Research on Modeling Technology and Application of Simulation Planning Based on Urban Ecological Park

Kun-Fa Lee and Jia-Qi Lai

Abstract—**Based on the importance of the construction of the regional environmental space of the urban ecological park, research on the topography, geology, hydrology, human activities and other aspects of the ecological engineering area of the park, use Geographic Information System (GIS) and MIKE21 technology to construct the regional environmental space of the urban ecological park, and establish the urban park Eco-engineering river section plane two-dimensional water flow, mathematical model analysis provides predictive engineering, simulating the change characteristics of river flow field and water level under typical flow, and the regional environment of urban ecological park can be used as a construction to ensure the safety of flood discharge and the water level along the line under the flood stability. To study the impact of urban ecological park project flood control on the flow pattern of water. Excessive water velocity can easily cause serious damage to the river embankment, which affects the structural stability of the river embankment of the ecological park and ultimately affects the flood discharge capacity of the ecological park's rivers. MIKE21 and ecological models are adopted. Analyze the feasibility of the modeling method by numerical simulation, establish the numerical simulation model of the urban ecological park, simulate the ecological regional modeling logic system, predict and analyze the impact of the project on the change of the flood carrying capacity of the river, and provide the engineering research of the urban ecological park.**

Index Terms—**Mike21, Numerical simulation, Ecological model.**

I. Text

Many experts and scholars have conducted research on modeling and simulation research in the past. For example: In 1995, [1] Cao. GX used fuzzy set theory to develop a fixed ecology; 1998 [2] Stockwe II. D *et al.* GARP system for automatic spatial prediction problems and solution modeling solutions; In 2003, [3] Deng Yi discussed the development and concept of urban ecological parks; In 2006, [4] Phillips S. J. *et al.* established the maximum entropy model by geographical distribution of species; In 2008, [5] Liu Wei and others simulated the flood discharge capacity and flood inundation in the lower reaches of the Biliuhe Reservoir; In 2009, [6] Wang Qinghui and others based on Mike 21 FM for numerical simulation of temperature and drainage of the extension project of the Laibin Power Plant; In 2009, [7] Li Daming *et al.* used the mathematical model of flood evolution in rivers and flood detention areas; In 2010, [8] He Jie and Xin Wenjie's numerical solution to the shallow water equation with turbulent viscous terms; In 2010, [9] Tang Ming used the Lanzhou Yintan Ecological Park as an example to study the evaluation system of urban ecological parks in the northwest region; In 2012, [10] Tarroso P. *et al.* established a simple simulation map for the ecology; In 2013, [11] Qiao Huijie and others in the ecological model theory, development direction and challenges.

The comprehensive urban ecological park integrating ecological protection and leisure can alleviate the problems of current urban water pollution and deterioration of water environment quality, and ensure social ecological environment protection and economic benefits. The urban ecological parks in all provinces of China have their own special geographical location. Because the water level of the river flooding section is reduced due to the area, the flood safety of the river channel is hidden. Therefore, whether the flood resistance of the river bank is affected is the most concerned when designing the project. problem. This paper intends to use the Mate21 water flow mathematical model to simulate the flow field and river erosion deformation of urban river parks. For example, the three-dimensional natural water flow needs to be described by the three-dimensional Navier-Stokes equation (1), using the Reynolds averaging NS equation. Based on the mathematical model of water flow, provide relevant data for river flood control impact analysis.

$$\partial\xi/\partial x + \partial p/\partial x + \partial q/\partial y = Ss \ldots \quad \ldots\ldots (1)$$

It can be seen from Table I that the continuous large scale flood flow in several years is reduced by about 1.2 km in the main channel of the river channel and the cross section of the river channel is reduced between S4 of 450 m and S6 of 1650 m section The water surface of the river is suddenly narrowed and widened from S5 (1200m) to S6 (1650m), and the widening section is about 350m long and there is a drop. The water level of the river between the S7 (2150m) and S9 (2700m) sections is straight, the water level changes relatively smoothly, and the plane topography is not much different. This shows that the model simulates the calculation of the water surface line shape and the corresponding relationship between the water surface line and the river channel plane is reasonable. The model is used to calculate the accuracy of the model for the large-scale flood flood flow surface line and hydrological bureau flow measurement for several years, and the urban ecological park simulation analysis is carried out. Fig. 1 illustrates the analysis of the ratio of the continuous water flow level to the elevation section of the continuous river channel for several years. It can be seen that neither the design flow level nor

