WAREHOUSE STORAGE LOCATION ALLOCATION METHOD AND APPARATUS, ELECTRONIC DEVICE, AND STORAGE MEDIUM

TECHNICAL FIELD

[0001] The present application mainly relates to the field of warehousing technologies, and in particular, to a warehouse storage location allocation method and apparatus, an electronic device, and a storage medium.

BACKGROUND

[0002] The quantity of storage locations required for products in a warehouse is usually determined based on manual experience. In complex scenarios or in scenarios with a large quantity of storage location types, it is difficult to dynamically configure the quantity of the storage locations for the products in the warehouse, resulting in inaccurate allocation of the storage locations in the warehouse.

SUMMARY

[0003] The present application provides a warehouse storage location allocation method and apparatus, an electronic device, and a storage medium, to solve a problem of inaccurate allocation of storage locations in a warehouse.

[0004] According to a first aspect, the present application provides a warehouse storage location allocation method, including: (a) acquiring storage location allocation information at an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2; (b) performing simulated replenishment for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain product replenishment information at the i^{th} repetition of the target product, where the product replenishment information at the i^{th} repetition includes at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition; and (c) determining whether the product replenishment information at the

i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

[0005] According to a second aspect, the present application provides a warehouse storage location allocation method, including: acquiring storage location allocation information at an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2; performing a simulated outbound operation for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain outbound information at the i^{th} repetition of the target product, where the outbound information at the i^{th} repetition includes at least one of the following indicators: product replenishment times or coefficient of variation indicating outbound stability of the target product at the i^{th} repetition; and determining whether the outbound information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that the at least one indicator is less than a corresponding preset indicator value.

[0006] According to a third aspect, the present application provides a warehouse storage location allocation apparatus, including: an acquiring module, configured to acquire storage location allocation information of an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2; a simulation module, configured to perform simulated replenishment for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain product replenishment information at the i^{th} repetition for the target product, where the product replenishment information at the i^{th} repetition includes at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition; and a determining module, configured to determine whether the product replenishment information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location

allocation information, where the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

[0007] According to a fourth aspect, the present application provides an electronic device, including: one or more processors; a memory; and one or more application programs, where the one or more application programs are stored in the memory and are configured to be executed by the one or more processors to implement the warehouse storage location allocation method according to the first aspect and/or the second aspect.

[0008] According to a fifth aspect, the present application provides a computer-readable storage medium, where the computer-readable storage medium stores a computer program, and the computer program is configured to be loaded by a processor to execute the warehouse storage location allocation method according to the first aspect and/or the second aspect.

[0009] According to a warehouse storage location allocation method and apparatus, an electronic device, and a storage medium provided by the present application, simulated replenishment is performed for daily stock by using storage location allocation information at the i^{th} repetition and historical outbound information, to confirm product replenishment information, and whether the product replenishment information satisfies a preset allocation condition is determined, to confirm target storage location allocation information. The product replenishment times information and/or daily stock information are/is considered for confirming the target storage location allocation information, thereby improving allocation accuracy of warehouse storage locations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a schematic diagram of a scenario of a distribution system for warehouse storage locations according to an embodiment of the present application.

[0011] FIG. 2 is a schematic flowchart of a warehouse storage location allocation method according to an embodiment of the present application.

[0012] FIG. 3 is a schematic flowchart of a warehouse storage location allocation method according to another embodiment of the present application.

[0013] FIG. 4 is a schematic flowchart of a warehouse storage location allocation method according to another embodiment of the present application.

[0014] FIG. 5 is a schematic flowchart of a warehouse storage location allocation method according to another embodiment of the present application.

[0015] FIG. 6 is a schematic flowchart of a warehouse storage location allocation method according to another embodiment of the present application.

[0016] FIG. 7 is a schematic flowchart of a structure of a warehouse storage location allocation apparatus according to an embodiment of the present application.

[0017] FIG. 8 is a schematic diagram of a structure of an electronic device according to an embodiment of the present application.

[0018] FIG. 9 is a schematic diagram of a structure of a storage medium according to an embodiment of the present application.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] There will be many shelves in a warehouse, and a plurality of storage locations are set up on a shelve, where the storage locations are places for storing products. The shelves are mainly classified into storages area and picking areas. Each storage location is located at a different height. A storage location located in the storage area is higher than a storage location located in the picking area. This is because that the storage location located in the picking area is placed at a lower position, which will be convenient for an operator to pick products. However, after a product is retrieved from the storage location located in the picking area, products in the storage locations located in the picking area gradually decrease. A process of moving a product in the storage location located in the storage area to the storage location located in the picking area to meet a normal outbound requirement is referred to as replenishment. The process of moving a product from the storage location located in the storage area to the storage location located in the picking area not only wastes manpower but also may reduce outbound efficiency.

[0020] In view of this, a certain quantity of storage locations are usually set. However, given complex scenarios and scenarios with a large quantity of storage location types, it is difficult to dynamically configure the quantity of storage locations for products in the warehouse to ensure that storage location distribution of all products is at an appropriate level and to improve outbound efficiency of the products and reduce the quantity of replenishment times and warehouse costs. Therefore, a warehouse storage location allocation method in the related art is inaccurate.

[0021] To solve the foregoing problem, embodiments of the present application provide a warehouse storage location allocation method and apparatus, an electronic device, and a storage medium, which are described in detail below.

[0022] Referring to FIG. 1, FIG. 1 is a schematic diagram of a scenario of a distribution system for warehouse storage locations according to an embodiment of the present application. The distribution system for the warehouse storage locations may include an electronic device 100.

[0023] The electronic device 100 in the embodiment of the present application may be configured to execute a warehouse storage location allocation method. For specific content of the warehouse storage location allocation method, please refer to the following description. In an example, the electronic device 100 is integrated with a warehouse storage location allocation apparatus for executing the warehouse storage location allocation method described below.

[0024] In an exemplary embodiment, the electronic device 100 may be a general-purpose computer device or a dedicated computer device. In a specific implementation, the electronic device 100 may be a desktop computer, a portable computer, a network server, a personal digital assistant (Personal Digital Assistant, PDA), a mobile phone, a tablet computer, a wireless terminal device, a communication device, an embedded device, a smart television, or the like. A type of the electronic device 100 is not limited in this embodiment.

[0025] It will be understood by a person skilled in the art that an application environment shown in FIG. 1 is merely one example of an application scenario for the solutions of the present application and does not constitute a limitation on application scenarios for the solutions of the present application. Other application environments may include more or fewer electronic devices than those shown in FIG. 1. For example, merely one electronic device is shown in FIG. 1. However, it may be understood that the distribution system for the warehouse storage locations may also include one or more other electronic devices capable of processing data, which will not be not specifically limited herein.

[0026] In addition, as shown in FIG. 1, the distribution system for the warehouse storage locations may also include a memory 200 for storing data.

[0027] It should be noted that, the schematic diagram of the scenario of the distribution system for the warehouse storage locations shown in FIG. 1 is merely an example, and the distribution system for the warehouse storage locations and its scenario described in the embodiment of the present application are merely for the purpose of more clearly explaining the technical solutions of the embodiment of the present application, and do not constitute a limitation to the technical solutions provided by the embodiment of the present application. A person of ordinary skill in the art may know that with the evolution of the distribution system for the warehouse storage locations and the emergence of new service scenes, the technical

solutions provided in the embodiments of the present application are also applicable to similar technical problems.

[0028] The warehouse storage location allocation method provided in the present embodiment of the present application will be described in further detail below with reference to FIG. 2 to FIG. 6.

[0029] An embodiment of the present application provides a warehouse storage location allocation method, which may be executed by the electronic device 100 (for example, a warehouse storage location allocation apparatus) shown in FIG. 1. For simplicity and ease of description, this execution body is omitted in subsequent embodiments of the method.

[0030] As shown in FIG. 2, FIG. 2 is a schematic flowchart of a warehouse storage location allocation method according to an embodiment of the present application. The warehouse storage location allocation method includes the following steps S201 to S203.

[0031] S201: Acquiring storage location allocation information at an i^{th} repetition in a target warehouse. The storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2.

[0032] The initial storage location allocation information includes a quantity of allocated storage locations for the target product in the target warehouse. Since the target product is placed in the storage locations based on an outbound specification, the quantity of the allocated storage locations for the target product in the target warehouse may also be understood as a quantity of allocated storage locations for each outbound specification. A storage location is a bin on a shelf of the target warehouse. The quantity of allocated storage locations may be understood as a quantity of bins allocated on the shelf of the target warehouse for the target product (or each outbound specification).

