

## Design of GPS-based Intelligent Logistics Management System

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**Abstract.** The GPS system is in order to the logistics and transport process. Customers through the GPS system can real-time understanding of the goods in transit, and projections to reach the destination time. GPS can provide the vehicle location, security, anti-robbery, driving the route monitoring and call conductor. To achieve all of the above features must have the three elements of the GPS terminal, transmission network and monitoring platform. Intelligent logistics management system goal is precisely for large and medium-sized logistics enterprises a set of functional, practical and intelligent logistics solutions for the rapid response capability. The paper puts forward the design of GPS-based intelligent logistics management system.

### Introduction

With the surging domestic economy, was born in the logistics industry is also the rapid development of the city's atmosphere and in the last five years has been rapid development. Logistics industry in people's lives as a middleman in the city used a convenient way to bring people a pleasure. As a result, which can not be seen, the core of the logistics industry is immediately to complete the transport of goods quickly and safely. Then the entire car's performance and security are particularly important. Therefore, in contemporary logistics industry, GPS technology is very important in today's society, the Logistics Vehicle GPS positioning products will help modern logistics technology.

Logistics industry, covering vast territory, many vehicles, information, regional and line monitoring requirements outstanding work closely with the shipping documents and cargo security requirements, the system response requires a flexible, timely and user needs the information of location-based services multi, degree of data sharing requirements, the need to improve the vehicle of a unified information management [1]. Bypass the same time, logistics and transport vehicles driving private pull goods, failure analysis, cargo theft and reduce no-load rate can be effective regulation. Market demand for the logistics industry, logistics and transport vehicles, GPS intelligent management platform sets global satellite positioning system (GPS), geographic information system (GIS), mobile communication systems (GSM, GPRS) in one, by the software and hardware integrated system; and the company offers a professional car digital video recording system can be more perfect the management of logistics and transport vehicles.

ILM (Intelligent Logistic Manager) is a new online business logistics management solutions based on Internet technology. The rapid development of Internet, the enterprise management capabilities and management requirements be expanded to provide each client with personalized manufacturing, service has become a reality. E-commerce enterprises business ideas and management style to a fundamental change. Greater to meet customer needs and reduce operating costs, the dual pressures of the transport industry is through investment in technology to fight for a sustainable return. The ILM goal is for large and medium-sized logistics enterprises to provide a set of functional, practical and intelligent logistics solutions with a rapid response capacity to bring significant, sustained impact on the operation of the entire enterprise.

As the first fully established in the cutting-edge network applications (web application) on the basis of logistics management software, ILM has a Client / server architecture is difficult to compare the advantages. ILM to combine the specific operational procedures of the logistics enterprises, the company's main business of network management in support of functional modules: ILM for more

than 100 logistics and transport companies to provide them with personalized solutions tailored. The system uses open XML standards to connect has a good scalability, to ensure integration with related applications in different environments.

With the development of information technology and the market economy, the rapidly changing market environment, supply chain often need to follow to make appropriate adjustments, the logistics system should be able to adjust in order to support the integration of supply chain management and control. To take full advantage of the enterprise both professional logistics services, to achieve optimal allocation of resources and improve the comprehensive strength. The application of GPS technology is for the logistics industry benefit. GPS system on one of the greatest contribution of the logistics industry is in order to achieve control of the logistics and transport process. Goods in transit, and projected to reach destinations in time to solve the traditional logistics "goods to issue one, what do not know" through the system, customers can immediately understand. The paper puts forward the design of GPS-based intelligent logistics management system.

### Intelligent Logistics Management solution

ILM to provide users with order of key items (such as shippers, destination, commodity, order types, order priority, etc.) to sort, classify and summarize the details of the means of transport status query intelligence support to help complete the orders of the sub-management and scheduling the production of the single. These intelligent supports for the operator to reduce reliance on customers and fleet specific information memory, increase speed and accuracy of order entry, to improve the efficiency of the order sub-management and scheduling orders prepared [2]. Scheduling system to real-time network communication to the warehouse, transportation companies and other multi-released dispatch instructions, scheduling instructions can information quickly and easily pass? Can be made local readiness, the scheduling system to deal with unexpected events (such as the vehicle difficult for warehouse stocking and transportation companies, etc.), the second scheduling, improve efficiency; reduce losses and timely feedback to the dispatch center via the Internet terminal.

