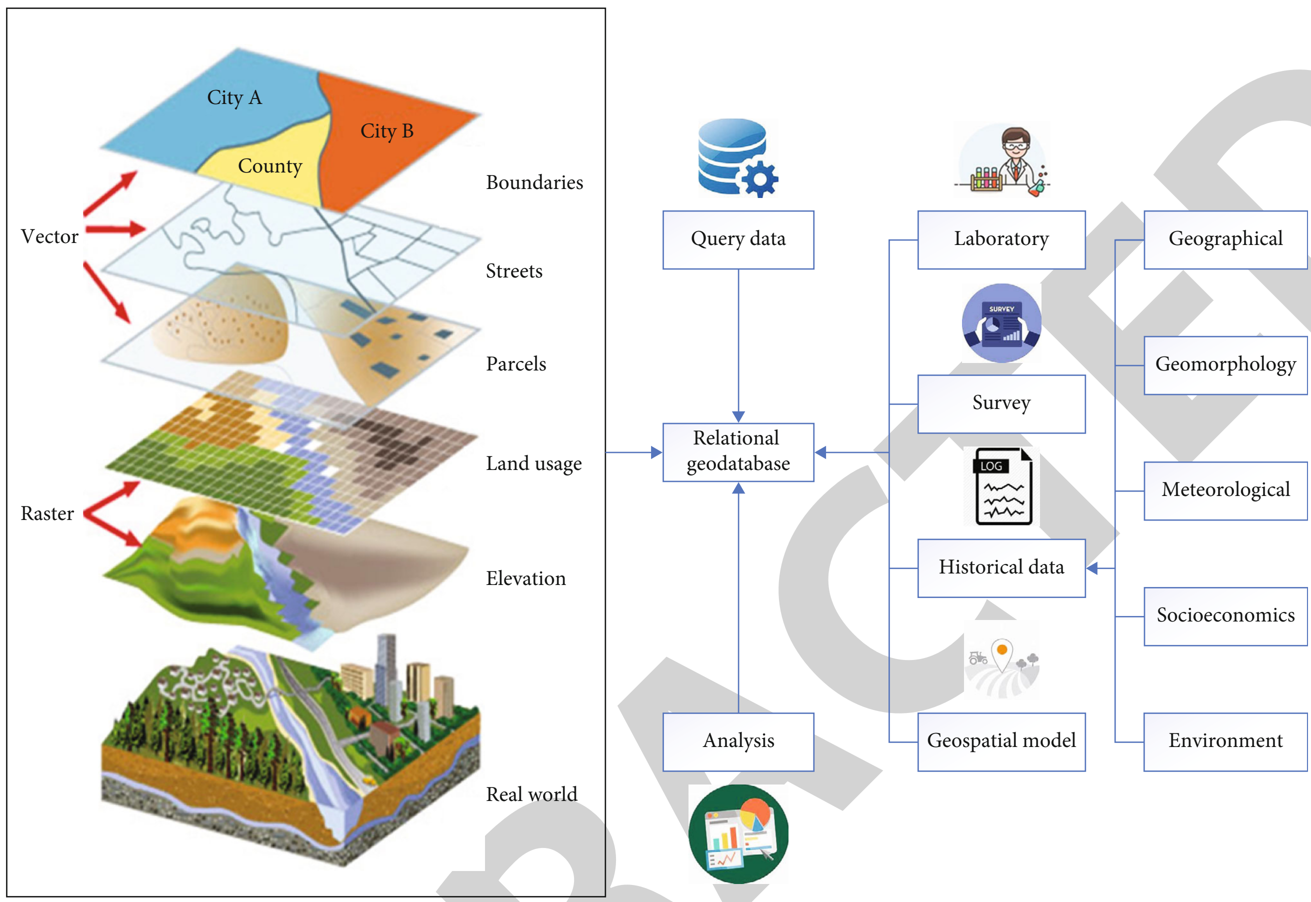

Figure 1: GIS fusion big data system framework.

The spatial syntax is used to represent the complex relationship contact structure between nodes, and the following indicators are selected to analyze it: connection degree value, average depth value, overall integration degree value, cooperation degree value, etc. Through the analysis of the spatial characteristics and evaluation of the rationality of the overall urban traffic landscape network, the spatial influencing elements that lead to the unreasonable traffic landscape are discovered and used as the theoretical guidance for the improvement of the urban traffic landscape. Based on the current research status and theoretical foundation, this paper defines the macro level of traffic landscape network characteristics of river valley-type cities.

The complex network-level expresses the number of connections to the i-th node (space). The urban traffic landscape-level expresses the number of points (spaces) inside the space that can be visually connected to all neighboring or nearby points (spaces), and the higher the connectivity, the better the spatial permeability.

$$C_n = \sum_n R_{n1}^2. \quad (1)$$

C indicates the number of connections of all nodes (spaces) to node (space) i in the spatial system; $R_{n1}^2 = 0$ indicating that two nodes (spaces) in the spatial system are connected; otherwise, $R_{n1}^2 = 1$.