[0033] The outbound specification is used for indicating a packaging specification in which the target product is loaded into the storage location. Various outbound specifications may include a standard trailer, a standard container and a standard carton. In an example, for an outbound operation on the target product by using each outbound specification, a standard trailer is fully filled with the target product, a standard container is fully filled with the target product, and a standard carton is fully filled with the target product.

[0034] The initial storage location allocation information may be set based on manual experience. The initial storage location allocation information may include the quantity of

allocated storage locations when the target product is performed outbound operation based on each outbound specification. For example, the initial storage location allocation information includes: when the target product A is performed outbound operation on a basis of the standard trailer, the quantity of allocated storage locations is 10; when the target product A is performed outbound operation on a basis of the standard container, the quantity of allocated storage locations is 8; or when the target product A is performed outbound operation on a basis of the standard carton, the quantity of allocated storage locations is 7.

[0035] In an exemplary embodiment, historical outbound information of the target warehouse within a historical time period may be further acquired.

[0036] The target warehouse may be a refurbished warehouse, and historical outbound information of the refurbished warehouse within the historical time period is acquired. The target warehouse may alternatively be a newly built warehouse, and historical outbound information of another warehouse having a same type as the newly built warehouse may be acquired as historical outbound information of the newly built warehouse within the historical time period.

[0037] The historical time period may be six months or eight months, or the like, which may be set according to a specific situation. The historical outbound information may include a historical outbound quantity of each product (for example, the target product) that is performed the outbound operation on a basis of each outbound specification.

[0038] S202: Performing simulated replenishment for the target warehouse based on the storage location allocation information at the i^{th} repetition and the historical outbound information within the historical time period, to obtain product replenishment information at the i^{th} repetition of the target product, where the product replenishment information at the i^{th} repetition includes at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition.

[0039] The product replenishment times information includes the quantity of emergency replenishment times that emergency replenishment is initiated for the target product. Emergency replenishment is initiated when an outbound quantity of the target product in the target warehouse is greater than a pre-outbound stock quantity. The daily stock information includes a coefficient of variation of a daily post-replenishment stock quantity of the target product within the historical time period.

[0040] The simulated replenishment refers to hypothetical replenishment for future based on historical data. For example, in the present application, simulated replenishment is performed based on the assumed initial storage location allocation information and the historical

outbound information, thereby obtaining the product replenishment information. Simulated replenishment may be performed by using an existing dynamic stock model, a secure stock model, or an integer linear programming model, or the like.

[0041] S203: Determining whether the product replenishment information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

[0042] It should be understood that, the target storage location allocation information is a quantity of allocated storage locations for the target product finally presented to warehouse personnel, so as to facilitate the warehouse personnel's subsequent outbound operations for the target product.

[0043] The at least one indicator may include the quantity of emergency replenishment times or the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period. Certainly, the at least one indicator may also include other indicators, such as a replenishment cost and replenishment time, which may be set according to a specific situation.

[0044] In an exemplary embodiment, when the product replenishment information includes the product replenishment times information, the at least one indicator includes the quantity of emergency replenishment times, the corresponding preset indicator value is a preset quantity of replenishment times, and the preset allocation condition is that the quantity of emergency replenishment times for the target product is less than the preset quantity of replenishment times. The preset quantity of replenishment times may be set according to a specific situation. For example, the preset quantity of replenishment times may be 3 times.

[0045] In another exemplary embodiment, when the product replenishment information includes the daily stock information, the at least one indicator includes the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period, the corresponding preset indicator value is a preset coefficient value, and the preset allocation condition is that the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period is less than the preset coefficient value. The preset coefficient value may be set according to a specific situation. For example, the preset coefficient value may be 0.7.

[0046] In another exemplary embodiment, when the product replenishment information includes the product replenishment times information and the daily stock information, the preset allocation condition is that the quantity of emergency replenishment times of the target

product is less than the preset quantity of replenishment times, and the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period is less than the preset coefficient value.

[0047] In another exemplary embodiment, when the product replenishment information includes the product replenishment times information and the daily stock information, the preset allocation condition is that the quantity of the emergency replenishment times of the target product is less than the preset quantity of the replenishment times, or the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period is less than the preset coefficient value.

[0048] In an exemplary embodiment, the allocation method further includes: confirming that the product replenishment information at the i^{th} repetition satisfies the preset allocation condition; and confirming the storage location allocation information at the i^{th} repetition as the target storage location allocation information. For example, when i = 1, it is confirmed that the initial outbound information satisfies the preset allocation condition; and the initial storage location allocation information is confirmed as the target storage location allocation information.

[0049] When the product replenishment information at the i^{th} repetition satisfies the preset allocation conditions, it means that the quantity of the allocated storage locations is accurate and appropriate. Therefore, the storage location allocation information at the i^{th} repetition is directly confirmed as the target storage location allocation information.

[0050] In another exemplary embodiment, the allocation method further includes: (d) confirming that the product replenishment information at the i^{th} repetition does not satisfy the preset allocation condition; and repeating the foregoing steps S201 to S203 and step (d) until an n^{th} repetition to obtain product replenishment information at the n^{th} repetition that satisfies the preset allocation condition, and confirming storage location allocation information at the n^{th} repetition as the target storage location allocation information.

[0051] The foregoing repeating process includes at least two repetitions. The 1^{st} repetition is as follows: acquiring storage location allocation information of the 1^{st} repetition (that is, the initial storage location allocation information); performing simulated replenishment for the target warehouse based on the storage location allocation information of the 1^{st} repetition and the historical outbound information, to obtain product replenishment information of the 1^{st} repetition for the target product; confirming whether the product replenishment information of the 1^{st} repetition satisfies the preset allocation condition; and performing the 2^{nd} repetition if it is confirmed that the product replenishment information of the 1^{st} repetition does not satisfy

the preset allocation condition. The 2nd repetition is as follows: acquiring storage location allocation information of the 2nd repetition; performing simulated replenishment for the target warehouse based on the storage location allocation information of the 2nd repetition and the historical outbound information, to obtain product replenishment information of the 2nd repetition for the target product; determining whether the product replenishment information of the 2nd repetition satisfies the preset allocation condition; and confirming that the product replenishment information of the 2nd repetition satisfies the preset allocation condition, that is, repeating the foregoing steps S201 to S203 and (d) until the 2nd repetition (that is, n=2), except that step (d) is no longer performed because in the 2nd repetition, the product replenishment information of the 2nd repetition obtained after execution of step S203 satisfies the preset allocation condition. Instead, the storage location allocation information of the 2nd repetition is directly determined as the target storage location allocation information. When it is confirmed that the product replenishment information of the 2nd repetition does not satisfy the preset allocation condition, the foregoing steps S201 to S203 and (d) are repeated until the 3rd repetition. By analogy, n repetitions are completed to obtain product replenishment information at the nth repetition that satisfies the preset allocation condition, and storage location allocation information at the nth repetition is confirmed as the target storage location allocation information.

[0052] In an exemplary embodiment, to improve accuracy of the initial storage location allocation information, as shown in FIG. 3, when i = 1, step S201 may include the following steps.

[0053] S301: Acquiring a capacity of each storage location in at least one storage location in the target warehouse, a loading rate at which the target product is loaded in the at least one storage location based on at least one type of target outbound specification, and a volume of each type of the target outbound specification in the at least one type of the target outbound specification.

[0054] The at least one type of the target outbound specification is used for representing a packaging specification in which the target product is loaded in the at least one storage location, for example, a standard trailer, a standard container, or a standard carton.

[0055] In the description of this specification, each storage location is referred to as a single storage location. That is, the single storage location described below may be understood as each storage location, and the storage location described below may also be understood as a single storage location.

[0056] In an example, a single storage location stores merely one type of target outbound specification. For example, one storage location stores a standard trailer, another storage location stores a standard container, and another storage location stores a standard carton. Therefore, one storage location corresponds to one type of target storage location specification. There are different loading rates for different types of target outbound specifications, for example, a loading rate at which the target product is loaded in the storage location on a basis of the standard trailer, a loading rate at which the target product is loaded in the storage location on a basis of the standard container, and a loading rate at which the target product is loaded in the storage location on a basis of the standard carton.