Transport tracking module transportation companies via the Internet, and regularly report to the dispatch center on the latest vehicles in transit, including vehicle location, road (sea) situation, weather conditions, cargo conditions, oil and so on. The dispatch center can be pooling vehicles in-transit information to provide customers with the latest order status inquiry services, update the estimated time of arrival. ILM can be connected according to customer needs with the most advanced access to the communication system to realize the true sense of the real-time information exchange, play a great performance of the logistics software, to further improve fleet productivity, improve customer service.

The inventory management module is the same as all of the warehouse system; the ILM inventory management helps the enterprise warehouse management of inventory in storage, a library, mobile, and inventory operations, comprehensive control and management. Inventory management from different angles of the categories, materials, cargo space, lot, single-Date, ABC classification to manage the number of inventory items, inventory cost and the amount of funds used, so that users can understand and control all aspects of business inventories accurate and the data [3]. ILM designed to facilitate web-based remote access of distributed warehouses, and easy to complete the task of scheduling as well as commodity out of storage of information transmission, as is shown by equation1.

$$\begin{aligned} X(m+1) &:= [x^T(m+1,1), x^T(m+1,2), \dots, x^T(m+1,M)]^T \\ &:= [x^T(mM+1), x^T(mM+2), \dots, x^T(mM+M)]^T \end{aligned} \quad (1)$$

The financial settlement module of ILM financial settlement module is responsible for logistics and a variety of settlement costs (freight, and various kinds of fees). Where freight is the main business is income of the logistics enterprises. Its settlement with according to company specific

business needs custom rate system based on automatically by the system in accordance with orders, scheduling single calculation. Rate system can use a number of key items (customers, transport companies, the mode of transport, destination, departure, etc.) only determine the rate. With the appropriate user permissions set by the rate of maintenance, the sales price of the logistics enterprises can effectively manage and control. At the same time, ILM introduced the rates the concept of family: the combination of enterprises of different billing methods, extracting one or more key building rates family. For example, a client transports company together as a rate family. Rate family as a whole, maintenance, it is greatly reducing the workload of routine maintenance. The rate of family flexible design can help companies more easily development partners, to expand the business space, and introduce a new pricing policy.

Analysis and decision-making module of ILM powerful reporting and analysis capabilities to decision makers at all levels can see the results of the analysis of their respective concern, to help them better manage and control the business of logistics enterprises [4]. Mainly to provide an analysis of information: not scheduled orders, goods in transit, outstanding orders (by customers or transportation company), the transport company load, transport, mass-loss orders, inventory status, as is shown by equation2.

$$\|g(x, y) - f(x, y)\| \geq \|P^j f(x, y) - f(x, y)\| \quad (2)$$

Logistics management system based on Internet technology, transport enterprises to create a new exchange of information without geographical, time and computer constraints, sharing and collaboration. As a result of the use of logistics management information system within the enterprise, so as to achieve smooth business flow, logistics, capital flow, information flow. Enterprise operational data using information systems technology, and thus become more accurate, timely, it is comprehensive and informative. The same time, the logistics management information system can achieve all kinds of information to further processing, to provide a sufficient basis for the production of corporate leadership, business decisions, to enable them to better grasp the business opportunities, and create more opportunities for development, as is shown by figure1.

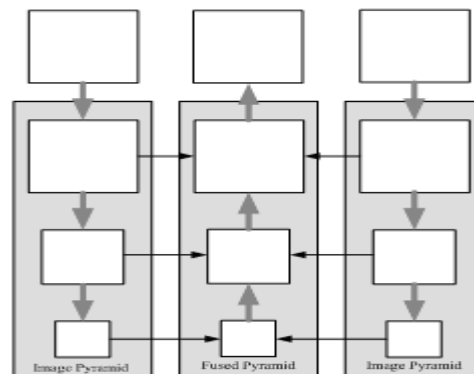


Figure. 1 Intelligent Logistics Management solution example

ILM by a series of components and structures in the implementation of the system, it is according to the specific circumstances of the enterprise. For most of the common part, ILM provides a set of high-quality components, to be constructed in the implementation of the personality. Between components is a loose structure, the replacement of a component does not affect the other components, which solves the problem of corporate personalized [5]. Due to the use of standardized EJB components, the system can be well connected to the system with other standards-compliant components constructed to avoid the problems caused by the system island. Security in the security design of any system user login name and password can not access the system per capita, while each system users are granted appropriate permissions; you can not access any unauthorized information. So as to ensure maximum system security.