The integration degree indicates the topological accessibility of a point (or a space) i to all points (or all spaces) in the whole system, and the larger the integration degree value is, the higher the topological accessibility of the changed point (or space). The overall integration degree reflects the accessibility and permeability of the point-connected axes (or space-connected axes) in the overall structure of the system, and a value of integration degree greater than 1 represents strong spatial agglomeration.

$$I_{(n)} = m\left[\ln\left(\frac{m-2}{3}+1\right) - m\right] / (m+1)|D+1|. \quad (2)$$

The depth value is the number of shortest connected edges that a point (a space) i needs to pass through to reach other points (spaces) in the network space, which is an intermediate variable to obtain the next integration degree. The average depth value is also one of the accessibility reference indicators, which is the average of the connectivity values from a point (or a space) to other points (or spaces) in the network space, and can also be abstracted as the shortest distance from a street to all streets (not the real distance, but the accessibility).

$$D = \sum_{d=1}^{s} d \times N_d^2 / (m+1). \quad (3)$$

Cooperation is a global and local linear correlation value, which expresses the strength of correlation between the local space and the overall space. The difference between the overall integration value and the connectivity value of the system is obtained statistically to indicate the strength of cooperation, with 0.5 as the scale.

$$R_{n1}^2 = \left[\sum (C_i - C)(I_i + I)\right] / \left[\sum (C_i - C)^2 (I_i + I)^2\right]. \quad (4)$$

C is the average value of connectivity, and I is the average value of global integration. In modern urban traffic landscape, urban traffic network is the key carrier of traffic landscape, which is a typical network structure composed of many points and edges, where roads are regarded as edges and intersections as nodes, which can be seen as a complex network. Based on the complex network theory defining the microlevel of the network characteristics of river valley-type urban traffic landscape, the degree k_i^2 of a node i is the number of all edges connected to that node, and the average degree is as follows:

$$k = \frac{1}{n} \sum_{i \neq 1}^{n} k_i^2. \quad (5)$$

k_i is the number of nodes, and N is the number of network edges.

$$L = \frac{1}{N(N+1)} \sum_{i \neq j} d_{ij}^2. \quad (6)$$

Qualitative analysis is a logical and objective theoretical analysis, reasoning, and judgment to further find the potential laws of things in their development process, as well as the interconnection between the various elements of the composition, through analysis, and comparison, and ultimately determine the nature of their relationships. Quantitative analysis is a mathematical method that uses many data statistics to set up a corresponding mathematical model with the quantitative information contained in it, so that certain properties, characteristics, and interrelationships of the object to be analyzed can be obtained through theoretical data analysis. It reflects the relationship between things in a quantitative form through mathematical equations, graphs, models, and other forms, combined with relevant mathematical disciplines, calculating, and processing all kinds of complex data and making judgments and analysis comparisons. The quantitative analysis makes its problems more intuitive and clearer through quantification and can be more precise in the determination of the program, as shown in Figure 2.

Firstly, we decompose the objectives, classify, and unify the objectives and discriminatory factors, sort out their logical relationships with each other, and construct a top-down echelon model. For the influencing factors, we can sort them out into various categories, select the measurement criteria affecting the target, and design various programs according to different measurement criteria or indicators and according to the actual conditions, finally forming the target layer, criterion layer, and program layer. Hierarchical single indicator ranking is to rank the contribution value of each program to the indicator layer under a single indicator in a layer, and its contribution value ranking can also represent the calculation of relative importance ranking. Among them, the most central and critical calculations are the maximum eigen roots and eigenvectors of the discriminant matrix. Traffic information collection is the use of traffic information collection systems (sensors, cameras, etc.) installed on roads and vehicles for the collection, processing, and distribution of dynamic information such as traffic flow, traffic speed, control information, road conditions, car parks, and weather. It has become an important part of the intelligent transport system.

The above procedure only obtains the weight vectors of the indicators in this layer to the upper measurement criterion, but the comparative check in this layer needs to calculate the weight vectors of the qualitative variation of all the factors in this layer to the upper measurement criterion and further compare the calculated weight vectors for ranking. For the solution layer, it is even more required to rank the weights of the target layer to decide the optimal solution [17]. The weighting of the total ranking must be done from the bottom, and the weights under a single measurement criterion are calculated uniformly.

Qualitative assignment methods such as the expert scoring method and empirical analysis method are used to assign weights to the contribution values of each indicator by the above methods. The subjective assignment is limited by experts' experience and some people, which has a certain human factor and is more arbitrary in decision-making; quantitative assignment method derives the contribution value of indicators through strict logical reasoning, which is relatively more objective, but its calculation process is more complicated and the calculation results are difficult to ensure. Thus, quantitative and qualitative assignments are more complementary and can be used in combination, as shown in Figure 3. The result of process modelling is a process model that reflects a certain level or depth of abstraction of the software process and which also expresses a particular view of the software process. A process model can be expressed in a very detailed form or described roughly in a very simple form. The elements of a process model typically include subprocesses, activities, roles, constraints, resources, and deliverables. These elements describe the type, structure, and attributes of the process.

