Research on Road Route Selection Design Based on Google Earth Intelligent System

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Abstract. At present, in the field of road route selection design, the traditional auxiliary processing method has some shortcomings, such as high cost, not suitable for large-scale application and so on. Based on this, this paper first analyses the connotation of Google Earth and its role in road route selection design, then studies the specific application of Google Earth intelligent system in road route selection design, and finally gives the implementation path of road route selection design based on Google Earth.

Keywords: Road Route Selection, Google Earth, Intelligent System

1. Introduction

With the iterative maturity and progress of computer intelligent tech, it has been widely popularized and applied in many fields, especially in the field of road planning and route selection, which greatly promotes the progress of road route selection and planning and design. With the acceleration of urbanization process, urban roads are changing with each passing day [1]. At present, in the field of road alignment design, most of them use the combination of satellite remote sensing data and aircraft aerial remote sensing data. Although this auxiliary processing method has high accuracy and efficiency, it also has some shortcomings, such as high cost, not suitable for large-scale application. In this context, the intelligent system represented by Google Earth image has been deeply applied in the application of road alignment design.

In recent years, with the rapid change of social economy, the infrastructure construction has been improved rapidly, and the design work represented by road planning has made remarkable development. The traditional topographic map is difficult to meet the needs of road route selection design engineering in terms of timeliness. Although the cost of basic topographic map is low, there are some practical problems, such as early mapping time, poor reality, and the need for special organization of alignment and updating along the line [2]. On the one hand, Google Earth image can provide high-resolution images; on the other hand, it can provide rich three-dimensional information for road design. Google Earth is also in the continuous local update, which makes the use of Google Earth data for route optimization has a more significant condition.

In addition, the development of road route selection planning should be based on the principles of energy conservation, environmental protection, practical feasibility and operation benefit, and in the process of route selection design, all limiting factors and practical needs should be planned as a whole,
so as to ensure the scientificity and rationality of road route selection design planning [3]. Based on the data arrangement design of road route selection, several aspects as shown in Figure 1 are integrated, so as to reduce the cost of design and planning and ensure the economic benefits of the project.

![Figure 1. Data synthesis factors of road route selection.](image)

In short, in the process of road route selection design, we need to change the dependence on traditional artificial maps, make full use of the role and position of digital terrain data represented by Google Earth in road route selection, and promote the improvement of the quality and efficiency of its design and planning [4]. Make full use of the global digital terrain, high-definition image and advanced layer management system provided by Google to carry out line planning and design, and provide image aided decision-making in line planning, design, scheme comparison, evaluation, environmental assessment, safety audit and other links and processes [5]. The research of road alignment planning and design based on Google Digital Earth is helpful to improve the quality of road design, ensure the design progress, promote the optimization of the scheme and reduce the cost, so it has important engineering practice research value.

2. The connotation of Google Earth and its role in road alignment design

2.1. Characteristics and connotation of Google Earth

As a typical virtual globe software developed by Google, Google Earth integrates satellite photos, aerial photos and GIS data into a three-dimensional model of the earth [6]. It takes high-resolution satellite images as basic data and integrates classified information represented by various infrastructures closely related to life. With the launch of Google Earth, geographic information application is no longer the exclusive work of professionals, but a practical application tool for Internet users.

In addition, Google's multi-source vector data compression engine can ensure the integrity of the earth's data. Google Earth has the typical characteristics of highlighting key points, closely combining with search engine, providing convenient and free general services, intuitive geographic information, easy operation and high popularity, as shown in Figure 2 below.
2.2. Establishment process of virtual environment in Google Earth road alignment design

The specific process of virtual environment establishment in Google Earth road alignment design mainly includes image data update, 3D environment establishment, landmark labeling management and road information feedback [7]. Among them, in the aspect of data update affected by road route selection, Google Earth intelligent system enables users to apply more high-definition photos to cover the corresponding areas, so as to make the covered areas clearer and clearer. Secondly, at the level of 3D environment establishment, the general modeling work 3DMAX is used to model buildings and structures, and then the data is converted into 3D data that can be imported into Google Earth intelligent system.

In addition, in the aspect of landmark labeling management, Google Earth allows the labeling of place names and landmarks, so as to realize the management and preservation of buildings, roads and public facilities within the scope of road alignment planning [8]. In the aspect of road information feedback, thanks to the high popularity of Google Earth intelligent system, it can realize the real-time feedback of user information, so as to control the road status data by real-time monitoring and feed it back to users.

