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Research on simulation modeling technology of urban ecological park

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ABSTRACT

Based on the urban ecological park project flood control affects the flow state of water; the excessive velocity of the water flow affects the stability of the river embankment structure of the ecological park, and finally affects the flood capacity of the ecological park river. This paper adopts the numerical simulation analysis of MIKE21 and ecological model to analyze the feasibility of the modeling method, establishes the numerical simulation model of the urban ecological park, predicts and analyzes the influence of engineering on the change of river flood capacity and provides the construction engineering research of urban ecological park.

Key words: MIKE21, numerical simulation, ecological model.

INTRODUCTION

Various modeling simulation researches have been carried out by several experts and scholars, such as Cao (1995) who used fuzzy set theory to define ecology; Stockwell and Peters (1998) who used the garp system to predict the problem of automatic space and solved the modeling scheme; Yi (2003) who reported on the development and concept of urban ecological park. Phillips et al. (2006) established the maximum entropy model by the geographical distribution of species, while Liu et al. (2008) simulated the river basin downstream channel flood capacity and flood inundation. Wang et al. (2009) also carried out researches on the numerical simulation of temperature and drainage in Laibin power plant expansion project based on Mike 21FM, while Daming et al. (2009) used the mathematical evolution model of flood in river channel and flood detention area; Jie and Wen-Jie (2010) solved the shallow water equation using turbulent viscosity term; Ming (2010) used Lanzhou sliver beach ecological park as an example to study the evaluation system of urban ecological park in northwest China, while Tarroso et al. (2012) established a simple simulation diagram for ecology and Huijie et al. (2013) studied the theoretical basis, development direction and challenges of ecological models.

The comprehensive urban ecological park integrating environmental protection and leisure was used to alleviate the current urban water pollution and deterioration of water environment quality and ensure its ecological environment protection and social ecological economic benefits. The urban ecological parks in all provinces of China have their special geographical locations. The entire Chinese urban ecological park has its special geographical location. However, due to the shrinking of the area of the river flooding section and the increase of the water level, there is a hidden danger in the flood safety of the river. Therefore, whether the flood resistance of the river bank is affected is the most concerned issue in design engineering.

In this paper, MIKE 21 Flow Mathematical Model is adopted to simulate the flow field and river erosion deformation during river flood process in the construction of the urban ecological park. Three dimensional natural flow was described by the three dimensional Navier Stokes equation and Reynolds average *N-S* Equation (1) adopted as the flow mathematical model to provide relevant data for the analysis of the impact of river flood control. Equation 1 is given as:

$$\frac{\partial \xi}{\partial x} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = S_s \qquad (1)$$

Table 1 shows that the flow rate of several years of continuous heavy water flood is about 1.2 km in the

Table 1: Comparison of continuous flood discharge in recent years.

Project	Surface lines in different face values/m²								
	S01	S02	S03	S04	S05	S06	S07	S08	S09
Observed value	468.52	467.92	467.22	466.24	465.43	464.91	464.14	464.13	463.62
Value of simulation	468.52	468.14	467.51	465.33	464.32	463.83	463.50	462.34	462.81

Table 2: Advantages and disadvantages of simulation model.

S/No	Advantages	Disadvantages
1	Most of the collection can be used to model the simulated data	Difficult to use for complex model simulation formula
2	It can be used to quantify (language measurement) information	Model simulation data belong to Black box model
3	Evaluation data still perform model simulation when less than half the quantification	Suitable for modeling software

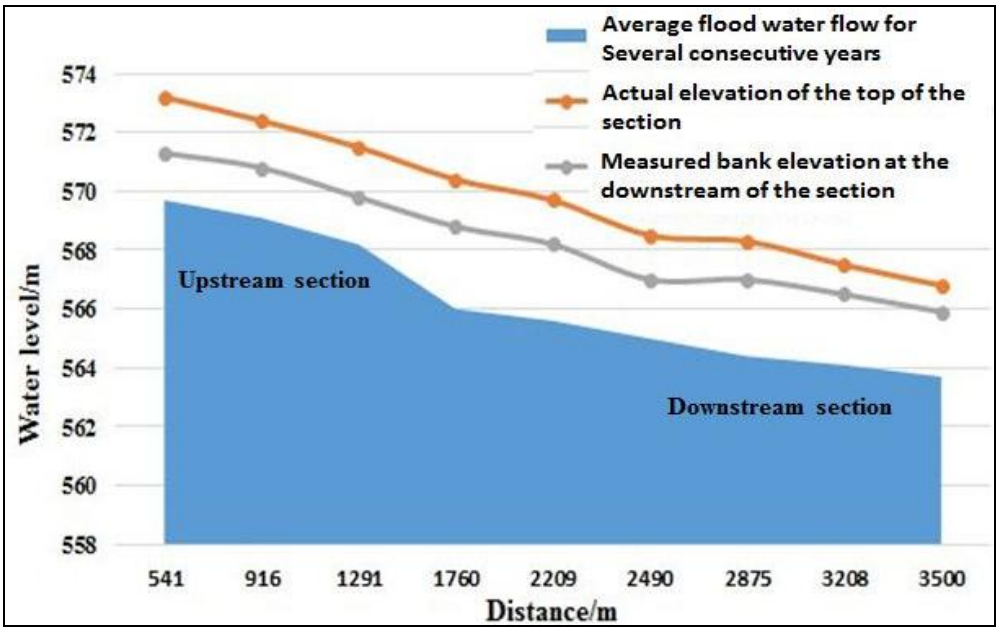

Figure 1: Analysis of the ratio of continuous water flow level and elevation section in the river channel.