The average flow and average speed data calculated by the subbranch model are summarized and further analyzed for their time-varying characteristics. As shown in Figure 3, in the time period of 0 : 00~6 : 00, the road operation is in the stage of low average flow-high average speed, and the average speed of the road fluctuates around 37 km/h, and the road is in the free-flow state; in the time period of 6 : 00~7 : 00, the demand for transportation of production factors increases, resulting in a rapid increase in the average flow and a precipitous decrease in the average speed, and the traffic flow changes from the free-flow state to the congestion state change; in 7 : 00~18 : 00 time period, the road operation in the high average flow-low average speed of the state, the full lane flow maintained at 400 or more, the road average speed maintained at 27 km/h or more, the peak is not prominent, and the traffic is in the more dense stage of vehicles; in

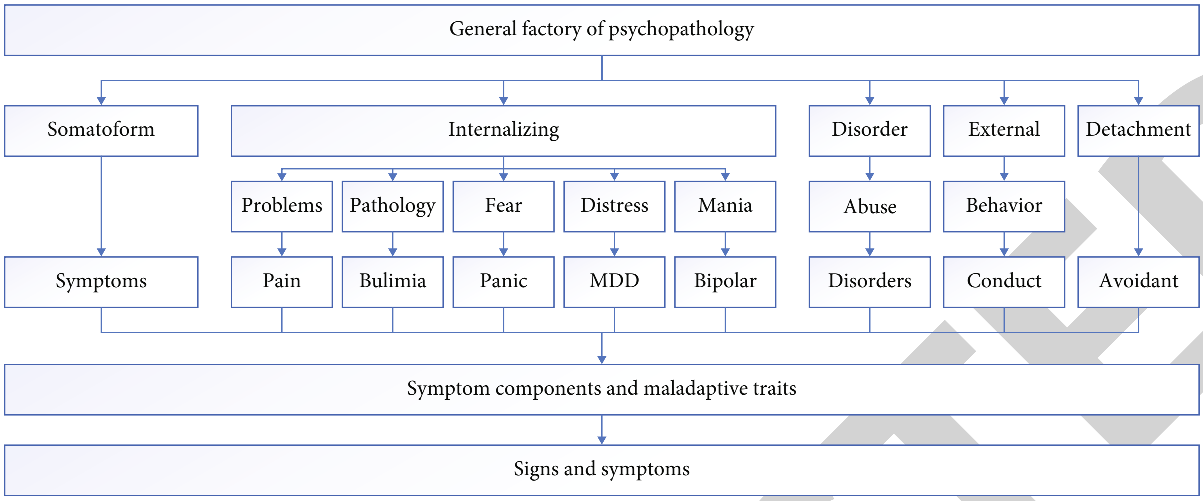

FIGURE 2: Hierarchical analysis method echelon model diagram.

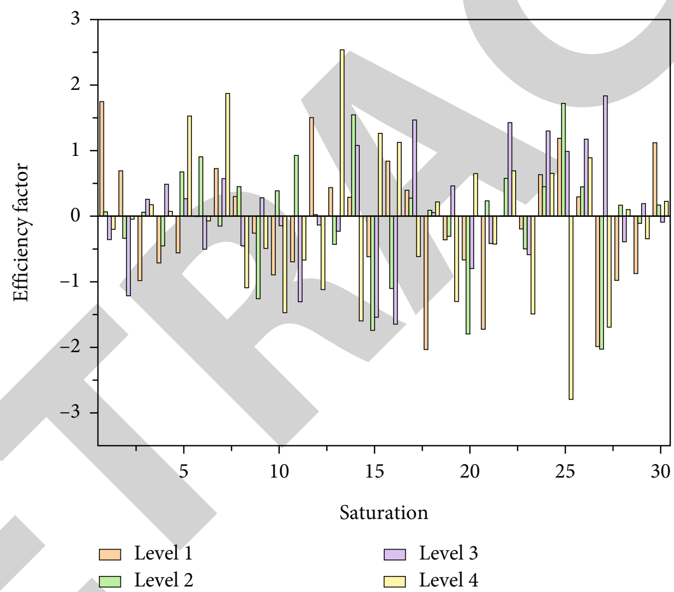

FIGURE 3: Corresponding values of measurement level and evaluation index.

18 : 00~24 : 00 time period, the traffic gradually returned to the sparse state. The average speed rises, the average flow rate decreases, and the traffic gradually transitions from a more congested state to a free-flow state. Overall, the trend of average flow and average speed of secondary roads is consistent with other classes of roads.

In the study of the physical space of urban design, the graphical layer study is mainly divided into the study of the stratification of urban spatial structure and the study of the stratification and graphical interpretation of more detailed urban space and elements. The study of layering of urban spatial structure is more mature, and the content, characteristics, and internal action mechanisms of layers and elements of many layer systems have been proposed. The research on the diagramming of urban space and elements is divided into the diagramming method of deconstructing urban design procedures and the method of diagramming expression of elements. The former research constructs many urban diagrammatic models, while the latter research provides a new urban design language that can be used in the expression of urban layers and elements.

4. Urban Road Landscape Simulation Analysis

By comparing the statistical properties of complex networks such as average degree, clustering coefficient, average shortest path, diameter, density, and global efficiency of 10 case neighborhoods before and after the ideal gridding process, it can be found that the average degree of the neighborhoods after the ideal gridding process generally increases, the average shortest path and diameter decrease, the global efficiency increases, and the clustering coefficient decreases compared with the status quo.