[0057] A single storage location in the target warehouse is a bin on a shelf of the target warehouse. A capacity of a single storage location may be measured in advance, and a loading rate at which the target product is loaded in a single storage location on a basis of the target outbound specification may be set in advance. The loading rate at which the target product is loaded in the single storage location on a basis of the target outbound specification refers to a ratio of a total volume, obtained after working personnel loads the target product into the single storage location on a basis of the target outbound specification, of the products in the single storage location to a capacity of the single storage location. For example, a loading rate at which the target product is loaded in a single storage location on a basis of the standard container is 0.9. A volume of each outbound specification may be preset, for example, a volume of the standard trailer, a volume of the standard container, and the volume of the standard carton.

[0058] S302: Confirming, based on the capacity of the storage location, the loading rate at which the target product is loaded in the storage location on a basis of the target outbound specification, and the volume of the target outbound specification, a quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification.

[0059] A product of the capacity of the single storage location and the loading rate at which the target product is loaded in the single storage location on a basis of the target outbound specification is calculated and then is divided by the volume of the target outbound specification, to obtain the quantity of specifications that the target product is loaded in the single storage location on a basis of the target outbound specification. For example, the capacity of the single storage location is V, the loading rate at which the target product is loaded in the single storage location on a basis of the target outbound specification is 0.9, and the volume of the target outbound specification is V_V. In this case, the quantity of specifications that the target

product is loaded in the single storage location on a basis of the target outbound specification is $V*0.9/V_V$.

[0060] For example, the target outbound specification is the standard container, and the quantity of the standard containers that the target product is loaded in the single storage location on a basis of the standard container is 10, which means that the single storage location is able to accommodate 10 standard containers of products.

[0061] S303: Confirming a quantity of allocated storage locations of the target outbound specification based on the historical outbound information and the quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification.

[0062] A monthly average quantity of the target outbound specifications is confirmed based on the historical outbound information, and a monthly replenishment frequency corresponding to the target outbound specification is acquired; and the quantity of allocated storage locations of the target outbound specification is confirmed based on the monthly average quantity of the target outbound specifications, the monthly replenishment frequency corresponding to the target outbound specification and the quantity of specifications that the target product is loaded in the storage location on a basis of the target outbound specification. It should be understood that, one type of the target outbound specifications corresponds to one monthly replenishment frequency.

[0063] The monthly average quantity of the target outbound specifications is divided by the monthly replenishment frequency corresponding to the target outbound specification and then is divided by the quantity of specifications that the target product is loaded in the single storage location on a basis of the target outbound specification, to obtain the quantity of the allocated storage locations of the target outbound specification.

[0064] For example, the target outbound specification is the standard trailer, the monthly average quantity of the outbound standard trailers for the target product that are performed outbound operation on a basis of the standard trailer is P_Q, and the quantity of standard trailers that the target product is loaded in the single storage location on a basis of the standard trailer is P_1. In this case, a Quantity of the allocated storage locations for the standard trailer = P_Q/Monthly replenishment frequency corresponding to the standard trailer/P1.

[0065] S304: Confirming the initial storage location allocation information based on the quantity of the allocated storage locations of the target outbound specification.

[0066] It should be understood that, step S301 to step S304 are for confirming the initial storage location allocation information for the target product. When there are a plurality of

products, each product may be used as the target product, so that the initial storage location allocation information is confirmed for the plurality of products.

[0067] For example, each product is separately confirmed as the target product; a capacity of a single storage location in the target warehouse, a loading rate at which the target product is loaded in the single storage location on a basis of the target outbound specification and the volume of the target outbound specification are acquired; the quantity of specifications that the target product is loaded in the single storage location on a basis of the target outbound specification is confirmed based on the capacity of the single storage location in the target warehouse, the loading rate at which the target product is loaded in the single storage location on a basis of the target outbound specification and the volume of the target outbound specification; the quantity of the allocated storage locations for the target outbound specification of the target product is confirmed based on the historical outbound information and the quantity of the specifications that the target product is loaded in the single storage location on a basis of the target outbound specification, to obtain the quantity of allocated storage locations for a target outbound specification of each product; and the initial storage location allocation information is confirmed based on the quantity of allocated storage locations for the target outbound specification of each product.

[0068] In an exemplary embodiment, when the at least one type of target outbound specification includes one type of target outbound specification, steps S301 to S304 are performed for one type of target outbound specification, and the initial storage location allocation information of the target warehouse is the quantity of allocated storage locations for the target outbound specification.

[0069] In another exemplary embodiment, in order to meet diverse outbound strategies, the at least one type of target outbound specification includes a plurality of types of target outbound specifications, and the plurality of types of target outbound specifications include a standard trailer, a standard container, and a standard carton. For example, an outbound strategy is: the target product may be performed outbound operation by using a standard trailer, and is performed outbound operation in the form of standard trailer; the target product cannot be performed outbound operation by using a standard trailer, but may be performed outbound operation by using a standard container, and is performed outbound operation in the form of the standard container; or the target product cannot be performed outbound operation by using a standard trailer or a standard container, and is performed outbound operation in the form of standard carton.

[0070] For the plurality of types of target outbound specifications, through step S302, the following may be obtained: a quantity of standard trailers that the target product is loaded in the storage location (that is, a single storage location) on a basis of the standard trailer, a quantity of standard containers that the target product is loaded in the storage location (that is, a single storage location) on a basis of the standard container, and a quantity of standard cartons that the target product is loaded in the storage location (that is, a single storage location) on a basis of the standard carton.

[0071] The historical outbound information includes a total quantity of historical outbound pieces, and step S303 may include: confirming a total quantity of outbound standard trailers, a total quantity of outbound standard containers and a total quantity outbound standard cartons based on the total quantity of historical outbound pieces and an outbound strategy; acquiring a monthly replenishment frequency corresponding to the standard trailer, a monthly replenishment frequency corresponding to the standard container and a monthly replenishment frequency corresponding to the standard carton within the historical time period; confirming a monthly average quantity of outbound standard trailers, a monthly average quantity of outbound standard containers and a monthly average quantity of outbound standard cartons based on the total quantity of outbound standard trailers, the total quantity of outbound standard containers and the total quantity outbound standard cartons; and separately confirming, based on the monthly average quantity of outbound standard trailers, the monthly replenishment frequency corresponding to the standard trailer, the quantity of standard trailers that the target product is loaded in the storage location on a basis of the standard trailer, the monthly average quantity of outbound standard containers, the monthly replenishment frequency corresponding to the standard container, the quantity of standard containers that the target product is loaded in the storage location on a basis of the standard container, the monthly average quantity of outbound standard cartons, the monthly replenishment frequency corresponding to the standard carton, and the quantity of standard cartons that the target product is loaded in the storage location on a basis of the standard carton, the quantity of allocated storage locations for the standard trailer, the quantity of allocated storage locations for the standard container and the quantity of allocated storage locations for the standard carton respectively.

[0072] The total quantity of outbound standard trailers is the quantity of standard trailers that are performed outbound operation on a basis of the standard trailer, the total quantity of outbound standard containers is the quantity of standard containers that are performed outbound operation on a basis of the standard container, and the total quantity of outbound

standard cartons is the quantity of standard cartons that are performed outbound operation on a basis of the standard carton.

[0073] Total quantity of outbound standard trailers = [Total quantity of historical outbound pieces/Total quantity of target products when the standard trailer is fully loaded with the target products]. For example, the total quantity of historical outbound pieces of the target product is 1021 pieces, and the total quantity of target products when the standard trailer is fully loaded with the target products is 100 pieces. In this case, Total quantity of historical outbound pieces/Total quantity of target products when the standard trailer is fully loaded with the target products = 1021/100 = 10.21, and the total quantity of outbound standard trailers = [10.21] = 10.

[0074] Total quantity of outbound standard containers = [(Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products)/Total quantity of target products when the standard container is fully loaded with the target products]. For example, the total quantity of target products when the standard container is fully loaded with the target products is 20 pieces, Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products = 1021 – 10 * 100 = 21, (Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products)/Total quantity of target products when the standard container is fully loaded with the target products = 21/20=1.05, and Total quantity of outbound standard containers = [1.05]=1.

[0075] Total quantity of outbound standard cartons = [Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products – Total quantity of outbound standard containers * Total quantity of target products when the standard container is fully loaded with the target products/Total quantity of target products when the standard carton is fully loaded with the target products]. For example, the total quantity of target products when the standard carton is fully loaded with the target products is 10 pieces, Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products – Total quantity of outbound standard containers * Total quantity of target products when the standard container is fully loaded with the target products/Total quantity of target products when the standard carton is fully loaded with the target products = (1021 – 10*100 – 1*20)/10 = 0.1, and Total quantity of outbound

standard cartons = [0.1]=1. It should be understood that, if Total quantity of historical outbound pieces – Total quantity of outbound standard trailers * Total quantity of target products when the standard trailer is fully loaded with the target products – Total quantity of outbound standard containers * Total quantity of target products when the standard container is fully loaded with the target products/Total quantity of target products when the standard carton is fully loaded with the target products = 1.1, Total quantity of outbound standard cartons = [1.1] = 2.

