

DESCRIPTION

Title of Invention

DELIVERY SUPPORT APPARATUS

Technical Field

[0001]

The present invention relates to delivery technology when a store is replenished with a stock of a product.

Background Art

[0002]

A stock amount of a product sold at a retail store such as a drug store is managed so that a product displayed and sold at a storefront does not run out, and when the stock amount falls below a certain amount, the product is shipped from a manufacturer, a wholesaler, an in-house warehouse, or the like, and replenishment of the storefront product is performed.

[0003]

Under such a background, for example, Patent Literature 1 proposes an order determination apparatus capable of presenting a quantitative criterion for determining the appropriate order quantity at the time of ordering a product and verifying the validity of the order quantity.

Citation List

Patent Literature

[0004]

Patent Literature 1: JP 2024-049832 A

Summary of Invention

Technical Problem

[0005]

However, when a store is replenished with a product, a vehicle including a cargo bed for loading a product is used. However, in the above-described conventional technology, since delivery work is performed in a state where there is an empty space in the cargo bed, there is a problem that use efficiency of the vehicle is low and it is necessary to use many vehicles.

[0006]

Therefore, in view of the above problems, an object of the present invention is to provide a delivery support apparatus that improves a cargo bed loading rate of a delivery vehicle replenishing products to a retail store to reduce the frequency of service of the delivery vehicle, thereby contributing to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions.

Solution to Problem

[0007]

One aspect of a delivery support apparatus disclosed herein includes: a product information storage unit that stores a store stock amount and a store sales amount trend for each store and each product sold in the store; a delivery threshold storage unit that stores a first threshold related to the store stock amount and a second threshold larger than the first threshold for each product; a first stock amount prediction unit that calculates a predicted value of the store stock amount after a predetermined period for each product based on information stored in the product information storage unit, for one store; a first candidate extraction unit that extracts a product of which the store stock amount related to the one store is less than the first threshold as a first delivery candidate product; a second candidate extraction unit that extracts a product of which a predicted value of the store stock amount related to the one store is less than the second threshold as a second delivery candidate product, and a delivery unit that performs delivery arrangement processing of delivering the first delivery candidate product and the second delivery candidate product to the one store using one vehicle.

Advantageous Effects of Invention

[0008]

A delivery support apparatus disclosed herein improves a cargo bed loading rate of a delivery vehicle replenishing products to a retail store to reduce the frequency of service of the delivery vehicle, thereby contributing to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions.

Brief Description of Drawings

[0009]

Fig. 1 is a diagram illustrating an outline of a delivery support apparatus according to the present embodiment.

Fig. 2 is a functional block diagram of the delivery support apparatus according to the present embodiment.

Fig. 3 is a diagram illustrating a hardware configuration example of the delivery support apparatus according to the present embodiment.

Fig. 4 is a flowchart illustrating a flow of a processing example by the delivery support apparatus according to the present embodiment.

Description of Embodiments

[0010]

An embodiment of the present invention will be described with reference to the drawings.

(Operation Principle of Delivery Support Apparatus According to Present Embodiment)

[0011]

An operation principle of a delivery support apparatus (hereinafter, simply referred to as the "present apparatus") 100 according to the present embodiment will be described with reference to Figs. 1 and 2. Fig. 1 is a diagram illustrating a connection relationship between the present apparatus 100 and another apparatus, and Fig. 2 is a functional block diagram of the present apparatus 100.

[0012]

As illustrated in Fig. 1, the present apparatus 100 is connected to a store terminal 370 via a communication network 380. The communication network 380 may be in a wired form or a wireless form. The store terminal 370 is an apparatus that notifies the present apparatus 100 of a sales state and a stock state of a product 240 sold in a store 210, and may be, for example, a point of sales (POS) system.

[0013]

As illustrated in Fig. 2, the present apparatus 100 includes a product information storage unit 110, a delivery threshold storage unit 120, a neighboring store storage

unit 130, a first stock amount prediction unit 140, a first candidate extraction unit 150, a second candidate extraction unit 160, a second stock amount prediction unit 170, a third candidate extraction unit 180, an empty space determination unit 190, and a delivery unit 200.

[0014]

The product information storage unit 110 stores a store stock amount 250 and a store sales amount trend 260 for each product 240 sold in the store 210. The store sales amount trend 260 is, for example, the latest sales, the seasonal characteristics of the sales amount, and the characteristics of the sales amount depending on the weather for each product 240, and is information necessary for predicting a future store stock amount 250 of the product 240.

