Intelligent logistics vehicle transportation informatization scheme design

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Abstract. With the rapid development of modern intelligent logistics, traditional logistics enterprises are facing the development trend of informatization and intelligentization, and it is urgent to carry out informatization construction in the management of vehicle transportation. This article starts from the perspective of vehicle transportation informatization and divides the intelligent logistics vehicle transportation informatization plan into command A total of four modules, including the personnel module, the transport vehicle module, the driver module, and the basic service module, are designed as a whole to complete the real-time collection, processing and transmission of various parameters of the vehicle during the driving process, so as to control the vehicle in real time for the commander and the driver Status provides visual information; under all-weather conditions, real-time collection of vehicle status information and road condition video information, providing service guarantees and warning information for drivers to grasp vehicle and road condition information in real time, and real-time grasp of the stability of the cargo; complete the vehicle driving process The collection, processing and transmission of driver status information; including BeiDou positioning and timing services, geographic information mapping services, security resource services, and various information interaction services.

1. Introduction
With the rapid development of science and technology, the application of a large number of new technologies such as big data, artificial intelligence, radio frequency identification, global positioning, etc., is a brand-new challenge and revolution for logistics enterprises, and traditional logistics and transportation are gradually becoming informatized and intelligent. Only by continuously using new technologies for intelligent processing, intelligent management, and safety management, logistics enterprises can continuously improve product quality and reduce production costs as much as possible to remain invincible in the future logistics industry.

In the link of modern intelligent logistics management, vehicle transportation management is undoubtedly a key link, which directly determines the success or failure of the final product delivery.
and the final completion of the transaction[1]. Today, with the rapid development of new technologies, it is imperative to integrate visualization, real-time situational awareness, route assistance, driving assistance, cargo dynamic monitoring and other technologies into the entire process of vehicle transportation. This article aims to explore the informatization and intelligentization of traditional logistics vehicle transportation through a package of information technology design, so as to provide reference and reference for modern logistics enterprises' vehicle transportation management.

2. Informatization plan conception

2.1. Distinguish module
The distinguishing module is mainly divided into four modules for design, the commander module, the transport vehicle module, the driver module, and the basic service module. Through the scheme design, it mainly completes the real-time collection, processing and transmission of various parameters of the vehicle during the driving process, and provides visual information for the commander and driver to control the state of the vehicle in real time[2]. When an abnormal situation occurs, an alarm message is issued.

2.2. Technology Architecture
The technical architecture of the intelligent solution includes application layer, service layer and resource layer, as shown in Figure 1.

![Figure 1 Technical architecture diagram](image)

The resource layer provides technical elements for guaranteeing resources such as computing storage, communication networks, security and confidentiality, time and space benchmarks, and basic data, and provides basic support for system interconnection and various resource management and regulation. Based on the elements of the resource layer, the service layer provides authorization authentication, information subscription, information transmission, data maintenance, location services, timing services, communication services, confidential services, etc., and provides various information and service support for the application layer. The application layer is the commander module, transporter module and driver module constructed under various specific scenarios.

3. Commander module design
On the basis of transport vehicles with command function (fleet captain), develop and install additional command assistance decision-making, vehicle and driver status monitoring and warning, vehicle positioning and sequence monitoring, plan making and route planning. The software is configured in the vehicle-mounted terminal for use during driving; it can also be configured with a logistics enterprise commander's office for pre-transport planning, and is hinged with the Beidou unit to grasp the status of vehicles in transit in real time.
3.1. Command module vehicle terminal
In the command module, it can be expanded to two command positions, namely the main and deputy commanders, according to the task volume. The device configuration mode is the separation of the host and the touch display. The host is located in the cabinet and the touch display is located in the front of the seat, as shown in Figure 2.

Figure 2 Command module touch display reference diagram

3.2. Vehicle condition, road condition, human condition and cargo condition monitoring alarm
Receive the driving speed, mileage, fuel volume, temperature and positioning information of each transport vehicle in real time. It is displayed in the form of a table on the terminal display interface of the commander module, and the commander can consult according to needs, which is convenient for grasping the driving status of each transportation vehicle[3]. When a vehicle parameter alarm occurs, you can check the linkage status. The timing and positioning information of each transportation vehicle is provided by the Beidou module of the basic service sub-system, and the positioning information is reported to the command module to facilitate the command module situation plotting; the timing information is used by the time system of each vehicle.

3.3. Driving condition monitoring and warning
Through the image acquisition and processing method, the collected fatigue driving warning information of each transportation vehicle driver is reported to the command module in real time. The commander reads the driver's video information as needed.

3.4. Cargo monitoring alarm
Through ad hoc network communication or Beidou communication, real-time receiving alarm information of cargo displacement reported by each transport vehicle. The warning information of each vehicle is displayed on the display interface of the vehicle terminal, and a prompt sound is issued to the driver. After receiving the alarm information, you can choose to view the relevant elements of the linkage display. By plotting the deployment information of their own resources on the electronic map in real time, the commander can be provided with information such as the positioning and sequence interval of each vehicle during driving.

3.5. Command module assisted driving
The transport vehicle with command function (fleet captain) is equipped with front-view, side-view and rear-view video modules, and the video collection information of each channel is sent to the video processing module. After processing, it can be used by the driver for observation while driving. On the other hand, sent to the lower computer for storage and recording, as shown in Figure 3.