[0076] That is, through the foregoing example, a preset outbound strategy is may be obtained as follows: 1000 target products out of the 1021 target products may be performed outbound operation through 10 standard trailers, 20 target products out of the 1021 target products may be performed outbound operation through 1 standard container, and 1 target product out of the 1021 target products may be performed outbound operation through one standard carton.

[0077] When the target outbound specification is the standard trailer, the monthly average quantity of outbound standard trailers is P_Q, and the quantity of standard trailers that the target product is loaded in the single storage location on a basis of the standard trailer is P_1. In this case, Quantity of allocated storage locations for the standard trailer = P_Q/Monthly replenishment frequency corresponding to the standard trailer/P1.

[0078] When the target outbound specification is the standard container, the monthly average quantity of outbound standard containers is C_Q, and the quantity of standard containers that the target product is loaded in the single storage location on a basis of the standard container is P2. In this case, Quantity of allocated storage locations for the standard container = C_Q/Monthly replenishment frequency corresponding to the standard container/P2.

[0079] When the target outbound specification is the standard carton, the monthly average quantity of outbound standard cartons is U_Q, and the quantity of standard cartons that the target product is loaded in the single storage location is P3. In this case, Quantity of allocated storage locations for the standard carton = U_Q/Monthly replenishment frequency corresponding to the standard carton/P3.

[0080] Through the foregoing steps, the quantity of allocated storage locations for the standard trailer, the quantity of allocated storage locations for the standard container, and the quantity of allocated storage locations for the standard carton may be obtained. Therefore, the initial storage location allocation information of the target warehouse includes the quantity of allocated storage locations for the standard trailer, the quantity of allocated storage locations for the standard container, and the quantity of allocated storage locations for the standard carton.

[0081] That is, step S302 is used for confirming the quantity of specifications for one type of target outbound specification. When there are a plurality of types of outbound specifications, a

corresponding specification quantity is acquired for each type of target outbound specification according to the method of step S302.

[0082] For example, each outbound specification of a target product is confirmed as a target outbound specification to obtain the quantity of allocated storage locations for the target outbound specification of the target product; each product is confirmed as the target product to obtain the quantity of allocated storage locations for each outbound specification of each product; and the quantity of allocated storage locations for each outbound specification of each product is confirmed as the initial storage location allocation information.

[0083] In another exemplary embodiment, when i = 2, step S201 may include: increasing an initial quantity of allocated storage locations to obtain storage location allocation information at the 2^{nd} repetition.

[0084] It should be understood that, regardless of the quantity of repetitions, if the product replenishment information does not satisfy the preset allocation condition, a target product that does not satisfy the preset allocation condition and a corresponding target outbound specification are acquired, and the quantity of allocated storage locations (for example, an initial quantity of allocated storage locations) for the target outbound specification of the target product is increased to obtain updated storage location allocation information (for example, storage location allocation information at the 2^{nd} repetition).

[0085] In an exemplary embodiment, as shown in FIG. 4, step S202 includes the following steps.

[0086] S401: Confirming a replenishment lower limit quantity at the i^{th} repetition of the target outbound specification based on the quantity of the allocated storage locations at the i^{th} repetition and a quantity of specifications that the target product is loaded in a single storage location on a basis of the target outbound specification.

[0087] In an exemplary embodiment, the replenishment lower limit quantity for the target outbound specification is confirmed based on the quantity of allocated storage locations for the target outbound specification, a preset proportion of storage locations for replenishment, and the quantity of specifications that the target product is loaded in a single storage location on a basis of the target outbound specification.

[0088] Replenishment lower limit quantity for the target outbound specification = Quantity of allocated storage locations for the target outbound specification * Preset proportion of storage locations for replenishment * Quantity of specifications that the target product is loaded in the storage location on a basis of the target outbound specification.

[0089] Replenishment lower limit quantity for the standard trailer = Quantity of allocated storage locations for the standard trailer * Preset proportion of storage locations for replenishment * Quantity of standard trailers that the target product is loaded in the storage location on a basis of the standard trailer.

[0090] Replenishment lower limit quantity for the standard container = Quantity of allocated storage locations for the standard container * Preset proportion of storage locations for replenishment * Quantity of standard containers that the target product is loaded in the storage location on a basis of the standard container.

[0091] Replenishment lower limit quantity for the standard carton = Quantity of allocated storage locations for the standard carton * Preset proportion of storage locations for replenishment * Quantity of standard cartons for the target product loaded in the storage location on a basis of the standard carton.

[0092] When a proportion of remaining storage locations for a certain target outbound specification to allocated storage locations for the target outbound specification is lower than a preset proportion of storage locations for replenishment, replenishment is initiated. For example, the target outbound specification is the standard trailer, the quantity of allocated storage locations for the standard trailer is 10, and the preset proportion of storage locations for replenishment is 30%. When the quantity of remaining storage locations for the standard trailer is less than 3, replenishment is initiated. The quantity of standard trailers that the target product is loaded in a single storage location on a basis of the standard trailer is 5, and the replenishment lower limit quantity for the standard trailer is 10*30%*5=15, which means that replenishment is triggered when there are 15 remaining standard trailers.

[0093] S402: Confirming a replenishment upper limit quantity of storage locations at the i^{th} repetition of the target outbound specification based on the historical outbound information, the replenishment lower limit quantity at the i^{th} repetition, and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification.

[0094] A daily historical outbound quantity of the target product outbound on a basis of the target outbound specification is confirmed based on the historical outbound information, and the monthly replenishment frequency corresponding to the target outbound specification is acquired; and a replenishment upper limit quantity of storage locations for the target outbound specification is confirmed based on the daily historical outbound quantity of the target product on a basis of the target outbound specification, the monthly replenishment frequency corresponding to the target outbound specification, the replenishment lower limit quantity, and

the quantity of specifications that the target product is loaded in the storage location on a basis of the target outbound specification.

[0095] For example, when the target outbound specification is the standard trailer, the monthly average quantity of outbound standard trailers that the target product is loaded in the target storage location on a basis of the standard trailer is confirmed based on the daily historical outbound quantity of the target product which is performed outbound operation on a basis of the standard trailer, and the monthly replenishment frequency corresponding to the standard trailer is obtained; and the replenishment upper limit quantity of storage locations for the standard trailer is confirmed based on the monthly average quantity of outbound standard trailers, the monthly replenishment frequency corresponding to the standard trailer, the replenishment lower limit quantity for the standard trailer, and the quantity of standard trailers that the target product is loaded in the single storage location on a basis of the standard trailer.

[0096] Replenishment upper limit quantity of storage locations for the standard trailer = [(Monthly average quantity of outbound standard trailers/Monthly replenishment frequency corresponding to the standard trailer + Replenishment lower limit quantity for the standard trailer)/Quantity of standard trailers that the target product is loaded in a single storage location on a basis of the standard trailer].

[0097] Replenishment upper limit quantity of storage locations for the standard container = [(Monthly average quantity of outbound standard containers/Monthly replenishment frequency corresponding to the standard container + Replenishment lower limit quantity for the standard container)/Quantity of standard containers that the target product is loaded in a single storage location on a basis of the standard container].

[0098] Replenishment upper limit quantity of storage locations for the standard carton = [(Monthly average quantity of outbound standard cartons/Monthly replenishment frequency corresponding to the standard carton + Replenishment lower limit quantity for the standard carton)/Quantity of standard cartons that the target product is loaded in a single storage location on a basis of the standard carton].

[0099] For example, the monthly average quantity of outbound standard trailers is 20, the monthly replenishment frequency corresponding to the standard trailer is 2 times, the replenishment lower limit quantity for the standard trailer is 2, and the quantity of standard trailers that the target product is loaded in a single storage location on a basis of the standard trailer is 5. [(Monthly average quantity of outbound standard trailers/Monthly replenishment frequency corresponding to the standard trailer + Replenishment lower limit quantity for the standard trailer)/Quantity of standard trailers that the target product is loaded in a single storage

location on a basis of the standard trailer] = [(20/2+2)/5] = 3, and Replenishment upper limit quantity of storage locations for the standard trailer = 3. In other words, there are 3 storage locations that need replenishment. However, if the calculated replenishment upper limit quantity of storage locations is greater than the quantity of allocated storage locations at the i^{th} repetition, the replenishment upper limit quantity of storage locations is the quantity of allocated storage locations at the i^{th} repetition.