For the traffic landscape network of the neighborhood after ideal gridding, the average number of connected roads increases and the average shortest path decreases, indicating that the distance between nodes in the treated neighborhood becomes smaller, the dispersion of nodes decreases compared with the status quo, and the traffic convenience of the neighborhood increases [18]. While the difficulty of any node in the treated neighborhood to reach other nodes through the neighborhood increases, the maximum distance between some roads in the neighborhood decreases, but most of them are still larger, and the traffic capacity of most neighborhoods is still low. The 3D visualization management system is mainly applied in the management system of the wisdom city video remote monitoring, fire management control, population information management, etc. It realises a 3D virtual simulation system consisting of the wisdom city 3D visualization management system for the visualization of the city's equipment, roads and construction. It is also possible to present realistic data in a three-dimensional scene to build a visual management system that monitors, queries, analyzes, reports, and displays the city in one, thus presenting a complete picture of the city's real-time development dynamics and facilitating the formulation of reasonable development strategies.

Therefore, through this section, the statistical characteristics of the complex network between the current neighborhood and the ideal gridded neighborhood are compared and analyzed, under the assumption that the open neighborhood can be realised, the roads in the case neighborhood become more massive and complex after the ideal gridded treatment, and the road intersections in the treated neighborhood increase, and more intersections need to be passed in the traffic; although the connectivity and accessibility of the neighborhood are improved, the difficulty of traffic increases and the time spent on traffic also becomes longer, but the gridded treatment of the neighborhood has optimized the effect of improving the connectivity and traffic capacity of the neighborhood distributed along the river valley.

In the next section, we will consider the realistic conditions of the treated neighborhoods and compare the statistical characteristics of the existing neighborhoods and the ideal gridded neighborhoods at the traffic landscape network level, as shown in Figure 4.

The average shortest paths in the case block are mainly distributed between 4.5 and 8 in the current situation and between 4.5 and 6 after considering the realistic conditions. As shown in Figure 4, the average shortest paths of the neighborhoods along the river distribution are reduced from 6.064 to 5.591, and those of the inland distribution is reduced from 6.503 to 5.776 after the treatment of realistic conditions, and the accessibility of the roads in the inland distribution is still larger than that of the neighborhoods along with the river distribution. The average shortest paths of most of the roads in the case neighborhoods of city have been reduced after considering the realistic conditions of the neighborhoods, so considering the realistic conditions of the neighborhoods has an optimal effect on improving the accessibility of the roads in the neighborhoods.

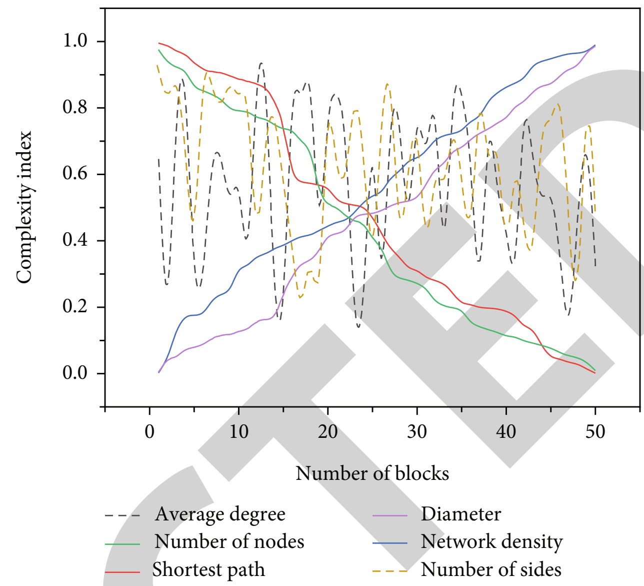

Figure 4: Complex characteristics of roads in the case block under realistic conditions.

The construction of a basic geographic information system at the county level has not yet been carried out, and there is no relatively perfect, complete, and wide coverage of basic spatial geographic information data, no basic spatial geographic information database has been established, and there is no application system developed and constructed based on basic spatial geographic information database, which cannot provide basic geographic spatial information services for various departments and industries and cannot meet the needs of economic and social development, as shown in Figure 5. In the past, due to the lack of large-scale quantitative analysis data, urban traffic managers were unable to accurately determine the extent to which congestion had developed, so that the formulation, implementation, and evaluation of traffic mitigation measures were still based on subjective empirical judgement and lacked a quantitative and assessable mechanism to support them. In recent years, with the development of intelligent transportation and the application of information technology and intelligent terminals throughout society, it has become possible to assess the operation of urban traffic through a large amount of data.

Geographic information refers to the sum of information related to geographic elements such as graphics, distribution, text, quantity, quality, and regularity; specifically, there are two main points: First is spatial location and attribute information. According to the information-related standards, geographic information can be divided into spatial location and attribute information, among which, spatial location mainly refers to the information of relevant things in geographic spatial location, which can be reflected by graphics, such as the starting location of streets and the starting location of buildings. The attribute information mainly refers to the geographically related human information, such as the names of streets, the construction years, and structures of buildings. Secondly, basic and thematic geographic information is mainly based on the scope of use of the information, of which, basic geographic information