Figure 3 Schematic diagram of command module auxiliary driving unit structure

3.6. Transportation route assistance planning
The road transportation plan mainly involves factors such as the reasonable configuration of transportation vehicles, the reasonable stowage of transportation equipment and the reasonable selection of road transportation routes. Comprehensive consideration of transportation capacity,
capacity and routes is the main basis for balancing transportation capacity and transportation volume, and is the utilization of transportation capacity. The degree plan mainly considers the following factors: arrange the starting and ending time of vehicle operation, marching routes, loading and unloading locations, and transportation volume to be completed in calendar order; vehicle utilization efficiency index requirements; cargo source survey implementation status; cargo loading and unloading site and loading and unloading capacity investigation; road obstruction and road network development; recent weather forecast; vehicle maintenance and repair capabilities; driver and passenger staffing, etc.

4. Modular design of transport vehicle
The transportation vehicle module design mainly includes the transportation vehicle driving state information collection design, vehicle assisted driving design (including the driver state recognition design of the driver module), abnormal situation warning and reporting design, information processing display transmission design, etc.

4.1. Information collection of transport vehicle driving status
The collected state information during the driving process of the vehicle mainly includes: vehicle speed, mileage, fuel volume, temperature (axle temperature and engine) and positioning information. Connect the data acquisition circuit with the signal generation circuit on the vehicle to directly collect data. The block diagram of the acquisition principle is shown in Figure 4.

![Figure 4 Schematic diagram of vehicle instrument information collection](image)

4.2. Cargo Displacement Monitoring of Transport Vehicle Module
A displacement monitoring component is installed on the beam below the gooseneck of the trailer to monitor the displacement of the cargo carried by the transporter.

5. Driver module design
The driver module is mainly designed to collect and identify the driver's status, carry out driving warning, and expand the design of the driver's night vision function and the design of the wireless access network handheld terminal. The driver status monitoring terminal is installed above the A-pillar on the left side of the driver. Through real-time collection of driver's facial image information, image comparison processing and analysis, the condition monitoring terminal adopts wired connection, and the cable runs along the A-pillar to the instrument panel, and enters the vehicle terminal host of the equipment cabinet along the inside of the instrument panel.

5.1. Driver identification
Before starting to drive or when the driver leaves the monitoring screen and then returns, take the initiative to capture the driver's frontal photos at the set interval and send them to the vehicle terminal for identification through the serial port.

5.2. Fatigue driving warning
When the vehicle is driving, if the vehicle speed is greater than the set speed threshold, if the driver’s eyes are detected abnormally and continuously closed by means of driving time counting and face monitoring, an alarm will be generated, and a voice warning will be given at the same time (don’t drive with fatigue), and upload The alarm information is sent to the vehicle terminal and reported to the command vehicle.
5.3. Distracted driving warning
When the vehicle is running, if the vehicle speed is greater than the set speed threshold, the facial monitoring method detects that the driver lowers his head, turns his head, and looks left and right, then an alarm will be generated and a voice warning will be given (please correct driving posture).

5.4. Call alert
When the vehicle is running, if the vehicle speed is greater than the set speed threshold, if the driver's call gesture is detected through gesture monitoring, an alarm will be generated, and a voice alert will be given at the same time (do not make a call).

5.5. Driver night vision function
The night vision function is mainly used for scenes such as night cargo loading and unloading, vehicle maintenance, refueling, and leaving the vehicle to perform road condition survey tasks, as shown in Figure 5.

![Figure 5 The night vision function is used for vehicle maintenance, loading and unloading, etc.](image)

6. Basic service module design
Basic service modules include various types of information transmission, vehicle positioning and timing, confidential communication services, etc., which are respectively configured in the commander module, transport vehicle module and driver module[4].

6.1. Wireless networking technology architecture
The wireless networking design is based on SDR's modular hardware platform and software platform technical architecture, as shown in Figure 6. The hardware platform is composed of multiple modules such as the main control board, baseband processing board, wireless interconnection processing board, radio frequency processing board, integrated switching board and service adapter board. The software platform is composed of the physical layer, data link layer, network layer and application layer.

![Figure 6 Schematic diagram of modular hardware platform design based on SDR](image)

6.2. Beidou Communication Design
Realize the transmission of short message data, positioning timing data and voice information between the transport vehicle with command function (fleet leader) and each transport vehicle, commander and
As shown in Figure 7. In the integration design, integrate Beidou-1 transceiver RF chip, 10W power amplifier circuit, low-noise amplifier circuit and RDSS baseband chip to realize short message communication and two-way positioning function; integrate Beidou and GPS dual-mode navigation positioning module and RNSS baseband chip, realize positioning timing function.

Figure 7 Schematic diagram of Beidou communication interconnection

In practical applications, considering the immediacy, specificity, and authenticity of short messages, Beidou voice transmission can be realized through voice codec transmission[5]. The implementation principle is shown in Figure 8.

Figure 8 Schematic diagram of Beidou short message voice sending and receiving

7. Conclusions

This solution uses wireless networking and Beidou communication methods to realize information interaction among members of the system. In view of the characteristics of divergence and uncertainty of information, it is inevitable that information leakage will occur. It is necessary to embed a security module in the communication end-to-end to ensure the security of the transmitted information. Confidentiality module needs to go to relevant national departments to assist in applying, and then do adaptive integration. It is installed by combining KDC and TF card, and the key is injected by the key gun.

Based on work experience and practical research, the author has carried out an informatization scheme design for modern intelligent logistics vehicle transportation. By distinguishing the commander module, driver module, transport vehicle module, and basic service module, the intelligent and information technology is applied to traditional logistics. In enterprises, in order to increase the overall process management of logistics and transportation, improve transportation safety and quality and efficiency, it has played a key role in the transportation of intelligent logistics vehicles, and has carried out theoretical and practical exploration and research. In the future, intelligent logistics vehicle transportation informatization is imperative, let us wait and see.

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