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Intelligent Shared Bicycle Transportation Planning System Under the Concept of Green Transportation and Smart Cities

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Abstract: Intelligent shared bicycle transportation planning system under the concept of the green transportation and smart cities is studied in this paper. The main part of the system we designed is based on the GIS, including the indexing, retrieval, positioning, spatial topology analysis of highway data, etc. The data needs to be accessed through Web GIS during operation to ensure the normal operation of the website. Our simulation study assumes that there is a certain connection between land use and transportation. Under the assumption that other influencing factors remain unchanged. Predict changes in transportation and travel by changing one or more land use variables. Furthermore, the concept of green transportation and smart cities are then combined to enhance the model. The designed framework is simulated under the complex environment.

Keywords: Smart cities; green transportation; shared bicycle transportation; intelligent model; planning system

1. INTRODUCTION

From the perspective of transportation mode, the green transportation system includes the pedestrian transportation, bicycle transportation, and conventional public transportation.

The green transportation system includes the pedestrian transportation, bicycle transportation, the conventional public transportation, rail transportation, and rail transportation [1-3]. The green transportation is a planning concept proposed under the objective conditions that the development of cities and urban transportation faces a series of transportation problems and development bottlenecks that can be considered as follows.

Determine the appropriate land scale to frame the travel behavior in the new ecological zone, combine the traffic conditions around the ecological new zone, and rationally divide various types of land; combine land use, and rationally lay out various traffic service facilities to make the land use functions of different levels and different functions complex, reducing unnecessary traffic demand from the source [4-6].

Because premise of integrating green transportation into the greenway system is that the green transportation system itself is a complete part, and to make three mainstream green transportation methods into a whole, transfer is the key.

Designing a dense road network to evacuate traffic to a set of narrow parallel roads instead of focusing on a small number of main roads is conducive to improving the traffic efficiency. At the same time, to create more linear routes to improve the environment for walking and cycling, create a slow-moving texture of the block, give priority to pedestrians rather than vehicles, and implement the planning concept of "city built for people" [7-9].

Green transportation is concept consistent with sustainable development, that is, to reduce the traffic congestion, reduce environmental pollution, and rationally use resources.

Its essence is to establish the transportation system that maintains sustainable development to then meet the people's transportation needs and also achieve maximum transportation efficiency, benefit, efficiency and effectiveness with the least social cost. The figure 1 shows the framework.

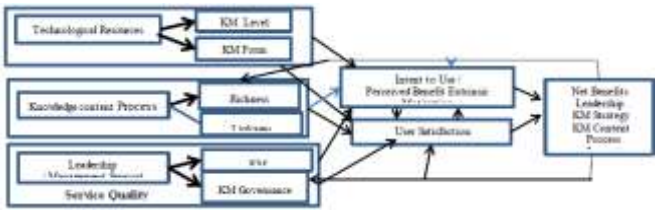

Fig. 1. The Green Transportation and Smart Cities Framework

From a theoretical perspective, urban design is a human-centered planning and design work starting from the overall environment. Its purpose is to improve the overall image and environmental beauty of the city, and improve people's quality of life. It is an extension and concretization of urban planning which is a deepened environmental design. The economic growth of the city should be low-cost and environmentally friendly [10-12]. On the contrary, if the development of the city is at the cost of urban environmental pollution and inhabitability, this will then reduce the quality of life of urban residents. Management is the guarantee of urban development and an important means of planning and construction. Only with good management can a city develop well [13].

Standardized and efficient urban management is the key to ensuring the full implementation of the urban planning, the gradual advancement of urban construction, and the smooth development of the various urban tasks. Only by scientifically formulating urban planning can be the urban development environment be better improved. In new era, the construction of low-carbon eco-city will not only achieve better economic development, but also achieve the better results in ecological economy. Therefore, in the urban planning, it is necessary to attach great importance to the improvement of the ecological environment and environmental quality, and carefully analyze and study the impact of the city on the economy, society and environment during the development process, so as to better promote the sustainable development of the city. In the next parts, the designed model will be implemented.

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2. THE PROPOSED METHODOLOGY

2.1 The Green Transportation and Smart Cities

Developing a public transportation system dominated by rail transit. Rail transit can be said to be a green mode of the transportation, and in the current situation where the road resources are limited, rail transit should be developed [14-16].

