Design and Development of Auxiliary Decision-Making System for Equipment Support Based on GIS Display Technology

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Abstract: The equipment support decision-making system developed in this paper can complete application analysis and display through GIS views for several typical application scenarios, application modes and application tasks. Then, it determines the weak links in equipment support, and quickly generates equipment support strategies.

Keywords: auxiliary decision-making; application scenario; application mode; application task

1. Introduction

Equipment support quality directly affects the role of use effectiveness [1]. Therefore, it is of great significance to carry out equipment support reasonably so that the equipment and support system can be well coordinated and matched, thus maximizing the effectiveness of the support system.

At present, with the continuous improvement in informatization degree of science and technology, joint application systems that seamlessly connect land, sea, air, space, and electricity constantly appear [2]. As information gets increasingly complicated, there is higher and higher informatization requirement for equipment support and equipment support gets more and more difficult [3]. Only relying on a single, traditional, and empirical guarantee model is far from satisfying the current complex application model. Therefore, it is necessary to accurately and clearly judge the use situation, master the use environment, and provide auxiliary decision support for the timely and rapid formulation of support plans and the reasonable optimization of support forces [4-5].

This article mainly develops the equipment support auxiliary decision-making system to determine the weak links in equipment support, and quickly generates equipment support strategies to provide a more objective and accurate evaluation for the auxiliary decision-making in support plan, thus providing a scientific and reasonable basis for the selection of the support plan.

2. Overview of Auxiliary Decision-Making System for Equipment Support

The system integrates the organization of equipment support forces, and the algorithm for searching for weak links in equipment support capabilities. It can allow the input of variables such as application tasks, application environments, application modes, and support automatic generation of equipment support strategies through the overall construction level of equipment support capabilities, the analysis and determination of weak links in support capabilities. With integrated display, high-efficiency application, modularity and portability, it provides an integrated digital system for guiding the construction of equipment support capabilities and the rapid generation of equipment support strategies. The equipment support auxiliary system includes two modules: task analysis and GIS view:

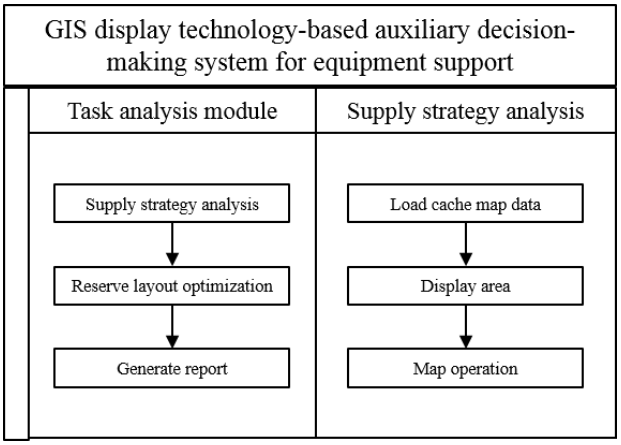

Figure 1. Flow chart of auxiliary decision-making system for equipment support

(1) The task analysis module can complete the guarantee model evaluation index system, model and algorithm, model optimization algorithm, guarantee weak link analysis algorithm, and guarantee strategy algorithm. Guarantee strategy reports and guarantee evaluation reports are generated based on custom report templates.

(2) The GIS view module is used to display GIS related information and display planned paths, supply and demand points, risk areas, etc. The view area can be displayed by loading the cache map data in offline mode,

and the user can zoom in and out of the map with the mouse, or perform operations such as map movement.

3. Functional Design of Auxiliary Decision-Making System for Equipment Support

3.1. Task Analysis Module Design

Functions include three functional pages: supply strategy analysis, reserve layout optimization, and calculation report.

3.1.1. Supply strategy analysis function

The supply strategy analysis page is mainly used to input the parameters of the supply and demand scheduling calculation, which allows the user to perform calculations based on the input and displays the calculation results.