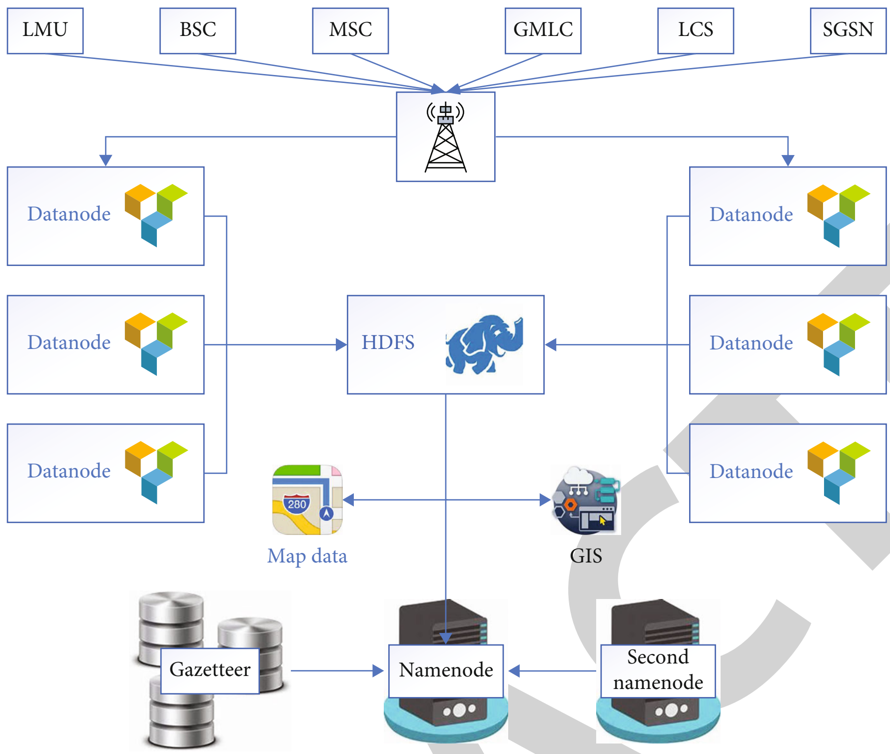

Figure 5: Simulation system architecture.

refers to geographic elements that can provide a relevant basis for urban construction, such as geology, geomorphology, hydrology, vegetation, and rivers, with public nature; thematic geographic information mainly includes urban planning, land resources, environment, and public facilities, with management nature [19]. After the spatialization of geographic information data, it can provide visual data support for the whole process of urban and rural planning management.

Finally, GIS combined with the big data method to build many urban spatial information databases, such as "Digital City" and "Digital Earth" platforms, which provide basic urban spatial information for urban planning and design and are used as the basis for scientific research. While 2D charts can also reflect the relevance of data, pure 2D charts cannot be viewed in the way that 3D can both view data such as on each dimension and the scenarios associated with it. 2D approaches cannot combine scenarios and data perfectly, but 3D visualization can be more intuitive, relevant, and effective in reflecting data relevance and handling data. At the same time, GIS has the function of visualizing data and information and can output special element analysis maps covering all information of each element in the form of figures, images, tables, etc., in combination with maps. The urban layer system can use this function to visualize the layers and elements in urban design, which facilitates the output of urban spatial information and the communication among designers as well as spatial analysis.

5. Performance Analysis of GIS Fusion Big Data System

The vehicle hours of different levels of roads are the product of the average traffic volume on the road section and the average vehicle travel time, which contains the dual influence of road length and road congestion, and traffic congestion is a linear monotonic relationship, which is closer to the actual traffic demand. It can reflect both the traffic congestion and the traveler's demand for traffic. Virtual reality has a wide range of applications, the most intuitive being for entertainment applications such as film and video games, for example, virtual reality games and film viewing, which can bring a more immersive experience and a greater sense of involvement.

Freeways have higher average daily traffic flow and lower average daily speed on holidays, unlike other class roads. It attracts a large number of minibuses to use highways to travel, relieves the traffic pressure of railroads, and widens the market of self-driving tourism, but highways become increasingly congested; expressways mainly undertake the task of commuting in the morning and evening, with more derived demand on weekdays, and the flow and speed will show a cliff-like up or cliff-like downtrend, with the higher average daily flow and lower average daily speed on weekdays, trunk roads as the city road. As the main artery of urban roads, it undertakes the transportation task of each administrative district between cities, which shows higher average daily traffic and lower average daily speed on weekdays; secondary roads are mainly responsible for the connection task between trunk roads and secondary roads, and there is the phenomenon of "delay" on holidays. The average daily traffic volume on weekdays is higher, and the average daily speed is lower, as shown in Figure 6.

Translucency is a characteristic that is generally used to describe spatial relationships in architectural design and urban planning. Urban space is inherently physically transparent and phenomenologically transparent. The translucency of

