Analysis of Intelligent Pick-up Terminal Based on Mobile Internet

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Abstract: Given the problems of low work efficiency, misplaced delivery and pick-up time, difficulty to build brand image, etc. in the logistics industry, a design scheme for intelligent pick-up terminal based on the mobile Internet is proposed. Firstly, the current status of the last mile delivery in the logistics industry is introduced. Various problems in the distribution are identified. Subsequently, the system architecture, hardware block diagram, and software flowchart of the design are described. The design has implemented intelligent distribution, which can improve logistics distribution efficiency and establish the brand image effectively.

Keywords: Internet, Logistics Distribution, Intelligent Distribution, Mobile Terminal System

1. Introduction

With the rapid development of the Internet of Things (IoT), driven by commercial interests, the competition in China's logistics industry has gradually evolved into a competition of the profit model. The logistics industry has accelerated the pace of reform, setting off a research upsurge on intelligent logistics distribution. China's logistics industry is still in the initial stage of development, and its low level of development has become a significant bottleneck in e-commerce development. The main problems in the distribution process include the following: excessive human investment, lack of professional logistics services, inadequate logistics industry management system, and too backward logistics infrastructure [2]. The use of high-tech technology to achieve intelligent logistics can significantly speed up the flow of goods in the logistics process, reduce manual operation errors, reduce
management costs, maximize global resource utilization, intensive the entire chain, and maximize the automation, optimization, Simplified. Intelligent distribution can optimize vehicle allocation and distribution routes in the logistics process, which can reduce distribution costs and operating time and improve distribution efficiency [3]. In the entire logistics and distribution process, the problem between “last mile” delivery and pick-up is particularly severe. Through market research, we understand the current development of the logistics industry and find that the “last mile” delivery has the following problems:

(1) Most work of the courier involves calling the customer and wait for the customer to pick up the goods, which results in low work efficiency;

(2) It is likely that customers are not at the designated pick-up address or temporarily busy. Hence, the courier often has to deliver the same goods multiple times, resulting in a waste of manpower and financial resources;

(3) Due to communication problems between the deliveryman and the customer, sometimes they do not understand each other, which leads to customer complaints against the logistics company, which seriously affects the brand effectiveness of the logistics company [4-5].

Aiming at the problems in the “last mile delivery”, a design scheme of an intelligent pick-up terminal based on the mobile Internet was proposed. Through the intelligent distribution mobile terminal system, on the one hand, intelligent and simple delivery can be implemented to reduce the labor input of distribution and improving the work efficiency; on the other hand, the time freedom of the person who picks up the cargo can be accomplished. The real-time monitoring of the goods and the availability of the cargo arrival information at any time facilitate the unified management of the logistics company.

2. Intelligent distribution mobile terminal system architecture

The system structure of the intelligent distribution mobile terminal system as shown in Figure 1 mainly includes the following: the automatic storage and retrieval of containers, the video surveillance system, the server, the human-computer interaction interface, the data processor, and the SMS sender. This system can implement intelligent distribution. In the last mile delivery, the courier does not need to wait for the consignee to pick up the article. He only needs to send the courier to the designated distribution point, and the consignee can remove the cargo within an appropriate period at will. Hence, the purpose of intelligent distribution can be achieved.
Figure 1. Architecture of Intelligent Distribution Mobile Terminal System

Its hardware is mainly divided into two parts: the front-end system and background operating system. The main components include the automatic access module, the server module, the data processor module, the automatic SMS sending module, the human-computer interaction module (the password authentication module, the barcode module), the video monitoring module, etc.

3. Module function introduction

3.1. Human-computer interaction interface

The human-machine interface (also known as the user interface) is a medium for interaction and information exchange between the system and users. It can implement the conversion between the internal form of information and the form acceptable to human beings.

In this design, the man-machine interface is embedded in the storage container, which mainly implements the operations required by the courier to store the goods and the owner to collect the goods. Including administrator password input, inventory button, pick-up button, pick-up password input, information proofreading, ID number confirmation, related prompts, etc., the man-machine interface can set an advertising interface when idle, which will bring additional economic benefit.

3.2. Automatic container access

The principle of automated storage and retrieval of containers is similar to that of supermarkets. The courier puts the courier goods into the cabinet, and the consignee picks up the free time to remove the cargo from the container within a specified period of time. The delivery process of the delivery of the courier and the delivery of the consignee are precisely the opposite. The container size and the number
of doors can be customized to meet the needs of different groups of people, and are generally divided into 24, 36, and 48 doors. In addition, the front side and back of the cabinet door can also be painted with different advertising slogans to increase additional income.

3.3. Video surveillance system

The video surveillance system is to ensure the safety and constraints of inventory and pick-up. The video surveillance system will start automatically if inventory/pick-up or the container is accidentally opened to monitor the entire process. As the video surveillance system is now a very mature product, it will not be described in depth. The existing video surveillance systems include the first-generation analog video surveillance system (CCTV), the second generation based on the “PC + Multimedia Card” digital video surveillance system (DVR), and the third generation based entirely on IP network video surveillance system (IPVS).