[0015]

The delivery threshold storage unit 120 stores a first threshold 270 related to the store stock amount 250 and a second threshold 280 larger than the first threshold 270 for each product 240 sold in the store 210. In addition, the delivery threshold storage unit 120 may store the first threshold 270 and the second threshold 280 for each store 210. In this way, it is possible to cope with a case where the store stock amount 250 and the store sales amount trend 260 to be held by each store 210 are

different.

[0016]

The neighboring store storage unit 130 stores store grouping information 330 obtained by grouping the stores 210 based on a predetermined criterion. Here, the predetermined criterion is a concept including that a delivery route is the same and that a distance between the stores 210 is a predetermined value or less. In this way, it is possible to know the store 210 that can efficiently deliver the product when the delivery is performed using the same vehicle.

[0017]

The first stock amount prediction unit 140 calculates a predicted value 290 of a future store stock amount 250 (after a predetermined period) for each product 240 based on information 250 and 260 stored in the product information storage unit 110, for one store 220. The predicted value 290 is, for example, the store stock amount 250 after 3 days or 1 week. Further, the predicted value 290 is calculated based on a general prediction method, and the prediction method is not particularly limited.

[0018]

The first candidate extraction unit 150 extracts, as a first delivery candidate product 300, the product 240 of which the store stock amount 250 related to one store 220

is less than the first threshold 270. This is general processing of selecting the product 240 to be replenished to one store 220.

[0019]

The second candidate extraction unit 160 extracts, as a second delivery candidate product 310, the product 240 of which the predicted value 290 of the store stock amount related to one store 220 is less than the second threshold 280. Note that the product 240 extracted as the first delivery candidate product 300 by the first candidate extraction unit 150 is excluded from the second delivery candidate product 310. This is processing of selecting a product for which there is still room for the store stock amount 250 as compared with the first delivery candidate product 300 but a product replenishment time is close (the product will be delivered soon).

[0020]

As described above, if delivery timing for each product 240 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340 increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle

340.

[0021]

The second stock amount prediction unit 170 calculates a predicted value 290 of a future store stock amount 250 (after a predetermined period) for each product 240 based on information 250 and 260 stored in the product information storage unit 110, for another store 230. The predicted value 290 is, for example, the store stock amount 250 after 3 days or 1 week. Further, the predicted value 290 is calculated based on a general prediction method, and the prediction method is not particularly limited.

[0022]

The second stock amount prediction unit 170 may calculate the predicted value 290 of the store stock amount 250 for another store 230 belonging to the same group as one store 220 in the store grouping information 330 stored in the neighboring store storage unit 130. By narrowing down candidates of another store 230 from the viewpoint of improving distribution efficiency, the operation efficiency of the delivery vehicle 340 can be improved, which can also contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0023]

The third candidate extraction unit 180 extracts, as

a third delivery candidate product 320, the product 240 of which the predicted value 290 of the store stock amount 250 related to another store 230 is less than the second threshold 280.

[0024]

As described above, if delivery timing for each product 240 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340 increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0025]

The empty space determination unit 190 confirms and determines whether or not there is an empty space 350 of the cargo bed when the first delivery candidate product 300 and the second delivery candidate product 310 are loaded on the cargo bed of one delivery vehicle 340.

[0026]

In addition, the empty space determination unit 190 confirms a size 360 of the empty space of the cargo bed when the first delivery candidate product 300 and the second delivery candidate product 310 are loaded on the

cargo bed of one delivery vehicle 340. When it is possible to confirm that the size 360 of the empty space is larger than the size of the third delivery candidate product 320, the empty space determination unit 190 determines that the third delivery candidate product 320 can be delivered by one delivery vehicle 340.

[0027]

The delivery unit 200 performs delivery arrangement processing of delivering the first delivery candidate product 300 and the second delivery candidate product 310 to one store 220 using one delivery vehicle 340. In addition to the above processing, the delivery unit 200 may perform delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340.

[0028]

As described above, if delivery timing for each product 240 and each of the different stores 220 and 230 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340 increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0029]

In addition to the above processing, the delivery unit 200 may perform delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340, when it is determined by the empty space determination unit 190 that there is the empty space 350.