It can inject vitality into the development of transportation. Therefore, in some cities where the conditions permit and the sustainable development of the urban transportation can be promoted by vigorously developing urban rail transit. In the lemma 1, the optimization model is defined.

$$\xi_t(i,j) = P(q_t = S_i, q_{t+1} = S_j \mid O, \lambda) = \frac{\alpha_t(i) a_{ij} b_j(O_{t+1}) \beta_{t+1}(i)}{\sum_{i=1}^{N}\sum_{j=1}^{N} \alpha_t(i) a_{ij} b_j(O_{t+1}) \beta_{t+1}(i)} \quad (1)$$

Green transportation is a brand-new concept, based on the connotation of the sustainable development, to develop a set of diversified urban transportation facilities, including roads, vehicles, parking lots, etc., to reduce the use of the personal transportation vehicles to reduce traffic congestion and reduce environmental pollution while the transportation system that promotes social fairness, energy saving, and cost reduction.

The ultimate emphasis is on solving the traffic congestion, reducing environmental pollution, rationally using resources, and reducing the use of personal transportation as a means. In the figure 2, the traffic network is defined.

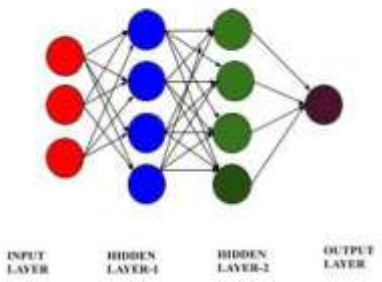

Fig. 2. The Traffic Network Model

The urban center is the core area of green transportation mode. The core urban center is often the area with the most intensive residents' activities. The flow of people and vehicles is very large. A large number of people and vehicles lead to a series of problems, such as the difficult traffic organization, difficult parking and unable to guarantee evacuation routes. If the traditional urban road design method can no longer meet its traffic needs, for the special sections in this city, a safe and efficient way of travel is needed, so pedestrian streets need to be built in urban central areas, especially commercial centers. In addition, for decentralized cities, it is also necessary to establish a walking and non motorized slow traffic system to form a slow traffic network connecting various centers, so as to provide convenience for residents' travel, so as to reduce the traffic problems in the core area of the city. In the lemma 2, the estimation model is defined [17-21].

$$\frac{dJ}{df_1} = E\left\{ 2(z_t - \sum_{\tau=0}^{m} f_\tau x_{t-\tau}) \frac{d}{df_1}(z_t - \sum_{\tau=0}^{m} f_\tau x_{t-\tau}) \right\} \quad (2)$$

The integrated slow traffic greenway meets the needs of traffic operation. According to the different geographical factors and the form of greenway isolation, the operating environment of bicycles and pedestrians is integrated, and the two are organically combined. As shown in figure 3, street trees are used for bicycles and walking system isolation is the most ideal isolation mode, and in areas where the width of the greenway is narrow, the isolation of different materials can fully increase the utilization rate of the land.

Fig. 3. The Green Transportation Platform

2.2 The Smart Planning

"Digital city", that is, urban informatization, is to integrate urban information resources and realize the urban economic informatization through construction of broadband multimedia information networks, geographic information systems and some other infrastructure platforms. To achieve this goal, in the listed, we define the core aspects [22-25].

Urban planning is the general basic direction of urban construction and development, and is the core of all urban construction activities. Therefore, the preparation of scientific urban planning is the most important and effective way to improve urban development.

Urban landscape design should be combined with architecture and garden for comprehensive design. Urban natural ecosystem has the characteristics of naturalness and scientificity. When designing urban landscape, we should fully consider organic combination of landscape and architecture. The detailed design of space skyline outline is an important work of architectural landscape design.

The construction of a digital city will inevitably bring about profound changes in urban development. Therefore, urban planning under the digital city should first change the planning concept and establish the concept of digital city planning. The meaning of the digital city planning can be understood from two aspects. First of all, in terms of planning methods, it is a "digital" city planning, which means that the entire planning process is then completed in the digital way, including: data collection, analysis, and plans Secondly, from the perspective of planning objects, it is a plan for the "digital city", which must consider both the physical city and also the virtual city considering different aspects of issues.