[0100] S403: Confirming a replenishment upper limit quantity at the i^{th} repetition of the target outbound specification based on the upper limit quantity of the storage locations at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification.

[0101] Replenishment upper limit quantity for the standard trailer = Replenishment upper limit quantity of storage locations for the standard trailer * Quantity of standard trailers that the target product is loaded in a single storage location on a basis of the standard trailer.

[0102] Replenishment upper limit quantity for the standard container = Replenishment upper limit quantity of storage locations for the standard container * Quantity of standard containers that the target product is loaded in a single storage location on a basis of the standard container.

[0103] Replenishment upper limit quantity for the standard carton = Replenishment upper limit quantity of storage locations for the standard carton * Quantity of standard cartons that the target product is loaded in a single storage location on a basis of the standard carton.

[0104] S404: Performing the simulated replenishment for the target warehouse based on the replenishment lower limit quantity at the i^{th} repetition, the replenishment upper limit quantity at the i^{th} repetition and the historical outbound information, to obtain the product replenishment information at the i^{th} repetition for the target product.

[0105] The historical outbound information includes a daily historical outbound quantity and a daily pre-outbound stock quantity.

[0106] A historical outbound quantity and a pre-outbound stock quantity on a preset historical date within the historical time period are respectively determined as a current outbound quantity and a current pre-outbound stock quantity; and replenishment is performed based on the current outbound quantity, the current pre-outbound stock quantity, the replenishment upper limit quantity at the i^{th} repetition and the replenishment lower limit quantity at the i^{th} repetition, to obtain a current post-replenishment stock quantity on the preset historical date.

[0107] If the current pre-outbound stock quantity is less than the current outbound quantity, emergency replenishment is triggered, and the current pre-outbound stock quantity is replenished to the replenishment upper limit quantity, so as to obtain the current post-

replenishment stock quantity on the preset historical date; if the current pre-outbound stock quantity is greater than or equal to the current outbound quantity, and a remaining stock quantity obtained after a current outbound round is completed is lower than the replenishment lower limit quantity, daily replenishment is triggered to replenish the remaining stock quantity to the replenishment upper limit quantity, so as to obtain the current post-replenishment stock quantity on the preset historical date; or if the current pre-outbound stock quantity satisfy the current outbound quantity, and a remaining stock quantity obtained after a current outbound round is completed is higher than the replenishment lower limit quantity, no replenishment operation is triggered, and a current stock level is maintained.

[0108] The current post-replenishment stock quantity on the preset historical date is confirmed as a new current pre-outbound stock quantity and a historical outbound quantity on a day after the preset historical date is confirmed as a new current outbound quantity to perform iterative replenishment, to obtain a historical daily post-replenishment stock quantity.

[0109] In addition, in the related art, a position of a storage location of a product is usually determined based on manual experience, that is, which product is placed on which storage location is manually determined. Given complex scenarios and scenarios with a large quantity of storage location types, it is difficult to dynamically configure positions of storage locations for products in the warehouse to ensure that storage location distribution of all products is at an appropriate level and to improve outbound efficiency of products and reduce the quantity of replenishment times and warehouse costs. For example, for hot-selling products, placing them in an area close to a picking cart and/or a packaging area will reduce a walking distance of a picking staff and improve picking efficiency. However, manually determining a position of a storage location for a product inevitably leads to incomprehensive consideration for which products are hot-selling and which products are unpopular, resulting in an unappropriated distribution of storage locations for all products.

[0110] In view of this, the warehouse storage location allocation method further includes: confirming monthly average outbound quantities and monthly replenishment frequencies of all products based on historical outbound information; acquiring an outbound median value of the monthly average outbound quantities of all the products and a frequency median value of the monthly replenishment frequencies of all the products; classifying all the products into a preset quantity of product sets based on the outbound median value and the frequency median value; and confirming positions of products in the preset quantity of product sets in the target warehouse based on a storage location priority sorting result.

[0111] Monthly average outbound quantities and monthly replenishment frequencies of all products are acquired based on the historical outbound information; and a median outbound value of a plurality of average monthly outbound quantities and a median frequency value of a plurality of monthly replenishment frequencies are acquired. For example, if the plurality of average monthly outbound quantities are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, the median outbound value is 5.5; and if the plurality of monthly replenishment frequencies are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, the median frequency value is 5.5.

[0112] All products are classified into four product sets based on the outbound median value and the frequency median value. For example, a product whose monthly average outbound quantity is greater than the outbound median and whose monthly replenishment frequency is greater than the frequency median is classified into a set of products with high outbound quantities and high frequencies, a product whose monthly average outbound quantity is less than the outbound median and whose monthly replenishment frequency is greater than the frequency median is classified into a set of products with low outbound quantities and high frequencies, a product whose monthly average outbound quantity is greater than the outbound median and whose monthly replenishment frequency is less than the frequency median is classified into a set of products with high outbound quantities and low frequencies, and a product whose monthly average outbound quantity is less than the outbound median and whose monthly replenishment frequency is less than the frequency median is classified into a set of products with low outbound quantities and low frequencies.

[0113] Monthly average outbound quantities of products in each product set are sorted in descending order. For example, in a set of products with high outbound quantities and high frequencies, there are three products whose monthly average outbound quantities are 8, 9, and 10, respectively, a product with a high ranking (for example, the product with an monthly average outbound quantity of 10) is placed in an area close to a picking cart and/or a packaging area, thereby reducing a walking distance of picking personnel and improving picking efficiency.

[0114] The picking-related personnel may number storage locations in three areas (for example, a storage area, a picking area, and a flow rack picking area), and sort the numbers by priority to provide a specific storage location priority sorting result.

[0115] A storage location priority sorting result of the target warehouse is acquired, where the storage location priority sorting result includes a priority of each storage location; and positions of products from the four product sets in the target warehouse are confirmed based on the storage location priority sorting result, and the products from the four product sets are

sequentially placed into storage locations of corresponding positions. Priorities for placing the products from the following set into storage locations decrease in sequence: the set of products with high outbound quantities and high frequencies, the set of products with low outbound quantities and high frequencies, the set of products with high outbound quantities and low frequencies, and the set of products with low outbound quantities and low frequencies. Priorities for placing products in a same product set increase with monthly average outbound quantities.

[0116] In an exemplary embodiment, it is determined, based on a preset cycle, whether a product whose product set has changed among a plurality of products in the target warehouse. If there is a product whose product set has changed, S201 to S203 and (d) are repeated to dynamically update the target storage location allocation information of the target warehouse.

[0117] For example, in the set of products with high outbound quantities and high frequencies, product A is a hot-selling product, which is allocated with more storage locations having a higher priority for storage location positions. However, after a period of time, the product A is no longer a hot-selling product. In this case, it is unnecessary to allocate more storage locations and a higher priority for the storage location locations for it. Therefore, target storage location allocation information for the product A is re-confirmed.

[0118] An embodiment of the present application further provides a warehouse storage location allocation method. A difference between this allocation method and the allocation method described above lies in that in the allocation method described above, simulated replenishment is performed for the target warehouse to obtain product replenishment information, while in this allocation method, a simulated outbound operation is performed for the target warehouse to obtain outbound information. Except for the difference above, other content of the two methods is similar, and details are not described herein again, please refer to the foregoing embodiments for details. As shown in FIG. 5, this allocation method includes the following content.

[0119] S501: Acquiring storage location allocation information at an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2.

[0120] S502: Performing a simulated outbound operation for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound

information within a historical time period, to obtain outbound information at the i^{th} repetition of the target product, where the outbound information at the i^{th} repetition includes at least one of following indicators: product replenishment times or a coefficient of variation indicating outbound stability of the target product at the i^{th} repetition.

[0121] The historical outbound information may include a historical outbound quantity of the target product outbound on a basis of each outbound specification. For example, the historical outbound quantity includes an outbound quantity of the target product within historical six months; an outbound quantity on January 1 was that 2 target products were performed outbound operation for the first time, 3 target products were performed outbound operation for the second time, and 2 target products were performed outbound operation for the third time; an outbound quantity on January 2 was that 2 target products were performed outbound operation for the first time, 3 target products were performed outbound operation for the second time, and 1 target product was performed outbound operation for the third time; and so on. In this way, an outbound quantity of the target product for each outbound operation in the 6 months from January 1 to July 1 is obtained.