[0030]

In addition to the above processing, the delivery unit 200 performs delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340, when it is determined by the empty space determination unit 190 that the third delivery candidate product 320 can be delivered by one delivery vehicle 340.

[0031]

Based on the above operation principle, the present apparatus 100 improves a cargo bed loading rate of the delivery vehicle 340 replenishing the products 240 to the retail store 210 to reduce the frequency of service of the delivery vehicle 340, thereby contributing to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions.

(Hardware Configuration of Delivery Support Apparatus According to Present Embodiment)

[0032]

A hardware configuration example of the present apparatus 100 will be described with reference to Fig. 3. Fig. 3 is a diagram illustrating an example of a hardware configuration of the present apparatus 100. As illustrated in Fig. 3, the present apparatus 100 includes a central processing unit (CPU) 510, a read-only memory (ROM) 520, a random access memory (RAM) 530, an auxiliary storage device 540, a communication I/F 550, an input device 560, a display device 570, and a storage medium I/F 580.

[0033]

The CPU 510 is a device that executes a program stored in the ROM 520, and performs arithmetic operation processing on data developed (loaded) in the RAM 530 according to a command of the program to control the entire present apparatus 100. The ROM 520 stores programs and data executed by the CPU 510. When the CPU 510 executes the program stored in the ROM 520, the program to be executed and data are developed (loaded) in the RAM 530, and the RAM 530 temporarily holds arithmetic operation data during arithmetic operation.

[0034]

The auxiliary storage device 540 is a device that stores an operating system (OS) that is basic software, an application program according to the present embodiment,

and the like together with related data, and includes, for example, a product information storage unit 110, a delivery threshold storage unit 120, and a neighboring store storage unit 130. The auxiliary storage device 540 is, for example, a hard disk drive (HDD) or a flash memory.

[0035]

The communication I/F 550 is an interface that is connected to the communication network 380 such as a wired or wireless local area network (LAN) or the Internet and exchanges data with another apparatus (POS system or the like) 370 that provides a communication function.

[0036]

The input device 560 is a device such as a keyboard for inputting data to the present apparatus 100. The display device (output device) 570 is a device including a liquid crystal display (LCD) or the like, and is a device that functions as a user interface when a user uses the functions of the present apparatus 100 or performs various settings. The storage medium I/F 580 is an interface for transmitting and receiving data to and from a storage medium 590 such as a CD-ROM, a DVD-ROM, or a USB memory.

[0037]

Each unit included in the present apparatus 100 may be realized by the CPU 510 executing a program corresponding to each unit stored in the ROM 520 or the

auxiliary storage device 540. In addition, each unit included in the present apparatus 100 may have a form in which processing related to each unit is realized as hardware. In addition, a program according to the present invention may be read from an external server device via the communication I/F 550, or the program according to the present invention may be read from the storage medium 590 via the storage medium I/F 580 to cause the present apparatus 100 to execute the program.

(Processing Example by Delivery Support Apparatus According to Present Embodiment)

A processing example by the present apparatus 100 will be described with reference to Fig. 4. Fig. 4 is a flowchart illustrating a flow of the processing example by the present apparatus 100.

[0038]

In S10, the first candidate extraction unit 150 extracts, as the first delivery candidate product 300, the product 240 of which the store stock amount 250 related to one store 220 is less than the first threshold 270. This is general processing of selecting the product 240 to be replenished to one store 220.

[0039]

In S20, the first stock amount prediction unit 140 calculates a predicted value 290 of a future store stock

amount 250 (after a predetermined period) for each product 240 based on the information 250 and 260 stored in the product information storage unit 110, for one store 220. The predicted value 290 is, for example, the store stock amount 250 after 3 days or 1 week. Further, the predicted value 290 is calculated based on a general prediction method, and the prediction method is not particularly limited.

[0040]

Further, in S20, the second candidate extraction unit 160 extracts, as the second delivery candidate product 310, the product 240 of which the predicted value 290 of the store stock amount related to one store 220 is less than the second threshold 280. Note that the product 240 extracted as the first delivery candidate product 300 in S10 is excluded from the second delivery candidate product 310. This is processing of selecting a product for which there is still room for the store stock amount 250 as compared with the first delivery candidate product 300 but a product replenishment time is close (the product will be delivered soon).