2.3. The role of Google Earth in road alignment design

Firstly, the application of Google Earth in road alignment design can build 3D building model within the planning scope, and overlay 3D building model within the road planning scope based on 3D model layer. Secondly, the application of Google Earth intelligent system can significantly increase public participation. Through the release of road alignment design and planning scheme on the network intelligent system, Google Earth users can conveniently download and feedback their opinions and suggestions, so as to facilitate the information collection and processing of planners and implementers.

In addition, the application of Google Earth helps to innovate the educational methods of route selection design and planning, and stimulate the innovation of road route selection planning and design. In addition to the application of traditional CAD, Photoshop and other auxiliary drawing software and GIS software, Google Earth focuses on increasing the combination of planning and design process, which is more conducive to analyzing and modifying the road alignment planning scheme from a three-dimensional perspective [9]. The digital earth intelligent system based on Google Earth, with its functions of clear remote sensing image of planning area environment, three-dimensional dynamic roaming and landmark file, has brought sufficient innovative materials for road route selection planners, so as to stimulate the design and planning inspiration of road route selection planners.
3. Specific application of Google Earth intelligent system in road route selection design

3.1. Provide basic information of road alignment design and planning

The basic data of road alignment design and planning mainly includes geographic data and attribute data. Among them, geographic data reflects the distribution of topography, land use, buildings and infrastructure within the scope of road alignment planning, which is the basic data for road alignment design and planning [10]. Secondly, the high-resolution remote sensing image provided by Google Earth intelligent system has gradually become an important geographic data source for road alignment design and planning.

3.2. Improve the visual evaluation of road alignment design and planning scheme

At present, the traditional road route selection planning and design still rely on two-dimensional plane information to reflect multi-dimensional information, but it has many defects, such as low accuracy, poor real-time and low efficiency. The establishment of a three-dimensional virtual environment for road alignment design in Google Earth intelligent system, based on which the planning approval can make the review content more intuitive and comprehensive to the relevant reviewers. In addition, with the help of the comprehensive and free control scene, the defects in the design of road route selection can be easily presented, which can effectively reduce the irreparable loss and impact caused by the unreasonable early planning, thus greatly improving the efficiency of the approval of road route selection planning and design.

3.3. Construction of road alignment design database

The road alignment design database is based on the existing two-dimensional and three-dimensional spatial information database within the scope of road alignment, and comprehensively uses the technologies shown in Figure 3 below to assist the detailed planning of road alignment design. Through the establishment of 3D model and attribute database of road route selection status and planning, it can simulate the real road topography and preview the development and change of road morphology, which is an important auxiliary means to carry out the investigation of road route selection status, scheme design, analysis, approval, design and planning scheme decision. In addition, the road alignment design database can provide data support for the planning and management of road, land and space resources and the design and management of related road construction projects.

![Figure 3. Tech integration of road alignment design database](image)

4. Design and implementation of road route selection based on Google Earth

4.1. Overall analysis of Google Earth intelligent system

The functions of Google Earth's road route selection intelligent system mainly include project management, road route plane and profile design, road route selection information query, progress output and tool management. The interface of intelligent system mainly consists of two parts: the input of design parameters and the input of display parameters. In addition, in the functional module design level of the intelligent system, the independence of each module is guaranteed, so that the stability and
maintainability of the system can be effectively improved, which is convenient for the later upgrade and maintenance of the system.

4.2. Realization of road route selection design
Firstly, in the plane design of road route selection, based on the requirements of line location selection, the intersection of lines is selected, so as to carry out the linear display of configuration curve and mileage. Secondly, in the vertical section design level of road route selection, the ground line of the line is obtained and the ground line graph is drawn, which lays the foundation for the construction of 3D model. In addition, in the three-dimensional effect display level of road route selection design, it focuses on the visual three-dimensional description of the complex and huge environment around the road, and intuitively shows all the route design schemes to the project reviewers, so as to improve the evaluation efficiency and quality of road route selection design scheme.

5. Conclusion
In summary, Google Digital Terrain, high-definition image and advanced intelligent system for route planning and design help to improve the quality and efficiency of road design and planning, and can provide image aided decision-making in route planning, design and scheme comparison, evaluation, environmental assessment, safety audit and other links and processes. Based on the study of the connotation of Google Earth and its role in road alignment design, this paper analyzes the establishment process of virtual environment in road alignment design of Google Earth. Through the analysis of the specific application of Google Earth intelligent system in road route selection design, this paper studies the implementation path of road route selection design based on Google Earth.

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