Given the application scenarios and cost factors of the system, the video surveillance system adopts the second-generation digital video surveillance system with backups.

3.4. Barcode recognition reader

Barcode readers are also known as barcode scanners and barcode scanners. They are a device used to read the information contained in barcodes. Based on the applications and types of barcodes, they can be divided into the following: wired barcode scanner (one-dimensional, two-dimensional); wireless barcode scanner (one-dimensional, two-dimensional). It has the advantages of reliability and accuracy, fast data input speed, economy and cheapness, and simple equipment. The barcode reader is also embedded in the automatic storage container. The courier scans the barcode on the courier, and the system reads the relevant information of the barcode, including the phone number, owner's name, delivery address, and ID number (if required), etc.

3.5. SMS sender and remote data sender

The existing courier manually scans the barcode, and the information is received by the wireless cat at the courier point and is transmitted to the server of the courier company, thereby ensuring that the arrival of the express shipment is accurately grasped in real-time.

The equation for sending short messages to calculate the joint supply days is shown in equation (1):

$$DS = \left[ A_j + \sum_{j=1}^{n} I_j \right] / \left[ \sum_{j=1}^{n} D_j \right]$$

(1)

Among them, DS is the number of days of joint supply for the distribution center inventory; Aj is the
number of inventory units allocated from the factory warehouse, \( I_j \) is the inventory of the distribution center \( j \) expressed in units, and \( D_j \) represents the daily demand of the distribution center \( j \).

The intelligent distribution mobile terminal system also uses this technology. When the courier scans the goods into the container, the goods arrive, and the stored information is sent to the server. When the owner removes the cargo, the data can also be timely transmitted to the server to ensure that the data are updated.

When the goods are deposited in the automatic delivery terminal, the barcode reader reads the personal information related to the courier, and then the SMS sender sends a message to notify the owner to come and pick up the goods, including the location of the pick-up, valid time, bill number, and owner name, pickup password and other information. Pick-up messages can also be uniformly sent through courier points.

The number assigned to each intelligent distribution terminal is calculated, as shown in equation (2):

\[
A_j = \left( DS - \frac{I_j}{D_j} \right) * D_j
\]

(2)

Where \( A_j \) is the amount of supply that should be reached to distribution center \( j \); \( DS \) represents the number of days that each distribution center should reach, \( I_j \) represents the inventory of distribution center \( j \) in units, and \( D_j \) represents the daily demand of distribution center \( j \).

In the “Smart distribution mobile terminal system”, the existing technologies and products are combined to address the problems in the market. Its advantages are low cost, low investment, and the market is in a blank stage. It is believed that with further investment, technological innovation, more significant improvements will be made, and the system will be more humane, scientific, and intelligent.

This system mainly includes the process of cargo pick-up. The consignee receives the message reminder of cargo pick-up and picks up the cargo within a specified period of time freely. This has avoided certain troubles due to the consignee not at the place of delivery and verbal friction with the courier, etc. and reduced the conflict with the logistics company. The specific collection process is shown in Figure 2.
Figure 2. Express pick-up process

4. Conclusions

To solve the problems in traditional logistics distribution, such as low work efficiency, disputes prone to arising between logistics companies and customers, and difficulty in building the image of logistics companies, a design for an intelligent distribution mobile terminal system based on the Internet of Things is proposed. This system can change the current status of traditional logistics distribution, implement intelligent distribution, reduce labor costs, and improve the competitiveness of the logistics industry. In addition, it can effectively achieve the goals of tracking objects dynamically, improving distribution efficiency, and reducing logistics costs, etc. Hence, it is a new way of improving the competitiveness of the industry and driving logistics into a new era of big logistics.

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References

[1] Youkyung Hong, Byunghun Choi, Keumjin Lee. Dynamic Robust Sequencing and Scheduling Under Uncertainty for the Point Merge System in Terminal Airspace[J]. IEEE Transactions on Intelligent Transportation Systems, 2017, 2(99):1-11.

[2] Tao Z, Zhen S, Xiao S, et al. The Android Intelligent Terminal-Based Implementation for Vertical Handover between Carrier-Grade WLAN and CDMA Networks[J]. Lecture Notes of the Institute for Computer Sciences Social Informatics & Telecommunications Engineering, 2013, 121:25-33.

[3] A. Gupta, C.K. Heng, Y.S. Ong. A Generic Framework for Multi-Criteria Decision Support in Eco-Friendly Urban Logistics Systems[J]. Expert Systems with Applications, 2016, 71(2):288-300.

[4] Tang J, Jiang H, Li Z, et al. A Two-Layer Model for Taxi Customer Searching Behaviors Using GPS Trajectory Data[J]. IEEE Transactions on Intelligent Transportation Systems, 2016, 17(11):3318-3324.

[5] Wang L, Wu D, Zhang J. Intelligent Terminal Application and Management in College Class Ecology[J]. Lecture Notes in Electrical Engineering, 2013, 218:423-429.