narrowed section of the main channel of the river and the section of the river flow is reduced between S_4 and S_6, which are respectively 450 m and 1650 m sections. Due to the backwater of the river, the section from S_5 (1200 m) to S_6 (1650 m) suddenly narrows and widens, while the length of the widened section is about 350 m and falls. The water level of the river flows through a straight section between S_7 (2150 m) and S_9 (2700 m) and the change of water level is relatively stable. There is little difference between the water level change and the stable plane topography, which indicates that the simulated calculation of the water surface line in this MODEL conforms to the corresponding relationship between the water surface line and the channel plane. The accuracy of the model was proved by calculating the water surface line of several years' flood discharge and the actual measurement of hydrological bureau's discharge, and thereafter the simulation analysis of urban ecological park was carried out.

Figure 1 shows the analysis of the continuous water flow level and high fault plane ratio of several consecutive river courses in the river channel. Figure 2 is a comparative analysis of river water level design and embankment elevation, while Figure 3 illustrates the flow rate and regional variation in several different situations. It is found

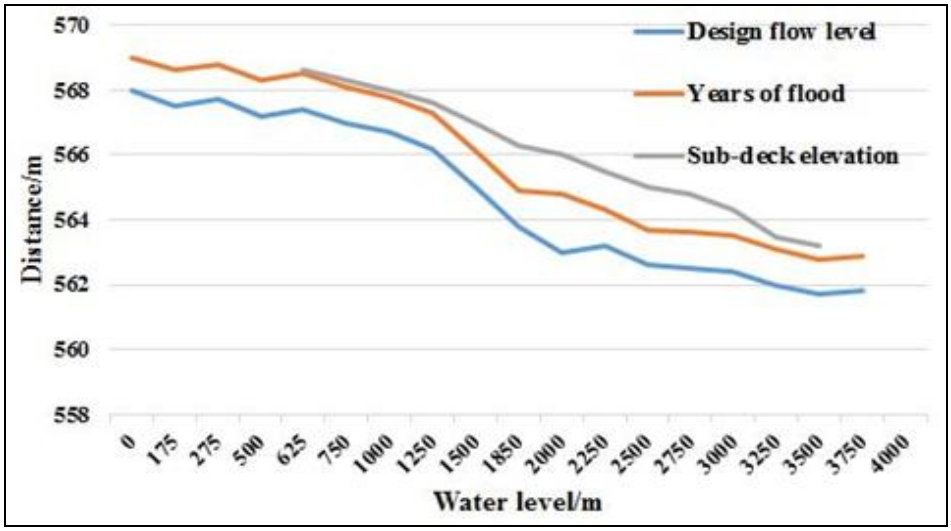

Figure 2: Comparison of river water level design and embankment elevation.

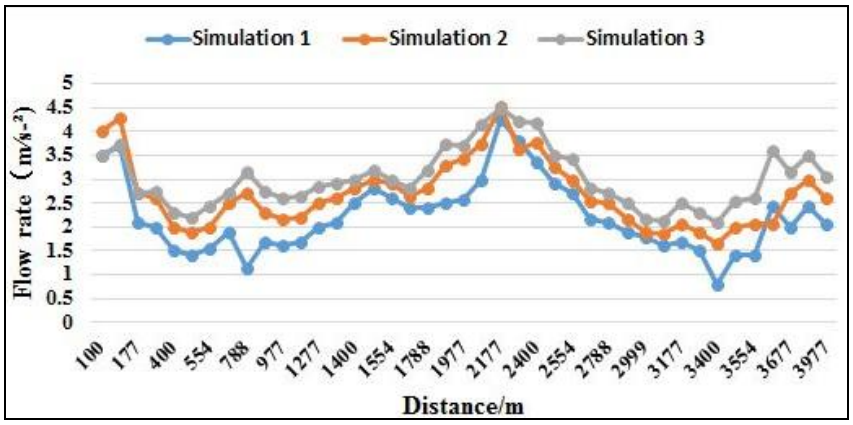

Figure 3: The flow rate and regional changes in several different situations.

from the figure that accurate simulation can improve the urban ecological buildings of different regions and achieve the cost and timeliness of urban ecological construction.