[0122] The simulated outbound operation refers to a future outbound operation assumed based on the historical outbound quantity. A process of performing the simulated outbound operation is related not only to replenishment for the target product, but also to an outbound situation of the target product. There may be a demand for replenishment only when products are continuously performed outbound operation. Therefore, the simulated outbound operation may also be understood as simulated replenishment.

[0123] For example, the simulated outbound operation may be performed by using an existing dynamic stock model, secure stock model, or integer linear programming model, or the like.

[0124] The initial storage location allocation information may include the quantity of allocated storage locations when the target product is performed outbound operation on a basis of a target outbound specification. For example, the quantity of allocated storage locations when the target product is performed outbound operation on a basis of the target outbound specification is 2. In this case, the model performs an outbound operation on the target product in 2 storage locations based on an outbound quantity of the target product within the historical 6 months. Same as the outbound quantity on January 1, an outbound quantity on the first day was that 2 target products were performed outbound operation for the first time, 3 target products were performed outbound operation for the second time, and 2 target products were performed outbound operation for the third time; same as the outbound quantity on January 2, an outbound quantity on the second day was that 2 target products were performed outbound

operation for the first time, 3 target products were performed outbound operation for the second time, and 1 target product was performed outbound operation for the third time; and so on. In this way, an outbound quantity of the target product for each outbound operation in the 6 months is simulated.

[0125] During the process in which the model performs the simulated outbound operation, there may be a need for replenishment. For example, each of the two storage locations is able to store 5 standard containers. On the first day, 2 standard containers were performed outbound operation for the first time, 3 standard containers were performed outbound operation for the second time, and 2 standard containers were performed outbound operation for the third time, with 3 remaining standard containers left. However, 3 standard containers are probably not able to meet a subsequent outbound requirement, and therefore a replenishment is carried out in this case, that is, daily replenishment is performed. For another example, on the first day, 2 standard containers were performed outbound operation for the first time, 3 standard containers were performed outbound operation for the second time, and 2 standard containers were performed outbound operation for the third time, with 3 standard containers left. On the second day, 2 standard containers were performed outbound operation for the first time, with 1 standard container left, and 3 standard containers needs to be performed outbound operation for the second time, but 1 standard container cannot meet the second outbound operation. Therefore, a replenishment is carried out before the second outbound operation, that is, emergency replenishment is performed.

[0126] Therefore, the foregoing model simulates an outbound process of the target warehouse based on the initial storage location allocation information and the historical outbound information to obtain the product replenishment times. The product replenishment times include the quantity of emergency replenishment times initiated for each product. When an outbound quantity of the target product in the target warehouse is greater than a pre-outbound stock quantity, emergency replenishment is initiated. The product replenishment times further include the quantity of daily replenishment times that daily replenishment is initiated for the target product. When a remaining quantity of the target product in the target warehouse is small, daily replenishment is initiated.

[0127] Since this allocation method uses a repeated execution method, product replenishment times are obtained by counting product replenishment times within a preset time period. For example, product replenishment times within 6 months are 100 times. That is, a repeated execution process is completed within the preset time period.

[0128] In addition, as described above, the model performs an outbound operation on the target product in the two storage locations based on an outbound quantity of the target product in historical 6 months, thereby obtaining an outbound quantity of the target product for each outbound operation in the 6 months. By calculating an average value and a standard deviation of outbound quantities of the target product in the six months, a coefficient of variation representing outbound stability of the target product is obtained. The coefficient of variation is also referred to as a coefficient of dispersion. The coefficient of dispersion is a normalized measure of a degree of dispersion of a probability distribution, and it is defined as a ratio of the standard deviation to the average value.

[0129] It should be understood that, a scenario in which the outbound stability of the target product is poor is as follows: An outbound quantity of the target product for the first outbound operation is 2 pieces, an outbound quantity of the target product for the second outbound operation is 50 pieces, and an outbound quantity of the target product for the third outbound operation is 200 pieces. It should be understood that, a scenario in which the outbound stability of the target product is good is as follows: An outbound quantity of the target product for the first outbound operation is 2 pieces, an outbound quantity of the target product for the second outbound operation is 2 pieces, and an outbound quantity of the target product for the third outbound operation is 3 pieces. The examples above are merely for understanding what the outbound stability refers to, and are not intended to limit the present application.

[0130] Therefore, the foregoing model simulates an outbound process of the target warehouse based on the initial storage location allocation information and the historical outbound information to obtain the coefficient of variation representing the outbound stability of the target product.

[0131] Similarly, the coefficient of variation is obtained by calculating a ratio of an average outbound quantity to a standard deviation of the target product within the preset time period. For example, if the quantity of product outbound operations within 6 months is 100 times, the coefficient of variation is obtained by calculating a ratio of the average outbound quantity of the 100 outbound operations to the standard deviation.

[0132] The preset time period may be the same as duration of the historical time period, or may be a portion of the duration of the historical time period. For example, the duration of the historical time period is 6 months, and the preset time period is also 6 months; and for another example, the duration of the historical time period is 6 months, and the preset time period is merely 3 months.

[0133] It should be noted that, the model is not only able to output the product replenishment times and the coefficient of variation, but also is able to output a replenishment cost, replenishment time, and the like, which may be set according to a specific situation.

[0134] S503: Determining whether the outbound information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that the at least one indicator is less than a corresponding preset indicator value.

[0135] A large value of product replenishment times indicates that the quantity of allocated storage locations is insufficient, which leads to a requirement for a plurality of replenishments. If a sufficient quantity of storage locations are allocated, replenishment does not occur. A large coefficient of variation indicates a more unstable product outbound quantity, which means a larger probability of replenishment. If a sufficient quantity of storage locations are allocated, the probability of replenishment decreases.

[0136] When the at least one indicator includes merely the product replenishment times, the preset indicator value is a preset quantity of replenishment times, and the preset allocation condition is that the product replenishment times are less than the preset quantity of replenishment times. For example, the quantity of emergency replenishment times of the target product is less than the preset quantity of replenishment times, or the quantity of daily replenishment times of the target product is less than the preset quantity of replenishment times, or a sum of the quantity of emergency replenishment times of the target product and the quantity of daily replenishment times of the target product is less than the preset quantity of replenishment times. The preset quantity of replenishment times may be set according to a specific situation. For example, the preset quantity of replenishment times may be 3 times.

[0137] When the at least one indicator includes merely the coefficient of variation, the preset indicator value is a preset coefficient value, and the preset allocation condition is that the coefficient of variation is less than the preset coefficient value. The preset coefficient value may be set according to a specific situation. For example, the preset coefficient value may be 0.7.

[0138] When the at least one indicator includes the product replenishment times and the coefficient of variation, the preset indicator value may be a preset quantity of replenishment times, the preset indicator value may alternatively be a preset coefficient value, and the preset allocation condition may be that product replenishment times are less than the preset quantity of replenishment times and the coefficient of variation is less than the preset coefficient value, or the preset allocation condition may be that the product replenishment times are less than the

preset quantity of replenishment times, or the coefficient of variation is less than the preset coefficient value.

[0139] In an exemplary embodiment, the allocation method further includes: Confirming that the outbound information at the i^{th} repetition satisfies the preset allocation condition; and confirming the storage location allocation information at the i^{th} repetition as the target storage location allocation information. For example, when i = 1, it is confirmed that the initial outbound information satisfies the preset allocation condition; and the initial storage location allocation information is confirmed as the target storage location allocation information.

[0140] When the outbound information at the i^{th} repetition satisfies the preset allocation conditions, it means that the quantity of allocated storage locations is accurate and appropriate. Therefore, the storage location allocation information at the i^{th} repetition is directly confirmed as the target storage location allocation information.

[0141] In another exemplary embodiment, this allocation method further includes: (x) Confirming that the outbound information at the i^{th} repetition does not satisfy the preset allocation condition; and repeating the foregoing steps S501 to S503 and step (x) until an n^{th} repetition to obtain outbound information of the n^{th} repetition that satisfies the preset allocation condition, and confirming storage location allocation information at the n^{th} repetition as the target storage location allocation information.

[0142] The foregoing repeating process is the same as the repeating process described in step S203, and details are not described herein again.

[0143] In an exemplary embodiment, the outbound information at the i^{th} repetition includes the product replenishment times at the i^{th} repetition, and the historical outbound information includes a historical outbound quantity of each outbound operation within the historical time period. Therefore, as shown in FIG. 6, step S502 may include the following steps.