3.1.2. Reserve layout optimization function

The reserve layout optimization function includes two sub-functions, namely storage expansion and new storage.

Storage expansion supports setting of alternative storage points and the maximum number of new warehouses. At the same time, location of the new warehouse and the unit cost of the new warehouse can be set.

3.1.3. Calculation report function

The design includes the report name, the calculation input and the planning result (planning path, cost and calculation time, etc.), and the result is saved as a word file.

3.2. GIS View Module Design

3.2.1. Load map data

Load cache map data in offline mode.

3.2.2. Target display

Display planned paths, supply and demand points, and risk areas.

3.2.3. Map operation

The design allows one to use the mouse to zoom in and out of the map, or perform operations such as map movement.

4. Application of Auxiliary Decision-Making System for Equipment Support

4.1. Analyze the Supply Strategy

The supply strategy analysis page is mainly used to input the parameters of the supply and demand scheduling calculation, which allows the user to perform calculations based on the input and displays the calculation results. Where, the page contains the supply point list, demand point list, risk area list, model selection and supply strategy analysis buttons from top to bottom.

4.2. Reserve Layout Optimization

As shown in the figure below, the user can select the storage point to be expanded from the list and set different unit expansion costs.

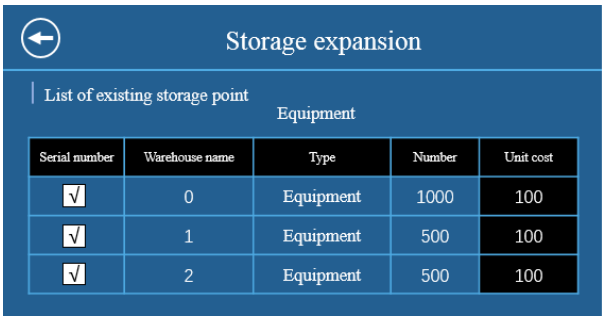

Figure 2. Storage expansion

As shown in the figure below, the user can select the location of the warehouse to be built in the alternative list and set the unit cost for building the new warehouse according to the needs.

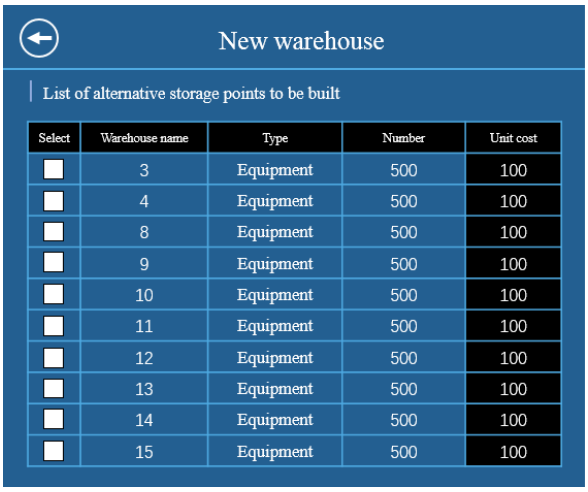

Figure 3. New warehouse

4.3. Report Export

The user can export the scheme through the "Export Report" button according to needs and save it as a world file.

Figure 4. Report export

4.4. GIS View

As shown in the figure below, the planned route, supply and demand points, risk areas, etc. can be displayed. The view area can be displayed by loading the cache map data in offline mode. The user can zoom in and out of the map with the mouse, or perform operations such as map movement.

Figure 5. GIS view area

5. Conclusion

This article describes the development of equipment support decision-making system based on GIS display technology. The system integrates equipment support configuration and algorithm for searching for weak links in equipment support capabilities. It can allow the input of variables such as application tasks, application environments, application modes, and support automatic generation of equipment support strategies through the overall construction level of equipment support capabilities, the analysis and determination of weak links in support capabilities. With integrated display, high-efficiency application, modularity and portability, it provides an integrated digital system for guiding the construction of equipment support capabilities and the rapid generation of equipment support strategies.

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