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the actual flood flow measurement in recent years does not exceed the elevation of the sub-dikes, which is safe. Fig. 2 is Explain that the flow velocity and regional changes under several different conditions. It can be seen that the flow velocity on the S09 section is accelerated, but it is not close to the river embankment, so it will not affect the river bank. However, the increase in the flow velocity in S04 ~ S06 will affect the river bank, so the river bank must be affected. For reinforcement, the comparative analysis of the water level design of the river course in Fig. 3 and the elevation of the embankment shows that even in the case of a once-in-a-hundred-year flood, the height of the water flow will not exceed the elevation of the top of the embankment. It is found from the map that accurate simulation can improve urban ecological buildings in various regions, to achieve the cost and timeliness of urban ecological construction, and have a high reference effect for similar ecological park river flood resistance.

TABLE I: COMPARISON OF CONTINUOUS LARGE FLOOD FLOOD FLOW OVER SEVERAL YEARS

Project	Surface lines in different face values /m								
	S 01	S 02	S 03	S 04	S 05	S 06	S 07	S 08	S 09
Observed value	469	468	467	466	465	462	464	464	464
Value of simulaction	469	468	468	465	464	464	464	462	463

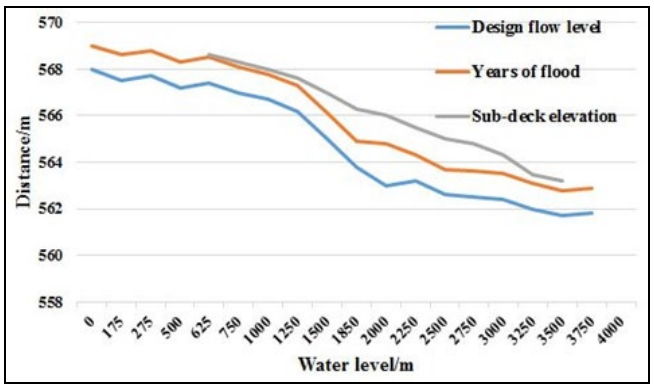

Fig. 1. Analysis of the ratio of continuous water flow level and elevation section in the river channel.

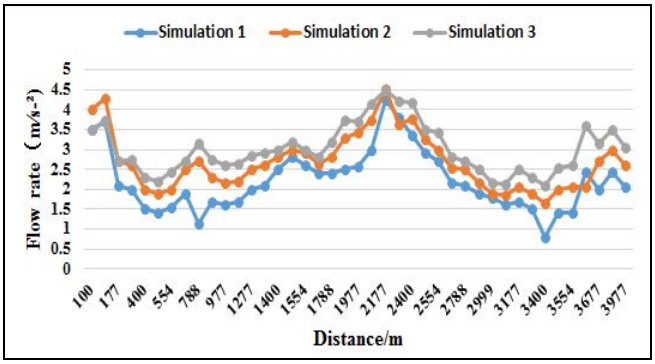

Fig. 2. Comparison of river water level design and embankment elevation.

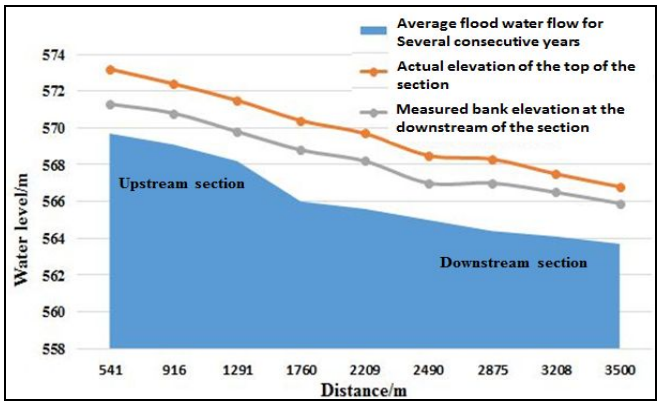

Fig. 3. The flow rate and regional changes in several different situations.