[0144] S601: Performing the outbound operation on the target product loaded in the allocated storage location at the i^{th} repetition based on a historical outbound quantity of the outbound operation at a preset x^{th} time within the historical time period to obtain a current stock quantity.

[0145] An outbound operation is performed on the target product based on the historical outbound quantity of the preset x^{th} time of outbound operation. For example, as described above, the historical outbound quantity includes an outbound quantity of the target product within historical 6 months. For example, an outbound quantity on January 1 was 2 target products that were performed outbound operation for the first time, 3 target products that were performed outbound operation for the second time, and 2 target products that were performed outbound operation for the third time. The quantity of allocated storage locations at the i^{th}

repetition is 2. When the target products from the 2 storage locations are performed outbound operation, same as the outbound quantity on January 1st, an outbound quantity on the first day is 2 target products for the first time, 3 target products for the second time, and 2 target products for the third time. Therefore, each time the target product is performed outbound operation, there is a corresponding stock quantity. For example, if a total stock quantity is 10, a stock quantity obtained after the first outbound operation is 10–2=8, and a stock quantity obtained after the second outbound operation is 8–3=5.

[0146] In an example, the preset x^{th} time corresponds to a current ordinal number. For example, if the preset x^{th} time is the first time on January 1, the current ordinal number refers to the first time on the first day. However, this is not limited in the embodiments of the present application. If the preset x^{th} time is the second time on January 1, the current ordinal number may also refer to the first time on the first day, provided that the target product in the allocated storage location at the i^{th} repetition is performed outbound operation based on a general outbound trend of the target product within the historical time period.

[0147] S602: Confirming whether to perform replenishment for the target product.

[0148] In an exemplary embodiment, whether to perform replenishment for the target product is confirmed based on the current stock quantity and the replenishment lower limit quantity of the i^{th} repetition.

[0149] When the stock quantity is less than the replenishment lower limit quantity, it means that the stock quantity is very low and daily replenishment may be performed. When the stock quantity is greater than the replenishment lower limit, it means that the stock quantity is still large and there is no requirement for daily replenishment.

[0150] In an exemplary embodiment, it is confirmed, based on the current stock quantity, a historical outbound quantity of a next outbound operation subsequent to the preset x^{th} time of outbound operation and the replenishment lower limit quantity at the i^{th} repetition, whether to perform replenishment for the target product.

[0151] The preset x^{th} time and the next time subsequent to the preset x^{th} time are two consecutive times. For example, if the preset x^{th} time is the first time on January 1, the next time subsequent to the preset x^{th} time refers to the second time on January 1.

[0152] If the current stock quantity is less than the historical outbound quantity of the next outbound operation subsequent to the preset x^{th} time, emergency replenishment is performed; or if the current stock quantity is greater than or equal to the historical outbound quantity of the next outbound operation subsequent to the preset x^{th} time, and a remaining stock quantity obtained after an outbound operation is performed based on the historical outbound quantity of

the next outbound operation subsequent to the preset x^{th} time is less than the replenishment lower limit quantity at the i^{th} repetition, daily replenishment is performed; or if the current stock quantity is greater than the historical outbound quantity of the next outbound operation subsequent to the preset x^{th} time, and a remaining stock quantity obtained after an outbound operation is performed based on the historical outbound quantity of the next outbound operation subsequent to the preset x^{th} time is greater than the replenishment lower limit quantity at the i^{th} repetition, no replenishment is performed and a current stock level is maintained.

[0153] S603: When it is confirmed that the target product does not require replenishment, repeating the steps 601 and 602 j times until it is confirmed that replenishment is required for the target product, where j is an integer greater than or equal to 1.

[0154] When it is confirmed that there is no requirement to perform replenishment for the target product, an outbound operation continues to be performed on the target product in the allocated storage location at the i^{th} repetition based on a general outbound trend of the target product within the historical time period, and then it is confirmed whether to perform replenishment for the target product. In other words, the process of performing the outbound operation + confirming whether to perform replenishment is repeated j times until it is confirmed to perform replenishment for the target product.

[0155] S604: Performing replenishment for the target product when it is confirmed that replenishment is required for the target product.

[0156] In an exemplary embodiment, replenishment is performed for the target product based on the replenishment upper limit at the i^{th} repetition. The allocated storage location at the i^{th} repetition is replenished with the target product with the replenishment upper limit quantity at the i^{th} iteration. For example, if the replenishment upper limit quantity at the i^{th} repetition is 10, the allocated storage location at the i^{th} repetition is replenished with 10 target products.

[0157] In addition, after the allocated storage location at the i^{th} repetition is replenished with the target product with the replenishment upper limit quantity at the i^{th} iteration, a post-replenishment stock quantity is obtained. Based on the post-replenishment stock quantity, it is confirmed whether the quantity of allocated storage locations at the i^{th} repetition is appropriate. As described above, when the coefficient of variation is large, the quantity of storage locations is increased. However, outbound stability of the target product may be poor merely in a period of time, and it is good in most of the time, and therefore the quantity of storage locations should not be increased. Therefore, by confirming the post-replenishment stock quantity obtained after each replenishment, it is confirmed whether some storage locations are always empty. If they are always empty, it means that the quantity of allocated storage locations is too large.

[0158] S605: Repeating the steps S601 to S604 m times to obtain the product replenishment times at the i^{th} repetition, where m is an integer greater than or equal to 1.

[0159] After replenishment is performed for the target product, an outbound operation will continue to be performed on the target product, then it is confirmed whether to perform replenishment for the target product, and then replenishment is performed for the target product. After the process of performing the outbound operation + confirming whether to perform replenishment + performing replenishment m times, the product replenishment times at the i^{th} repetition may be obtained.

[0160] As described above, the product replenishment times at the i^{th} repetition is obtained by counting product replenishment times within a preset time period, where the preset time period includes not merely time spent on a process of repeated execution, but also time spent on repeatedly executing the foregoing process.

[0161] However, it should be noted that, a value of m is not specifically limited in the present embodiment of the present application, and a person skilled in the art can set it according to an actual situation. For example, the process of performing the outbound operation + confirming whether to perform replenishment + performing replenishment 5 times.

[0162] In an exemplary embodiment, as described above, the outbound information at the i^{th} repetition includes the coefficient of variation at the i^{th} repetition, and the historical outbound information includes a historical outbound quantity of each outbound operation within the historical time period. Therefore, step S502 may include the following steps: (k) Performing an outbound operation on the target product loaded in an allocated storage location at the i^{th} repetition based on a historical outbound quantity of a preset x^{th} time of outbound operation within the historical time period to obtain a current outbound quantity; repeating the step (k) q times to obtain a plurality of outbound quantities, where q is an integer greater than or equal to 1; and calculating an average value of the plurality of outbound quantities and a standard deviation of the plurality of outbound quantities, and confirming the coefficient of variation based on the average value and the standard deviation.

[0163] After each outbound operation, an outbound quantity is obtained. Therefore, by repeating the outbound operation q times, (q+1) outbound quantities may be obtained. An average value of the (q+1) outbound quantities and a standard deviation of the (q+1) outbound quantities are calculated, and a ratio of the average value to the standard deviation is calculated to obtain the coefficient of variation.

[0164] The embodiments of the method of the present application are described in detail above with reference to FIG. 1 to FIG. 6. Embodiments of apparatus of the present application

are described in detail below with reference to FIG. 7 and FIG. 8. It should be understood that, the descriptions of the embodiments of the method correspond to the descriptions of the embodiments of the apparatus, and therefore, for portions that are not described in detail herein, please refer to the foregoing method embodiments.

[0165] In order to better implement the warehouse storage location allocation method in the embodiment of the present application, based on the warehouse storage location allocation method, an embodiment of the present application further provides a warehouse storage location allocation apparatus, and the warehouse storage location allocation apparatus is integrated in an electronic device. As shown in FIG. 7, the warehouse storage location allocation apparatus 700 includes an acquiring module 701, a simulation module 702, and a determining module 703.

[0166] The acquiring module 701 is configured to: (a) acquire storage location allocation information of an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2.

[0167] The simulation module 702 is configured to: (b) perform simulated replenishment for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain product replenishment information at the i^{th} repetition for the target product, where the product replenishment information at the i^{th} repetition includes at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition.