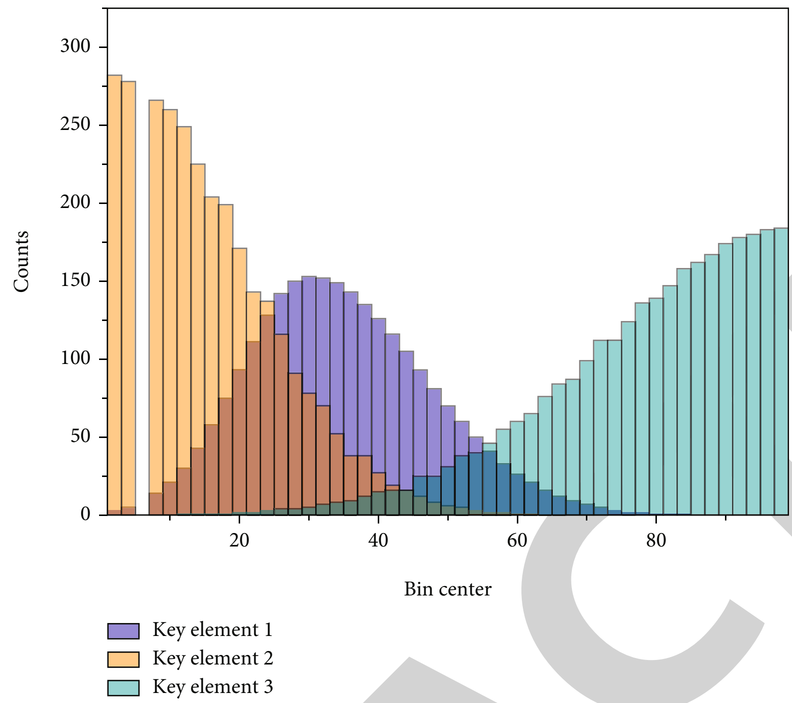

FIGURE 6: Evolution of the relationship between multiple urban elements or layers over time.

urban space gives it a hierarchical structure, and space is organized based on this hierarchy and clear organizational mechanisms. Urban space can be decomposed into many types of subspaces, which are not hierarchically structured and independent of each other but are ambiguous and ambiguous. The ambiguity between each type of urban subspace is a kind of order, which plays a different role in the formation of the whole urban space. Any urban space that has 2 or more reference systems exhibits the characteristic of translucency. In such urban spaces, there is not a perfect grading system, and each level keeps a certain openness with other levels of urban spaces, and there are various possibilities in the grading and selection of levels, as shown in Figure 7.

For the interchange structure with typical morphological characteristics, the correct rate of the road hierarchy results calculated by the method in this paper is high. The model generation time includes data processing time, DAG construction time, road classification and height calculation time by DAG description, modeling time, and necessary interaction time. As an example, the specific time spent for each part of the model building process, such as the experimental area I, is about 15 seconds for data processing, 0.8 seconds for DAG generation, 26.2 seconds for road classification and height calculation, 53 seconds for the model building process, and 14 seconds for the interaction operation.

The topological description advantage of DAG can be used to complete the model building work in a short time, and the automatic modeling process of all three areas takes less than 200 seconds, which saves a lot of time compared with manual modeling. The method enables users outside the domain to quickly build a high precision model that meets the general requirements for overpasses with complex hierarchical relationships. The method in this paper does not yet automatically solve the layering process of the underpass tunnel in the interchange structure and requires manual adjustment of the calculation results by the user after the automatic calculation.

6. Urban road Landscape Simulation Results

The editing module is mainly responsible for the editing of the road model and the constraints on the layout of the building model, and the details of the implementation will be described in detail next. The road model editing function implemented in this paper, in a semi-interactive way, enables users to adjust the hierarchical relationships of the automatically constructed overpass roads and ordinary roads. The implemented building model layout constraint function gives feedback based on the building models with unreasonable layouts in the scene, enabling the user to relayout the building models to improve the realism of the scene. Urban space is the vehicle for the operation of social, economic, political, and cultural elements of the city, and the functional areas formed by the various urban activities form the basic framework of the spatial structure of the city. Along with the economic development and improvement of transportation conditions, they constantly change their respective structural forms and mutual location relationships and express the evolution process and evolution characteristics of urban spatial structure by land use patterns. Unlike rural space, urban space is more complex and contains more elements than rural space, and the spatial elements are more closely linked to each other. These social, economic, political, and cultural elements together support the normal and coordinated operation of the city.

The user first imports the map data of the target area and then performs relevant interactive operations according to the step-by-step prompts. For example, for the setting of road