II. RESULTS AND ANALYSIS

The development and utilization of urban ecological parks can form a comprehensive park integrating ecological protection and leisure, which can alleviate the problems of water pollution and deterioration of water environmental quality that cities are currently facing, and ensure its ecological environmental protection and social, ecological and economic benefits. However, the construction of urban ecological parks will affect the flood-flooding section of the river, shrinking its area and increasing the water level, making the river flood-flooding safety a hidden danger. Moreover, the urban ecological park needs a special geographical location, so it has extremely high requirements for safety. The construction of the park will affect the flood carrying capacity of the river, so whether the flood resistance of the river embankment is affected is the most concerned issue when designing the project.

The modeling process of the niche model is complicated, and the niche shape cannot be presented well, but the statistical accuracy and practical application effect are good. Therefore, the complexity of the ecosystem and the randomness and ambiguity of its internal state make ecosystem research difficult. The establishment of fuzzy set theory is a means to describe the randomness and fuzziness of the system. Compare the advantages and disadvantages and development direction of each model of the fuzzy modeling method of the niche model.

The development trajectory of the fuzzy modeling of the niche model is the decision-making of the ecosystem. The set of optimal resources is a framework based on the theory of fuzzy sets, and the fuzzy intersection sets of corresponding resources between them. As a suitable method to describe changes in niche. Therefore, fuzzy logic is a method to deal with uncertainty. It uses fuzzy set theory to define niche and defines it as a fuzzy set of values on the environmental gradient.

Through the model simulation analysis, the protection measures are applied to protect the slope and the foot of the river in the river section to prevent the erosion of the hollow river bank due to the fast flooding. The results show that changing the channel shape will change the flooding capacity of the river channel due to the excessive water velocity and the stability of the riverbank. The ecological model has three major stages of research on the application

of mathematics and control theory to the ecosystem. The system describes the randomness and ambiguity of the system. The fuzzy set theory is established by Zadeh. The advantages, disadvantages and development directions of each model of the niche model fuzzy modeling method are compared. Then Ecological development model simulation modeling trajectory

Ragade provides simulation set theory as a framework for decision-making ecosystems, Bosserman simulation ecosystem analysis collection applications, and simulation collections to obtain urban ecological park programs. Edward the simulation theory model Lotka-Volterra is shown in equation (2).

$$a_{ij} = \frac{u_i(s)u_j(s)ds}{(u_i(s))^2 ds} \quad \text{..... (2)}$$

The best simulation resource set is the intersection constraint of the corresponding set of model simulation modeling, and describes the appropriate simulation of urban ecological change. Modeling simulation logic deals with uncertainty methods, and Salski applies simulation logic to ecological modeling. Cao uses simulation modeling sets to build urban ecological simulations. The simulation corresponding to the set is a measure of balanced competition. If the critical value is exceeded, the community does not exclude the coexistence of species. Using the concept of aggregation between simulations to obtain a clear bio-ecological model, it is a competitive relationship between community species in the ecosystem, resources, plaques, and time simulations. Hypothetical ecological fact or $\lambda i\ *(i = 1,2,3...n)$ Is the analog number, $\Lambda* = (\lambda 1\ ,\ \lambda 2\ ,\ ...\ ,\ \lambda n)$ Indicates the optimal ecological environment for living space. Simulation set $H(\Lambda*)$ Express * The most suitable ecological simulation set is geometrically an n-dimensional hyper-simulation space.

