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Development Infrastructure Information Management System Based on API

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Abstract

With the continuous development of the world economy, people's demand for transportation is constantly increasing, and the scale of transportation infrastructure construction is increasing. For infrastructure construction enterprises, how to effectively manage infrastructure projects has become a challenge. In order to solve this problem using information technology, this article designs and develops an infrastructure information management system. Firstly, API technology is used to store and manage the spatial information of the system, and then JavaScript is used to develop network functions. Finally, the development of the system is achieved. This system can assist infrastructure construction enterprises in information management of ongoing projects, improve efficiency, and ensure construction safety.

Keywords

Information management system, infrastructure, API.

1. Introduction

In the context of the growing scale of transport infrastructure construction, the scale of construction enterprises is also growing. The infrastructure projects run by large construction enterprises at the same time have reached a scale of 100 billion, which is a huge challenge for the management of such a large number of complex projects. Traditional management information systems are built on the basis of databases, storing project attributes in the form of data tables, and then developing management information systems based on this. They can engage in information storage, query, modification, and other work. However, infrastructure projects are distributed around the world and have very obvious spatial attributes, and traditional management information systems cannot manage spatial information. Therefore, this article introduces GIS technology and uses API as a tool to manage spatial and attribute information of infrastructure projects, achieving better management of infrastructure projects.

2. Overall design of system

The system is generally composed of four layers of organization, including the data layer, service layer, network layer, and user layer from bottom to top. The data layer is used to store and manage various types of data used by the system, including spatial data used to describe the spatial location information of management objects, attribute data used to describe the feature information of management objects, and topological data used to describe the positional relationship between management objects. The service layer is composed of functional modules that complete various specific management functions of the system. It receives user instructions and calls data from the data layer to calculate and complete corresponding functions, such as map publishing, map operation, information addition and deletion, information query, information management, etc. The network layer is used for network communication of the system, including web servers and map servers; Web servers

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are used to publish websites and data, while map servers are used to publish maps. The user layer is the human-machine interaction layer implemented by end users, which mainly provides functions such as user interface (UI), data input and output (I/O), and visual display.

3. API

Due to the complex data structure, large amount of data, and difficulty in visual expression of electronic maps, especially vectorized maps, when using electronic maps as the base map of information systems, specialized GIS platform software is required to complete the work of drawing and publishing the base map. The engineering quantity is extremely large, and a large amount of configuration integration technology work is also required during system development, greatly improving the difficulty of system development. In response to this situation, many government agencies and enterprises have created map API tools, which integrate national electronic map base maps into a network API tool after one-time production. When third-party developers develop electronic map based information systems, they only need to call this map API to achieve shared open source electronic maps, thereby saving a lot of base map drawing and mapping time. Work processes and costs such as image publishing. The map API used in this study is Tiantu JavaScript API 4.0, a map API tool built by the National Basic Geographic Information Center. It is a set of application program interfaces that comply with the HTML5.0 specification, providing various map services and data in the form of HTML5.0, such as map display, annotation, positioning, etc., providing developers with a fast access to Tiantu online geographic information services, including rapid map creation Calling maps, POI searches, and adding overlays to maps can help developers build rich and interactive map applications on websites. It supports browser based map application development on PC and mobile devices, and mainstream HTML4.0 and HTML5.0 feature map development.

4. Function design

The detailed design of the infrastructure information management system mainly includes five parts: map API call, map browsing and operation, bridge information input and editing, bridge information query, and event management.

4.1. Call of Map API

The map API is the map provider of the system, therefore, calling the map API is the first step in the detailed design and development of the system. The Tianmap API supports multiple methods of calling, among which the implementation of Tianmap JavaScript API 4.0 requires two steps: first, applying for the usage service license (key) of Tianmap, and second, referencing the API to the page through the<script>tag in the page document.

4.2. Map browsing and operation

After the map API is called, in order to complete the browsing and operation of the map, it is necessary to first complete the loading of the map by creating map container elements, creating map instances, determining the longitude and latitude coordinates of the map center, and initializing the map. After the map is loaded, design browsing and operation functions such as zooming in, zooming out, panning, distance measurement, and area measurement for the map.

4.3. Input and editing of bridge information

Since the map API only provides basic map data and cannot provide thematic data of various industries, the bridge thematic information that needs to be managed by the bridge information visualization system must be input and edited separately in the later stage. Therefore, during the development of the system, the input and editing functions of bridge information need to be designed to ensure that the system can have the basis of thematic data.

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4.4. Query of Bridge Information

The basic function of information management is information query. In the bridge information visualization management system, information query can be divided into two ways. One is to query its attribute information by selecting the visual bridge object on the map; The second is to visually display the bridge objects that meet the query criteria on the map by inputting the query criteria, namely the "attribute check" and "attribute check" functions. Due to the introduction of the map API, all queries in this system are visualized on the map.

4.5. Event Management

Event management refers to the response of various corresponding events triggered by the system when users perform various operations on the map, thereby completing the commands issued by users for map operations. Through event management, the system achieves various management functions that users want to use.

4.6. Core code of system

```
< script type = "text/javascript" src = "http :
//api.tianditu.gov.cn/api?v=4.0&tk=Keystring"><
/script>
var map=new T.Map('mapDiv');
var lnglat = new T.LngLat(117.508 26，37.99458)
map.centerAndZoom(lnglat，12)
< input type = "button" id = "button1" onClick =
"map.zoomIn()" value="zoomin"/>
< input type = "button" id = "button2" onClick =
"map.zoomOut()" value="zoomout"/>
var points = [];
points.push(new T.LngLat(117.52136，37.52569));
points.push(new T.LngLat(117.521794，37.5268));
points.push(new T.LngLat(117.52969，37.52940));
points.push(new T.LngLat(117.35238，37.90520));
var polygon = new T.Polygon(points，{
color： "blue"， weight： 3， opacity： 0.5， fillColor：
"#FFFFFF"，fillOpacity：0.5});
map.addOverLay(polygon);
switch (parseInt(result.getResultType())){
 case 1：
 pois(result.getPois());
 break;
 case 2：
 statistics(result.getStatistics());
 break;
function addMapClick()
{
removeMapClick();
```

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```
map.addEventListener("click"， MapClick)；
}
```

5. Conclusion

The use of map APIs to develop infrastructure information management systems can achieve various management functions in a visual environment with maps as the user's main field of view and operation basis. Moreover, developers no longer need to draw basic vector maps, greatly reducing the initial workload of development. It is an effective technical approach to develop the infrastructure information management system using the Skymap JavaScript API 4.0, and the development results can provide good help for the information visualization management of infrastructure projects.

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