[0041]

As described above, if delivery timing for each product 240 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340

increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0042]

In S30, the second stock amount prediction unit 170 calculates a predicted value 290 of a future store stock amount 250 (after a predetermined period) for each product 240 based on the information 250 and 260 stored in the product information storage unit 110, for another store 230. The predicted value 290 is, for example, the store stock amount 250 after 3 days or 1 week. Further, the predicted value 290 is calculated based on a general prediction method, and the prediction method is not particularly limited.

[0043]

The second stock amount prediction unit 170 may calculate the predicted value 290 of the store stock amount 250 for another store 230 belonging to the same group as one store 220 in the store grouping information 330 stored in the neighboring store storage unit 130. By narrowing down candidates of another store 230 from the viewpoint of improving distribution efficiency, the operation efficiency

of the delivery vehicle 340 can be improved, which can also contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0044]

Further, in S30, the third candidate extraction unit 180 extracts, as the third delivery candidate product 320, the product 240 of which the predicted value 290 of the store stock amount 250 related to another store 230 is less than the second threshold 280.

[0045]

As described above, if delivery timing for each product 240 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340 increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0046]

In S40, the empty space determination unit 190 confirms and determines whether or not there is an empty space 350 of the cargo bed when the first delivery candidate product 300 and the second delivery candidate

product 310 are loaded on the cargo bed of one delivery vehicle 340.

[0047]

As another form, in S40, the empty space determination unit 190 confirms the size 360 of the empty space of the cargo bed when the first delivery candidate product 300 and the second delivery candidate product 310 are loaded on the cargo bed of one delivery vehicle 340. When it is possible to confirm that the size 360 of the empty space is larger than the size of the third delivery candidate product 320, the empty space determination unit 190 determines that the third delivery candidate product 320 can be delivered by one delivery vehicle 340.

[0048]

In S50, the delivery unit 200 performs delivery arrangement processing of delivering the first delivery candidate product 300 and the second delivery candidate product 310 to one store 220 using one delivery vehicle 340. In addition to the above processing, the delivery unit 200 may perform delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340.

[0049]

As another form, in addition to the above processing, in S50, the delivery unit 200 may perform

delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340, when it is determined in S40 that there is the empty space 350.

[0050]

As still another form, in addition to the above processing, the delivery unit 200 performs delivery arrangement processing of delivering the third delivery candidate product 320 to another store 230 using one delivery vehicle 340, when it is determined in S40 that the third delivery candidate product 320 can be delivered by one delivery vehicle 340.

[0051]

As described above, if delivery timing for each product 240 and each of the different stores 220 and 230 is matched as much as possible, the number of products 240 that can be loaded on one delivery vehicle 340 increases, and as a result, the number of delivery vehicles 340 to be operated can be reduced. As a result, it is possible to contribute to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions caused by operation of the delivery vehicle 340.

[0052]

By performing the above processing, the present apparatus 100 improves a cargo bed loading rate of the

delivery vehicle 340 replenishing the products 240 to the retail store 210 to reduce the frequency of service of the delivery vehicle 340, thereby contributing to reduction in labor hours of people involved in distribution and reduction in greenhouse gas emissions.

[0053]

Although the embodiments of the present invention have been described in detail above, the present invention is not limited to the specific embodiments, and various modifications and changes can be made within the scope of the gist of the present invention described in the claims.

Reference Signs List

[0054]

- 100 delivery support apparatus
- 110 product information storage unit
- 120 delivery threshold storage unit
- 130 neighboring store storage unit
- 140 first stock amount prediction unit
- 150 first candidate extraction unit
- 160 second candidate extraction unit
- 170 second stock amount prediction unit
- 180 third candidate extraction unit
- 190 empty space determination unit
- 200 delivery unit

210 store
220 one store
230 another store
240 product
250 store stock amount
260 store sales amount trend
270 first threshold
280 second threshold
290 predicted value of store stock amount after
predetermined period
300 first delivery candidate product
310 second delivery candidate product
320 third delivery candidate product
330 store grouping information
340 vehicle
350 empty space of cargo bed
360 size of empty space of cargo bed
370 store terminal (point of sales (POS) system)
380 communication network
510 CPU
520 ROM
530 RAM
540 auxiliary storage device
550 communication interface
560 input device

570 output device
580 storage medium interface
590 storage medium

CLAIMS

[Claim 1]

A delivery support apparatus comprising:

a product information storage unit that stores a store stock amount and a store sales amount trend for each store and each product sold in the store;

a delivery threshold storage unit that stores a first threshold related to the store stock amount and a second threshold larger than the first threshold for each product;

a first stock amount prediction unit that calculates a predicted value of the store stock amount after a predetermined period for each product based on information stored in the product information storage unit, for one store;

a first candidate extraction unit that extracts a product of which the store stock amount related to the one store is less than the first threshold as a first delivery candidate product;

a second candidate extraction unit that extracts a product of which a predicted value of the store stock amount related to the one store is less than the second threshold as a second delivery candidate product; and

a delivery unit that performs delivery arrangement processing of delivering the first delivery candidate

product and the second delivery candidate product to the one store using one vehicle.