TABLE II: ADVANTAGES AND DISADVANTAGES OF SIMULATION MODEL

Advantages disadvantage	disadvantages
Most of collections can be used to model the simulated data	**Hard to use for complex model simulation formulas**
Can be used to quantify (language measurement)information	**Model simulation data belongs to black box model**
Evaluation data still performs model simulation when less than half of the quantification	**Suitable for modeling software**

The simulation set theory combined with Hutchinson's volumetric ecological positioning to simulate the volumetric ecological concept. Given $x\ i$ is the *i-th* dimension set $= x1 \times x2 \times ...xn$ Represents n-dimensional resource space, And the species α can be used $x\ A$ collection of all resource points consisting of a simulated set A to locate the species αecology, Ecological membership function $\mu A(x)$ Indicates the degree to which the species α utilizes the resource space x, indicating that the species α is applicable to the environmental resource x. Using the model to simulate the membership function of the set, the dynamic characteristics of the ecological simulation ecological width and overlap calculation are established. Let x be the resource axis, A be the resource curve simulation, and then the on-axis fuzzy simulation set A with a species as the ecological resource axis is the uncertainty. Simulate the redundant structure model of the ecosystem to calculate the reliability of the ecological species community and the reliability of the ecological biota, and quantitatively analyze and study the relationship between the stability of the ecological biota and the evolution of ecological organisms and environmental changes. Mamdani is an expert language formula, Sugemo uses an optimization program, and sven has the advantages and disadvantages of Table II.

Bosserman can use the simulation classification method to analyze the ecosystem, and provide more results than the traditional method. It can be said that it is very suitable for the model numerical simulation ecology, and gives the simulation model of the basic niche in the ecosystem.

The use of Salski simulation logic to model larks results in a consistent use, indicating that the theoretical theory of processing uncertainty has a powerful role. The simulation ecological model is given from the perspective of simulation set, and the relevant width is overlapped and quantified to obtain the ecosystem simulation model, and the ecosystem simulation modeling is from ecological to broader. In the Cao foundation, Huthcinson volume ecological simulation ecology and quantitative application examples are combined. Seen from the ecological membership function $\mu\ A\ (x)$Value between 0 ~ 1. Describe the degree of adaptation of species to the environment, which is more reasonable than Hutchinson's, functional uncertainty model set dynamic ecological model simulation. The simulation set membership function describes the niche dynamics. The function corresponds to a simulation set at each point, avoiding the Hutchinson volume model. Each point has an equal tolerance defect reflecting the authenticity. According to the dynamic eco-geographic region and the ideal ecology, respectively V_F, V_R and V_I, Among them $V_F \subseteq V_R \subseteq V_I$, and V_F Corresponding upper membership function $\mu \tilde{A}(x) V_I$ Corresponding number membership function $\mu A(x)$, So $[V_F,\ V_I]$ change in the middle. Description of ecological geographic regions V_F and V_I Dynamics vary with the environment the dynamics of environmental change modeling and simulation of ecological modeling. It has been widely used in various ecological fields since 1965. There have been many developments in niche modeling for more than 30 years. With the improvement of the theory of ecological geographic regions, the improvement of data accumulation and collection, and the development of computing technology, simulation ecological zone model simulation modeling can explain various ecological phenomena more reasonably.

III. CONCLUSION

1) Numerical simulation of urban ecological park simulation by MIKE 21 flow, under the simulation analysis of the water flow field and flooding capacity of different

numerical regions for several years, the project has a flood discharge capacity of Q=4000m^3/s for the river and a flow rate of Q=6500m^3/s for several consecutive years. The river water flow rate reached 4.5 m/s and 5.8 m/s, respectively, it can be clearly seen from the distribution map that the density of the left bank of the river channel has increased, the high velocity belt has lengthened and the influence on the left bank slope has become larger.

2) When the width of the river channel narrows and the flow rate reaches the peak, the corresponding slope protection and embankment protection measures should be set in the river section to prevent the erosion of the river bank caused by high-flow floods. The results show that the change of the shape of the river will affect the flow state of the water. The speed of the water flow will affect the stability of the river bank and ultimately affect the flood carrying capacity.

3) With the simulation of numerical simulation of urban ecological park simulation theory, the improvement of data accumulation and collection and the development of computational technology, the simulation ecological model will be more reasonable, accurate and reduce costs, it will be applied to urban ecological simulations, which the vast majority benefit the future development of urban ecology.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

This paper contributes to the tasks of author Lee Kun-Fa (Adviser): analysis, writing, translation, drafting, and author Lai Jia-Qi (Undergraduate) is responsible for data simulation, debugging, and collation. All authors have approved the final version.

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