RESULTS AND DISCUSSION

Available through model simulation analysis, in the river section, protective measures are taken to protect the slope and the foot of the embankment to prevent the erosion of the hollow river bank due to the rapid flow of water. 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 river bank.

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 river bank. The ecological model has two major stages of research on the application of mathematics and control theory to the ecosystem. It describes the randomness and ambiguity of the system, establishes the fuzzy set theory by Zadeh, and the fuzzy modeling method of the niche model. The advantages, disadvantages and development directions of each model are compared.

The ecological development model simulates the trajectory of modeling

Ragade provided the simulation set theory as the framework of the decision-making ecosystem, Bosserman applied the simulation set to analyze the ecosystem and used the simulation set to get the urban ecological park scheme. Edward's model of simulation theory Lot-ka Volterra Equation (2) is given as:

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

The best set of simulated resources is a suitable model to describe the urban ecological change by modeling the intersection constraints of the corresponding set. Modeling simulation logic deals with the method of uncertainty, and Salski (year) applied simulation logic to ecological modeling. Cao (1995) used simulation modeling set to establish urban ecological simulation. The simulated set corresponds to a good measure of inter-species equilibrium competition, which does not exclude species coexisting with each other beyond the critical value.

The concept of the set between simulations used was to obtain a clear biological-ecological model, and the relationship between community species in the ecosystem in terms of resources and patches, and time simulation was discussed as coexistence or competition. The relationship between community species in the ecosystem in terms of resources, patches, and time simulation was discussed as coexistence or competition. Hypothesis ecological factor lambda λi*(i = 1, 2, 3...n) is a simulation, $\Lambda^* = (\lambda_1, \lambda_2, ..., \lambda_n)$ is the ecological environment with the most suitable living space. For analog set H(Λ*), the optimal ecology is marked ✳, which is a set of dimensional simulations, geometrically it is an N-dimensional hyper analog space.

According to the simulation set theory combined with Hutchinson's volumetric ecological positioning, the concept of volume ecology is simulated. Let X_i be the set of i-th dimensions = $X_1 \times X_2 \times ... X_n$, which shows n dimension resource space. Species α may use the simulated set A of all resource point sets of X to locate the species alpha ecology. The membership function $\mu_{A(x)}$ indicates the degree to which the species α utilizes the resource space X, indicating the application of the species α to the environmental resource X. The model is used to simulate the effects of the membership function of the set, and the ecological simulation with dynamic characteristics established to make the ecological width and overlap calculation.

Bosserman used the analog classification method for ecosystem analysis, which provides more results than traditional methods. It is very suitable for the model numerical simulation ecology, giving a simulation model of the basic niche in the ecosystem.

Salski (year) used analog logic to model Larks to get results that are more general than linguistic variables. Instead, it is consistent with the purpose of daily description, indicating that analog theory processing uncertainty has a powerful effect. Given a simulated ecological model from the perspective of the simulation set, it quantifies the calculation of the associated width overlap. At the same time, simulation models of other concepts of the ecosystem, which promote ecosystem simulation modeling from an ecological perspective to a broader field are also obtained. Based on Cao's basis, Hao Feng combined Huthcinson's volumetric ecology to propose simulation ecology and quantification, giving more specific application examples. The membership function shows that the $\mu_{A(x)}$ value is between 0 and 1, which can describe the degree of adaptation of the species to the environment, which is more reasonable than Hutchinson.

In the concept of functional uncertainty, a set dynamic ecological model simulation is proposed. The membership function of the simulation set can describe the niche dynamics, and its function corresponds to a simulation set at each point. Avoiding Hutchinson's oversized model, each point has equal tolerance defects, and more realistically reflects the authenticity of nature. According to the dynamic basic ecological geographical area and the ideal ecology, it is recorded as V_F, V_R and V_I, respectively, where $V_F \subseteq V_R \subseteq V_I$, and V_F corresponds to the upper membership function, $\mu_{\tilde{A}}(x)$ V_I corresponds to the number of membership functions $\mu_A(x)$, which is the change in $[V_F, V_I]$. This illustrates the dynamics of the eco-geographical region changing between V_F and V_I as the environment changes. For eco-modeling simulation of eco-geographical regional thinking and outlook simulation, since its introduction in 1965, it has been widely used in various ecological fields. In the past 30 years, there has been a lot of development in the niche modeling simulation. With the improvement of the theory of ecological geographic regions, the improvement of data accumulation and collection, coupled with the development of computing technology, simulated ecological region model simulation modeling can explain various ecological phenomena more reasonably. With the development of simulation ecological region model simulation modeling logic system, more computing technologies have been programmed, and can be applied to ecological regional models to benefit the future development of urban ecology.

Conclusion

Conclusions drawn from the study include:

(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=4000 m^3/s for the river and a flow rate of Q=6500 m^3/s for several consecutive years. The river water flow rate reached 4.5 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 increased, while the high velocity belt lengthened, and the influence on the left bank slope became 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 and will be applied to urban ecological simulations, which the vast majority benefit the future development of urban ecology.

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