[Claim 2]

The delivery support apparatus according to claim 1, comprising:

a second stock amount prediction unit that calculates a predicted value of the store stock amount after a predetermined period for each product based on information stored in the product information storage unit, for another store; and

a third candidate extraction unit that extracts, as a third delivery candidate product, a product for which a predicted value of the store stock amount related to another store is less than the second threshold, wherein

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle.

[Claim 3]

The delivery support apparatus according to claim 2, comprising:

a neighboring store storage unit that stores store grouping information obtained by grouping the stores based on a predetermined criterion including that delivery routes are the same or that locations are within a predetermined distance, wherein

the second stock amount prediction unit calculates a predicted value of the store stock amount for another store belonging to the same group as the one store in the store grouping information.

[Claim 4]

The delivery support apparatus according to claim 3, comprising:

an empty space determination unit that confirms whether or not there is an empty space in a cargo bed of the one vehicle when the first delivery candidate product and the second delivery candidate product are loaded on the cargo bed, wherein

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle, when there is the empty space.

[Claim 5]

The delivery support apparatus according to claim 4, wherein

the empty space determination unit confirms a size of the empty space of the cargo bed, and determines that the third delivery candidate product is capable of being delivered, when it is possible to confirm that the size of the empty space is larger than the size of the third delivery candidate product, and

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle, when it is determined that the delivery is possible.

[Claim 6]

A delivery support method performed in a computer which includes a product information storage unit that stores a store stock amount and a store sales amount trend for each store and each product sold in the store, and a delivery threshold storage unit that stores a first threshold related to the store stock amount and a second threshold larger than the first threshold for each product, the delivery support method comprising:

a step of causing a first stock amount prediction unit to calculate a predicted value of the store stock amount after a predetermined period for each product based on information stored in the product information storage unit, for one store;

a step of causing a first candidate extraction unit to extract a product of which the store stock amount related to the one store is less than the first threshold as a first delivery candidate product;

a step of causing a second candidate extraction unit to extract a product of which a predicted value of the store stock amount related to the one store is less than

the second threshold as a second delivery candidate product; and

a step of causing a delivery unit to perform delivery arrangement processing of delivering the first delivery candidate product and the second delivery candidate product to the one store using one vehicle.

[Claim 7]

The delivery support method according to claim 6, comprising:

a step of causing a second stock amount prediction unit to calculate a predicted value of the store stock amount after a predetermined period for each product based on information stored in the product information storage unit, for another store; and

a step of causing a third candidate extraction unit to extract, as a third delivery candidate product, a product for which a predicted value of the store stock amount related to another store is less than the second threshold, wherein

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle.

[Claim 8]

The delivery support method according to claim 7, wherein

the computer includes a neighboring store storage unit that stores store grouping information obtained by grouping the stores based on a predetermined criterion including that delivery routes are the same or that locations are within a predetermined distance, and

the second stock amount prediction unit calculates a predicted value of the store stock amount for another store belonging to the same group as the one store in the store grouping information.

[Claim 9]

The delivery support method according to claim 8, comprising:

a step of causing an empty space determination unit to confirm whether or not there is an empty space in a cargo bed of the one vehicle when the first delivery candidate product and the second delivery candidate product are loaded on the cargo bed, wherein

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle, when there is the empty space.

[Claim 10]

The delivery support method according to claim 9, wherein

the empty space determination unit confirms a size

of the empty space of the cargo bed, and determines that the third delivery candidate product is capable of being delivered, when it is possible to confirm that the size of the empty space is larger than the size of the third delivery candidate product, and

the delivery unit performs delivery arrangement processing of delivering the third delivery candidate product to another store using the one vehicle, when it is determined that the delivery is possible.

[Claim 11]

A delivery support program for causing a computer to execute the method according to any one of claims 6 to 10.