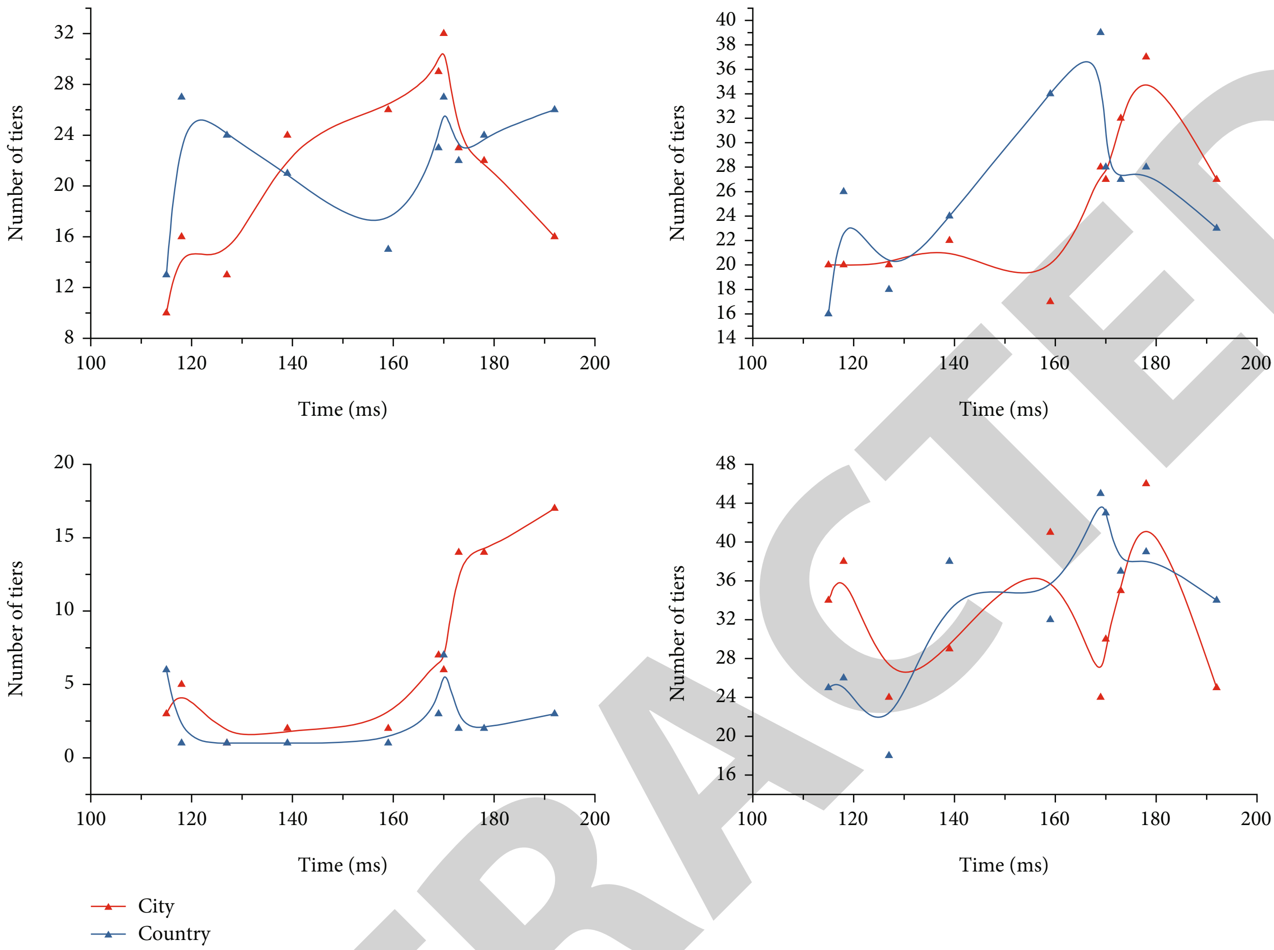

FIGURE 7: The correct calculation rate of this paper's method for different experimental areas.

width and traffic aids, users can either set the width and traffic aids manually or choose to use the system default settings. After a simple interactive operation, the system automatically generates an overpass model based on the settings and imported data from the previous step. After that, the user can select the appropriate model from the building and appendage model library to generate other common objects in the urban scene around the overpass road and set other scene parameters. After the complete urban scene is generated, users can also roam the scene to observe the generated effect.

The design and construction of overpasses can be influenced by many constraints, and relying on the automatic calculation of the hierarchical relationships presented in the previous section does not guarantee the correctness of all road layers. That is a fact that cannot be avoided by all current fully automated modeling methods. In terms of model complexity, the overpass model has certain commonalities with the complex mechanical model. The road data of the overpass obtained by the data processing method consists of many control points and road centerline, and the road centerline and control points can be drawn in the virtual 3D space by using the development tool, as shown in Figure 8.

Because of the lack of leisure space in the road green belt and the low participation of landscape, the space of plant landscape can be reasonably designed, and a walkway can be appropriately set at the open space so that the park workers can enter the walk during the lunchtime leisure time to increase the ornamental and interesting nature of recreation.

The crown of the balsam fir tree is oval, and the arrangement of planting can form a rhythmical and soothing forest canopy line, which makes people relax. The branch point of the balsam fir tree is high and evergreen in all seasons, which can ensure the green landscape of the road green belt in all seasons on the one hand and provide shade and space for passing vehicles and pedestrians under the tree on the other hand. In between the balsam fir trees planted, small trees cherry blossoms, evergreen trees as a background, and cherry blossoms in spring, creating a landscape of spring flowers, the lower layer of the regular method of planting heather, spring heather new and young leaves are very bright colors, is a good spring ornamental plant. On the side of the Huan long River, weeping willows are planted, which are resistant to water and humidity. The willows have long, soft, and graceful branches that dance in the wind, and aquatic irises are planted on the slope near the river to form a beautiful shoreline landscape, as shown in Figure 9.

