RAILWAY DISPATCHING AND TRANSPORTATION INTELLIGENT SYSTEM

Field of the Invention

The present invention relates to the field of railway dispatching and transportation technology, specifically a railway dispatching and transportation intelligent system.

Background to the Invention

The railway dispatching and transportation system mainly relies on manual dispatching and empirical judgment, which makes it difficult to cope with complex and changing transportation demands and emergencies. With the rapid development of information technology, especially the widespread application of technologies such as big data, artificial intelligence, and the Internet of Things, building a railway dispatch and transportation intelligent system that can collect real-time data, intelligently analyze and predict, and dynamically adjust dispatch plans has become an inevitable trend in the industry's development;

The patent announcement number CN103208055B discloses a railway transportation logistics intelligent dispatching system and its vehicle position tracking method, which is implemented through an industrial railway vehicle position tracking algorithm in software form. The industrial railway vehicle position tracking algorithm is implemented in the logistics management server. The above invention can track the vehicle position during the industrial railway transportation process, but although it can track the vehicle position during the transportation process, it cannot accurately predict the actual situation of train operation and adjust the train operation plan based on demand changes. Therefore, it is urgent to provide a railway dispatching and transportation intelligent system.

Statement of Invention

The purpose of this section is to outline some aspects of the embodiments of the present invention and briefly introduce some preferred embodiments. Simplification or omission

may be made in this section, as well as in the abstract and title of the present application, to avoid blurring the purpose of this section, abstract, and title, and such simplification or omission cannot be used to limit the scope of the present invention.

Therefore, the purpose of the present invention is to provide a railway dispatching and transportation intelligent system, which can monitor the status of each train, track, and station in real time through the intelligent system, and dynamically adjust the dispatching strategy according to transportation demand and real-time data, effectively reducing empty load or resource waste, ensuring that each train can operate under optimal conditions, and through intelligent dispatching and path planning, the system can avoid congestion between trains, adjust the speed, stopping stations, and time of trains in real time, thereby reducing traffic bottlenecks and improving transportation efficiency.

To solve the above technical problems, according to one aspect of the present invention, the present invention provides the following technical solution:

A railway dispatching and transportation intelligent system, comprising:

Cloud processing unit, as the processing and execution end of the system, receives data information transmitted by subordinate units and controls the work of subordinate units;

Blockchain fusion unit, connected to the cloud processing unit, is used to execute the combination of blockchain technology and smart contracts to create a transparent and traceable global dispatching system, ensuring that train dispatching, cargo transfer, and track maintenance operations are all recorded on the blockchain, ensuring the security and transparency of information;

dispatching optimization unit, connected to the blockchain fusion unit, is used to execute railway dispatching problems processed in real-time through quantum computing methods, ensuring optimal dispatching, resource allocation, and path planning under large-scale datasets;

Prediction unit, connected to the cloud processing unit, is used to perform real-time monitoring of the health status of trains and tracks through integrated big data analysis, IoT devices, and sensors, predict the likelihood of faults occurring based on the data and

implements local self repair using the system;

Multi dimensional demand unit, connected to the dispatching optimization unit, is used to perform dynamic prediction through machine learning models by combining user demand, weather forecast, and holiday multidimensional data, and to adjust the dispatching of future transportation demand;

Communication and collaboration unit, connected to cloud processing unit, is used to perform real-time communication and collaboration between different systems, support multi-party collaborative operations, ensure seamless connection between trains, stations, and dispatch centers, and timely transmit dispatch information.

As a preferred solution of the railway dispatching and transportation intelligent system described in the present invention, wherein: the cloud processing unit is equipped with an adaptive module, which is used to execute deep learning and reinforcement learning algorithms, continuously self optimize based on historical data and real-time information, and automatically adjust the dispatching strategy, making adaptive adjustments in different environments and abnormal situations.

As a preferred solution of the railway dispatching and transportation intelligent system described in the present invention, wherein: the dispatching optimization unit is equipped with a collaborative dispatching module, which utilizes unmanned driving technology and intelligent communication technology to enable autonomous collaboration among train groups, achieve cluster dispatching, determine optimal driving strategies, and ensure the safety and smoothness of train workshops.

As a preferred solution of the railway dispatching and transportation intelligent system described in the present invention, wherein: the dispatching optimization unit is connected to the route planning module, which is used to dynamically plan the optimal route based on real-time traffic conditions and historical data, reducing transportation time and costs.

As a preferred solution of the railway dispatching and transportation intelligent system described in the present invention, wherein: the cloud processing unit is connected to a virtual unit, which is used to construct a panoramic railway dispatch simulation

environment through VR and AR technology, helping dispatchers to conduct real-time dispatch training and decision simulation, experience the dispatch decision-making process in different scenarios, and improve the accuracy and response speed of decisions.

Compared with existing technologies, the present invention has the following beneficial effects:

1. Improve transportation efficiency:

Optimize resource allocation: Intelligent systems can monitor the status of various trains, tracks, and stations in real time, and dynamically adjust scheduling strategies based on transportation demand and real-time data, effectively reducing empty loads or resource waste, ensuring that each train can operate under optimal conditions;

Reduce congestion and delays: Through intelligent scheduling and path planning, the system can avoid congestion between trains, adjust the train's speed, parking stations, and time in real time, thereby reducing traffic bottlenecks and improving transportation efficiency;

2. Enhance security:

Intelligent warning and fault detection: The system can monitor the operation status of trains, tracks, and equipment in real time through IoT sensors, data analysis, and machine learning technology, detect potential faults or dangers in advance, such as equipment aging, track cracks, etc., and perform timely maintenance and adjustment to reduce the occurrence of accidents;

Automated control: Automated train control systems can reduce human errors, ensure safe distances between trains, and automatically take emergency measures in case of abnormal situations;

3. Enhance flexibility and adaptability:

Dealing with emergencies: Intelligent systems can quickly respond to emergencies such as severe weather, equipment failures, traffic accidents, etc., readjust scheduling plans, and ensure the continuity and reliability of railway transportation;

Flexible scheduling capability: The system can dynamically adjust transportation plans based on market demand, holidays, and other factors to ensure the maximum utilization of transportation resources.