In the lemma 3, the estimation model is defined.

$$div\left(\frac{\nabla u}{|\nabla u|}\right) + \lambda(u_0 - u) = 0 \quad (3)$$

In urban construction, there is the continuous synthesis of new materials and the decomposition of old materials. Such repeated cycles of the work constitute the foundation of the ecosystem. Therefore, for urban ecological construction, the rational circulation of resources should be promoted, and the energy consumption of resources should be reduced, so that people can obtain the greatest benefits. In the figure 4, the parameter details are presented.

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BERT Config class with Default Parameter Values		Bert Tokenizer	BertFor QuestionAnswering
attention_probs_dropout_prob	0.1	vocab_file	input_id
gradient_checkpointing	false	do_lower_case	attention_mask
hidden_act	gelu	cls_token	token_type_ids
hidden_dropout_prob	0.1	never_split	position_ids
hidden_size	768	unk_token	head_mask
initializer_range	0.02	sep_token	inputs_embeds
intermediate_size	3072	pad_token	output_attentions
layer_norm_eps	1e-12	do_basic _tokenize	output_hidden_states
max_position_embeddings	512	mask_token	return_dict
model_type	bert	strip_accents	start_positions
num_attention_heads	12	tokenize_ chinese_chars	end_positions
num_hidden_layers	12		
pad_token_id	0		
position_embedding_type	absolute		
transformers_version	4.8.2		
type_vocab_size	2		
use_cache	true		
vocab_size	30522		

Fig. 4. The Smart Planning Detailed Parameters

2.3 The Intelligent Shared Bicycle Transportation Planning

Travel information can guide travelers to choose travel modes based on the actual travel characteristics, especially between cars and public transportation. It has been verified that provision of multi-mode public transportation information services can guide transformation of individual transportation modes to public transportation modes, and to a certain extent optimize the travel structure of urban residents. The empirical study of the impact of land use on travel is to use the land use data and travel data obtained from the field investigations to establish an analysis model, and to reveal and then verify the internal relationship between elements through mathematical relationship between the variables [26-28].

Another important research direction of travel information is how travel information updates the travel experience of the travelers. It is also generally believed that travel information mainly affects travelers' perception of current traffic situation.

For example, from the perspective of Bayesian update, travelers initially have an initial perception of some various attributes of trip, which can be expressed by the distribution probability. According to Bayesian principle, after receiving the trip information, it will be updated to a new distribution probability. When commuters make decisions about the choice of travel mode and travel chain type, it is generally believed that the choice of travel mode determines the choice of travel chain type, that is, the travel mode is then regarded as an exogenous variable in the choice of travel chain type, we first consider which transportation mode to well choose, and then complete the travel chain activity arrangement as needed under the constraints of the transportation mode.

There are also studies that believe that the travel chain is an exogenous variable in the choice of travel mode. Travelers first organize one-day activities and trips into a travel chain according to the needs of individuals and families, and then consider which mode of transportation to choose under the constraints of travel chain. In the next section, the designed model will be simulated.

3. SIMULATIONS

This section will simulate the proposed model. Usually, the space linear distance between the centroids of the cells or the shortest distance (or time) between the centroids is used as the traffic impedance between the cells. Use the spatial straight-line distance as the impedance, without considering the road traffic network between the core communities, the prediction error is large. In the lemma 4, we define the basic standard for the estimation.

$$\mathrm{SNR}_{\mathrm{RMS}} = \sqrt{\frac{\sum_{r=0}^{N-1}\sum_{c=0}^{N-1}[g(r,c)]^2}{\sum_{r=0}^{N-1}\sum_{c=0}^{N-1}[g(r,c)-I(r,c)]^2}} \quad (4)$$

In the figure 5, the comparison analytic result is shown.

Model	Positive Classified	Negative Classified	Recall	Precision	F-Measure
CNN	62.29%	37.66%	0.592	0.562	0.249
CNN with CRF	85.77%	14.72%	0.789	0.772	0.329

Fig. 5. The Comparison Analysis Result

4. CONCLUSIONS

Intelligent shared bicycle transportation planning system under the concept of the green transportation and smart cities is studied in this paper. In urban construction, there is the continuous synthesis of new materials and the decomposition of old materials. Such repeated cycles of the work constitute the foundation of the ecosystem. Therefore, for the urban ecological construction, the rational circulation of resources should be promoted. Considering this, the paper proposes the novel shared bicycle transportation planning system. We test the proposed model on complex scenarios to validate the result.

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