Transportation management subsystem: all transport resources, including its own vehicles and collaboration vehicles and temporary vehicles to implement real-time scheduling, analysis of the goods, loading calculations, as well as the choice of the best transport routes. Including the vehicle management, carrier management, transportation, task management, transportation, job scheduling, transportation, tracking, it is receipt management, loading and unloading operations and other functions. Balance sheet management subsystem: the contract price one-stop management of all the logistics services, including multiple modes of warehouse rental costs, transportation costs, handling costs and other costs are calculated according to the specifications of the contract text, monetary standards, charges automatically generate the invoices., as is shown by equation3.

$$\left(\bar{P}^{(\alpha)}(1, s)\right)^{-1} = \left(\bar{P}^{(\alpha)}(1, s-1)\right)^{-1} + \Psi^T(1, s)\bar{R}^{-1}(1, s)\Psi(1, s) \quad (3)$$

Material Code management and use of object-oriented design, all the materials to consider a unified set aside behind the material definition of the attribute level, the original material properties of the encoded serial coding system changed the system of parallel coding, and the establishment of its material encoding library through the property to facilitate any adjustment on the properties of various types of materials. Materials procurement and management, purchase, plan declaration, approval, development, query the appropriate procurement plans, inventory analysis, frame analysis, tender bundle procurement channels analysis [6]. The subscription plan reporting, approval, procurement planning, approval, procurement method to determine the inventory analysis, procurement task allocation, shortage declaration, shortages decision analysis, wireless approval.

Contract management, including management of the contract the two types, one is the order contracts concluded with suppliers, the other is a supply contract signed with the needs of customers, cash flow corresponding to the payable and receivable. Main contract information entry, audit, preparation of contracts received payment plans, contract change, suspend, and archiving, query statistics, and according to the contract for material distribution and acceptance.

### Design of GPS-based intelligent logistics management system

GPS can not only improve work efficiency, and reduce fuel consumption costs. It is the default transport route in-transit information data package sent back to the monitoring center, customers sitting at home will be able to real-time monitoring of their goods, offset default line emergency alarm If it is found on the electronic map. It has strong anti-theft anti-robbery function. Encounter robbers, the driver simply press the alarm switch, the center will be promptly entered Alarming state; drivers via mobile phone vehicle off the oil treatment, forcing the robber to give up the robbery plan to ensure the safety of persons and property. Moreover, the GPS speed limit reminder function, can effectively improve the driver's driving security, the maximum possible reduction in vehicle accident rates, a puncture rate, easy to dispatch personnel management. The occurrence of the entire record of the travel path, to pull the private living situation is a logistics management drivers is a good helper.

Logistics Vehicle GPS positioning system, we can guarantee to do the monitoring and management platform, we can see every detail of each data for each shipment, this series has identity, norms, processes, clear displayed in front of us. GPS vehicle monitoring and management system, a set of global satellite positioning system (GPS), Geographic Information System (GIS) and wireless communication technologies in one integrated system of hardware and software, centralized management and monitoring of dispatch and command of logistics vehicles, with of vehicle location, speed monitoring, mileage and driving, parking state statistics, burglar alarm and other functions. GPS can provide the vehicle location, security, anti-robbery, driving the route monitoring and call conductor. To achieve all of the above features must have the three elements of the GPS terminal, transmission network and monitoring platform is defined as equation 4.

$$\begin{aligned}
 P^{(\lambda)}(m+1|m) &= \Phi(m)P^{(\lambda)}(m, M)\Phi^T(m) + \bar{Q}(m) \\
 &= \Phi(m)P^{(\alpha)}(m, M)\Phi^T(m) + \bar{Q}(m) \\
 &= P^{(\alpha)}(m+1|m)
 \end{aligned} \tag{4}$$

GPS navigation system, satellite part of the role is to continue to launch the navigation message. However, due to user acceptance machine clock and satellite space borne clock may not always synchronized, so in addition to the user's three-dimensional coordinates  $x$ ,  $y$ , and  $z$ , the time difference but also the introduction of a  $\Delta t$  satellite receiver as unknown, solution out of these four equations for four unknown. So if you want to know the location of the receiver to be able to receive at least four satellite signals.