Brief Description of the Drawings

In order to more clearly illustrate the technical solution of the embodiments of the present invention, the present invention will be described in detail below in conjunction with the accompanying drawings and detailed embodiments. It is obvious that the accompanying drawings described below are only some embodiments of the present invention. For those skilled in the art, other drawings can be obtained based on these drawings without creative labor. Among them:

FIG. 1 is a system architecture diagram of the present invention;

FIG. 2 is an extended diagram of the system shown in FIG. 1 of the present invention.

Detailed Description

In order to make the above objectives, features, and advantages of the present invention more obvious and understandable, the specific embodiments of the present invention will be described in detail below in conjunction with the accompanying drawings.

In the following description, many specific details are elaborated to facilitate a full understanding of the present invention. However, the present invention can also be implemented in other ways different from those described herein. Those skilled in the art can make similar generalizations without violating the connotation of the present invention. Therefore, the present invention is not limited by the specific embodiments disclosed below.

Secondly, the present invention will be described in detail in conjunction with the schematic diagram. When describing the embodiments of the present invention, for ease of explanation, the cross-sectional view representing the device structure will not be enlarged to a general scale, and the schematic diagram is only an example, which should not limit

the scope of protection of the present invention. In addition, in actual production, the three-dimensional spatial dimensions of length, width, and depth should be included.

In order to clarify the purpose, technical solution, and advantages of the present invention, the embodiments of the present invention will be further described in detail with reference to the accompanying drawings.

The present invention provides a railway dispatching and transportation intelligent system, which can monitor the operation status of trains, tracks, and equipment in real time through IoT sensors, data analysis, and machine learning technology through intelligent warning and fault detection. It can detect potential faults or dangers in advance, such as equipment aging, track cracks, etc., and carry out timely maintenance and adjustment to reduce the occurrence of accidents. Please refer to FIG. 1-2, which includes the following units:

Cloud processing unit, as the processing and execution end of the system, receives data information transmitted by subordinate units and controls the work of subordinate units;

Blockchain fusion unit, connected to the cloud processing unit, is used to execute the combination of blockchain technology and smart contracts to create a transparent and traceable global dispatching system, ensuring that train dispatching, cargo transfer, and track maintenance operations are all recorded on the blockchain, ensuring the security and transparency of information;

Dispatching optimization unit, connected to the blockchain fusion unit, is used to execute railway dispatching problems processed in real-time through quantum computing methods, ensuring optimal dispatching, resource allocation, and path planning under large-scale datasets;

Prediction unit, connected to the cloud processing unit, is used to perform real-time monitoring of the health status of trains and tracks through integrated big data analysis, IoT devices, and sensors, predict the likelihood of faults occurring based on the data and implements local self repair using the system;

Multi dimensional demand unit, connected to the dispatching optimization unit, is used to perform dynamic prediction through machine learning models by combining user demand,

weather forecast, and holiday multidimensional data, and to adjust the dispatching of future transportation demand;

Communication and collaboration unit, connected to cloud processing unit, is used to perform real-time communication and collaboration between different systems, support multi-party collaborative operations, ensure seamless connection between trains, stations, and dispatch centers, and timely transmit dispatch information.

The cloud processing unit is equipped with an adaptive module, which is used to execute deep learning and reinforcement learning algorithms, continuously self optimize based on historical data and real-time information, and automatically adjust the dispatching strategy, making adaptive adjustments in different environments and abnormal situations.

The dispatching optimization unit is equipped with a collaborative dispatching module, which utilizes unmanned driving technology and intelligent communication technology to enable autonomous collaboration among train groups, achieve cluster dispatching, determine optimal driving strategies, and ensure the safety and smoothness of train workshops.

The dispatching optimization unit is connected to the route planning module, which is used to dynamically plan the optimal route based on real-time traffic conditions and historical data, reducing transportation time and costs.

The cloud processing unit is connected to a virtual unit, which is used to construct a panoramic railway dispatch simulation environment through VR and AR technology, helping dispatchers to conduct real-time dispatch training and decision simulation, experience the dispatch decision-making process in different scenarios, and improve the accuracy and response speed of decisions.

Working principle: When the invention is in use, which can monitor the status of each train, track, and station in real time through the intelligent system, and dynamically adjust the dispatching strategy according to transportation demand and real-time data, effectively reducing empty load or resource waste, ensuring that each train can operate under optimal conditions, and through intelligent dispatching and path planning, the system can avoid

congestion between trains, adjust the speed, stopping stations, and time of trains in real time, thereby reducing traffic bottlenecks and improving transportation efficiency.

Although the present invention has been described with reference to embodiments in the preceding text, various improvements can be made and components can be replaced with equivalents without departing from the scope of the present invention. Especially, as long as there is no structural conflict, the various features disclosed in the embodiments of the present invention can be combined with each other in any way. The lack of exhaustive description of these combinations in this specification is only for the sake of omitting space and saving resources. Therefore, the present invention is not limited to the specific embodiments disclosed herein, but includes all technical solutions falling within the scope of the claims.