The landscape vignette is the final change of the road landscape. Dongguan's ceramic culture began in the early Tang

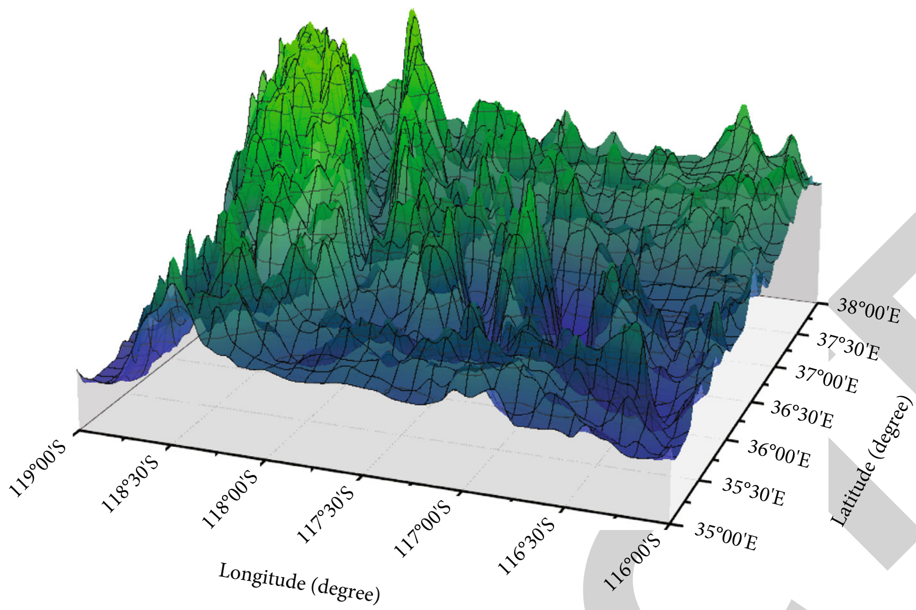

Figure 8: Enhancement of landscape participation.

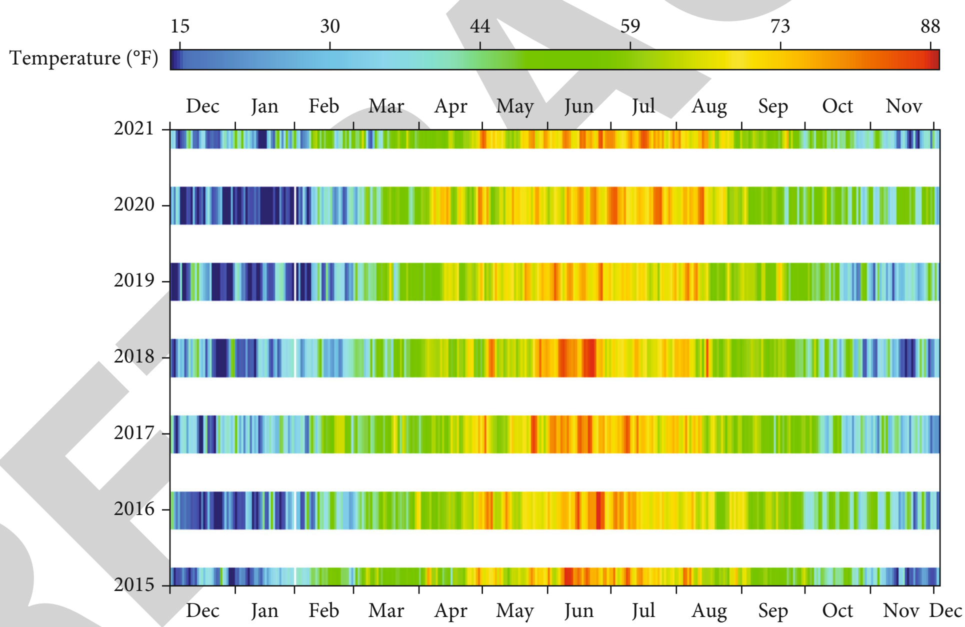

Figure 9: Plant seasonal analysis.

Dynasty and has a long history. After more than 1000 years of precipitation and accumulation, the ceramic culture has become the most representative culture of Dongguan, which is a symbol of Dongguan's regional characteristics.

In the theoretical research part, the composition, characteristics, and functions of industrial park road landscape are analyzed, which has regional, high efficiency, sustainable development, leisure, and recreation as well as special plant demand characteristics; the functions of industrial park road landscape should be diversified, and the landscape function and protection function should be given equal importance, and safety function and cultural function should also be taken into account. The analysis summarizes the five principles that should be followed in the design of road greening landscape in industrial parks, from the configuration techniques of road landscape plants, space creation, and seasonal phase creation.

7. Conclusion

Based on the abovementioned massive data and 3D geographic information sharing service platform, this study has carried out a series of 3D model applications around urban planning and management. The DAG-based interchange structured description method proposed in this paper has specific advantages in topology description and subsequent algorithm design. There is no restriction on the number of overpass levels in this paper, and the application scope is wider. The road classification and road height calculation method of the interchange proposed in this paper has a high correct rate of the final calculation. In expressway traffic flow, there is an obvious double-peak phenomenon, commuting periods show traffic volume cliff rise, and speed cliff declines in the trend of change. Further analysis of the morning and evening peak traffic flow characteristics can be found that the evening peak travel volume is generally higher than the morning peak on all levels of roads, and reasonable traffic measures should be further developed for the evening peak traffic congestion problem. In the actual modeling experimental results, the correct calculation rate obtained by applying the method of this paper is always above 90% for typical structural overpasses of different complexity. The model editing method based on auxiliary information can effectively reduce the difficulty of model editing operation and improve the user experience, and the interaction time of each group of experiments is controlled within a reasonable range.

Data Availability

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

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

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