GPS monitoring platform in real time on the logistics vehicle positioning, real-time location of the vehicle at the same time, we can understand the speed of vehicles through GPS monitoring platform, logistics vehicles beyond a certain speed, the system will alarm [7]. GPS vehicle management system also has the function of the parking management, logistics vehicles in transit, can not be suspended for too long, otherwise it will affect a normal speed of logistics through the GPS system platform can be very clear that the vehicle's parking time, as is shown by equation5.

$$\{2^j \Phi_j(x - 2^j k_1, x - 2^j k_1)\}, \quad k_1, k_2 \in \mathbb{Z}^2 \tag{5}$$

GPS vehicle management systems, vehicle management experts, it also has the powerful features of the electronic fence, that is, if this driving range is exceeded, the system will alarm. In addition, through the GPS satellite positioning system; also contribute to the normal scheduling of logistics vehicles. The status and location of the vehicle, you can call handle and scheduling screen text and voice dispatch, thus speeding up the operation of the logistics vehicle level, and comprehensively improve the management of the Logistics Vehicle GPS positioning. Windows XP operating system using Visual C#.net is used to achieve the above GPS-based intelligent logistics management. For randomly generated sets, the relationship between the probabilities of 85%, we do the extended test, the number of objects in increments of 41, recorded by the sub-formal context. The paper puts forward the design of GPS-based intelligent logistics management system, the results shown in Figure 2.

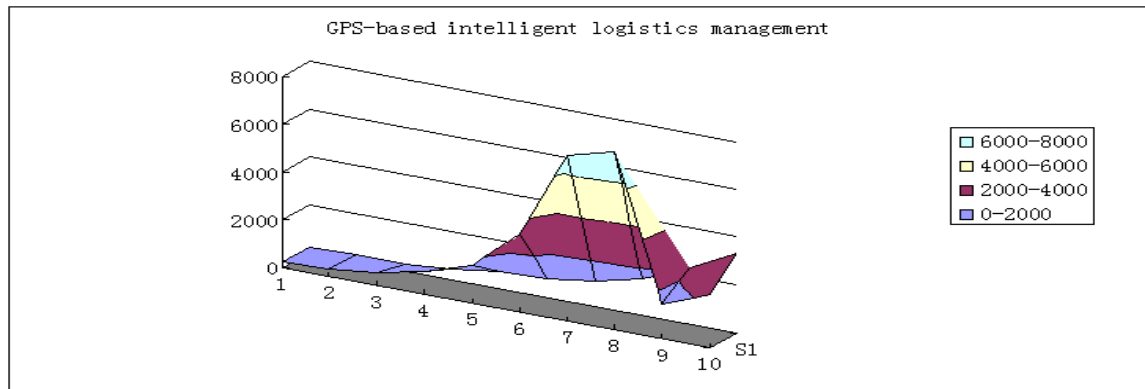


Figure. 2 The design of GPS-based intelligent logistics management system map

The management of the inventory of goods, the lack of information management will likely lead to the location of the inventory of goods to determine the difficulties, imprecise, and the lack of implementation of the unified bar code management conditions. During the planning and scheduling, distribution, and also, the management of the transport vehicles will increase the difficulty can not be an accurate delivery cost accounting. For management purposes, it is difficult to achieve effective monitoring of all orders. Often so often it will lead to feedback lag, thus affecting the entire logistics service quality and efficiency. Not only that, it will produce a chain reaction, mainly reflected in the decision-making management. As the above issues has led to the decision-makers can not keep

abreast of changes in the inventory can not be scientific and rational rationing procurement; In addition, there is no accurate data also make upper management, logistics management is difficult to carry out scientific analysis can not be accurately make the statistics and analysis reports. Therefore, in order to solve the problem with this series, the use of logistics management information system is not only very necessary, but indispensable.

### Summary

The paper puts forward the design of GPS-based intelligent logistics management system. Logistics and transport vehicles, GPS intelligent management platform for centralized management and real-time monitoring and dispatching of vehicles, all-weather, full-line vehicle real-time dynamic monitoring capabilities, vehicle tracking, scheduling, monitoring, history inquiries, security alarm, vehicle records management variety of uses. Vehicle to monitor the way is in order to more local monitoring vehicle operation and the delivery of supplies status. Enterprises optimize the allocation of resources; to improve the market competitiveness of enterprises; reduce business costs, and improve their level of service; provides a powerful and effective tool for modern logistics management.

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