[0168] The determining module 703 is configured to: (c) determine whether the product replenishment information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

[0169] Optionally, the determining module 703 is further configured to: (d) confirm that the product replenishment information at the i^{th} repetition does not satisfy the preset allocation condition; and repeat steps (a) to (d) until an n^{th} repetition to obtain product replenishment information at the n^{th} repetition that meets the preset allocation condition, and confirm storage

location allocation information at the n^{th} repetition as the target storage location allocation information.

[0170] Optionally, the determining module 703 is further configured to: confirm that the product replenishment information at the i^{th} repetition satisfies the preset allocation condition; and confirm storage location allocation information at the i^{th} repetition as the target storage location allocation information.

[0171] Optionally, the product replenishment times information includes a quantity of emergency replenishment times that emergency replenishment is initiated for the target product, the at least one indicator includes the quantity of emergency replenishment times, the corresponding preset indicator value is the preset quantity of replenishment times, and the preset allocation condition is that the quantity of emergency replenishment times is less than the preset quantity of replenishment times.

[0172] Optionally, the daily stock information includes a coefficient of variation of a daily post-replenishment stock quantity of the target product within the historical time period, the at least one replenishment indicator includes the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period, the corresponding preset indicator value is a preset coefficient value, and the preset allocation condition is that the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period is less than the preset coefficient value.

[0173] Optionally, when $i = 2$, the acquiring module 701 is specifically configured to: increase an initial quantity of allocated storage locations to obtain storage location allocation information at a 2^{nd} repetition.

[0174] Optionally, when $i = 1$, the acquiring module 701 is specifically configured to: acquire a capacity of each storage location in at least one storage location in the target warehouse, a loading rate at which the target product is loaded in the at least one storage location by using at least one type of the target outbound specification, and a volume of each type of target outbound specification in the at least one type of the target outbound specification, where the at least one type of the target outbound specification is used for representing a packaging specification in which the target product is loaded in the at least one storage location, and one storage location corresponds to one type of target outbound specification; confirm, based on the capacity of the storage location, the loading rate at which the target product is loaded in the storage location on a basis of the target outbound specification, and the volume of the target outbound specification, a quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification; confirm a quantity of

allocated storage locations of the target outbound specification based on the historical outbound information and the quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification; and confirm the initial storage location allocation information based on the quantity of allocated storage locations of the target outbound specification.

[0175] Optionally, when confirming the quantity of the allocated storage locations of the target outbound specification based on the historical outbound information and the quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification, the acquiring module 701 is specifically configured to: confirm a monthly average quantity of target outbound specifications based on the historical outbound information, and acquire a monthly replenishment frequency corresponding to the target outbound specification; and confirm the quantity of allocated storage locations of the target outbound specification based on the monthly average quantity of the target outbound specifications, the monthly replenishment frequency corresponding to the target outbound specifications, and the quantity of the specifications that the target product is loaded in the storage location on the basis of the target outbound specification.

[0176] Optionally, the simulation module 702 is specifically configured to: confirm a replenishment lower limit quantity at the i^{th} repetition of the target outbound specification based on the quantity of the allocated storage locations at the i^{th} repetition and a quantity of specifications that the target product is loaded in a single storage location on a basis of the target outbound specification; confirm a replenishment upper limit quantity of storage locations at the i^{th} repetition of the target outbound specification based on the historical outbound information, the replenishment lower limit quantity at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification; confirm a replenishment upper limit quantity at the i^{th} repetition of the target outbound specification based on the upper limit quantity of the storage locations at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification; and perform the simulated replenishment for the target warehouse based on the replenishment lower limit quantity at the i^{th} repetition, the replenishment upper limit quantity at the i^{th} repetition and the historical outbound information, to obtain the product replenishment information at the i^{th} repetition for the target product.

[0177] Optionally, the historical outbound information includes a daily historical outbound quantity and a daily pre-outbound stock quantity, and when performing simulated

replenishment for the target warehouse based on the replenishment lower limit quantity at the i^{th} repetition, the replenishment upper limit quantity at the i^{th} repetition and the historical outbound information, to obtain the product replenishment information at the i^{th} repetition for the target product, the simulation module 702 is specifically configured to: confirm a historical outbound quantity and a pre-outbound stock quantity on a preset historical date within the historical time period as a current outbound quantity and a current pre-outbound stock quantity, respectively; perform replenishment based on the current outbound quantity, the current pre-outbound stock quantity, the replenishment upper limit quantity at the i^{th} repetition and the replenishment lower limit quantity at the i^{th} repetition, to obtain a current post-replenishment stock quantity on the preset historical date; and confirm the current post-replenishment stock quantity on the preset historical date as a new current pre-outbound stock quantity and confirm a historical outbound quantity on a day after the preset historical date as a new current outbound quantity and performing iterative replenishment, to obtain a historical daily post-replenishment stock quantity.

[0178] An embodiment of the present application further provides another warehouse storage location allocation apparatus, and this warehouse storage location allocation apparatus is integrated in an electronic device. As shown in FIG. 7, the warehouse storage location allocation apparatus also includes: an acquiring module 701, a simulation module 702, and a determining module 703.

[0179] The acquiring module 701 is further configured to: acquire storage location allocation information of an i^{th} repetition in a target warehouse, where the storage location allocation information at the i^{th} repetition includes a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when $i = 1$, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, where i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2.

[0180] The simulation module 702 is further configured to: perform a simulated outbound operation for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain outbound information at the i^{th} repetition for the target product, where the outbound information at the i^{th} repetition includes at least one of the following indicators: product replenishment times or a coefficient of variation indicating outbound stability of the target product at the i^{th} repetition.

[0181] The determining module 703 is further configured to determine whether the outbound information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, where the preset allocation condition is that the at least one indicator is less than a corresponding preset indicator value.

[0182] Optionally, the historical outbound information includes a historical outbound quantity of each outbound operation within the historical time period, and the outbound information at the i^{th} repetition includes the product replenishment times at the i^{th} repetition. When performing the simulated outbound operation for the target warehouse based on the storage location allocation information at the i^{th} repetition and the historical outbound information, to obtain the product replenishment information at the i^{th} repetition for the target product, the simulation module 702 is specifically configured to: (e) perform the outbound operation on the target product loaded in the allocated storage location at the i^{th} repetition based on a historical outbound quantity of the outbound operation at a preset x^{th} time within the historical time period to obtain a current stock quantity; (f) confirm whether to perform replenishment for the target product; (g) when it is confirmed that the target product does not require replenishment, repeat the steps (e) and (f) j times until it is determined that replenishment is required for the target product, where j is an integer greater than or equal to 1; (h) perform replenishment for the target product when it is confirmed that replenishment is required for the target product; and repeat the steps (e) to (h) m times to obtain the product replenishment times at the i^{th} repetition, where m is an integer greater than or equal to 1.

[0183] Optionally, the simulation module 702 is further configured to: confirm a replenishment lower limit quantity at the i^{th} repetition of the target outbound specification based on the quantity of the allocated storage locations at the i^{th} repetition and a quantity of specifications for the target product loaded in a single storage location on a basis of the target outbound specification; confirm a replenishment upper limit quantity of storage locations at the i^{th} repetition of the target outbound specification based on the historical outbound information, the replenishment lower limit quantity at the i^{th} repetition and the quantity of specifications that the target product is loaded in the single storage location on the basis of the target outbound specification; and confirm a replenishment upper limit quantity at the i^{th} repetition for the target outbound specification based on the upper limit quantity of the storage locations at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification.

[0184] Optionally, when confirming whether to perform replenishment for the target product, the simulation module 702 is specifically configured to: confirm, based on the current stock

quantity and the replenishment lower limit quantity at the i^{th} repetition, whether to perform replenishment for the target product.

[0185] Optionally, when confirming whether to perform replenishment for the target product, the simulation module 702 is specifically configured to: confirm, based on the current stock quantity, a historical outbound quantity of a next outbound operation subsequent to the preset ordinal quantity of outbound operation and the replenishment lower limit quantity at the i^{th} repetition, whether to perform replenishment for the target product.

[0186] Optionally, when performing replenishment for the target product when it is confirmed that replenishment is required for the target product, the simulation module 702 is specifically configured to: perform replenishment for the target product based on the replenishment upper limit quantity at the i^{th} repetition.

[0187] Optionally, the historical outbound information includes a historical outbound quantity of each outbound operation within the historical time period, and the outbound information at the i^{th} repetition includes the coefficient of variation at the i^{th} repetition. When performing the simulated outbound operation for the target warehouse based on the storage location allocation information at the i^{th} repetition and the historical outbound information, to obtain the product replenishment information at the i^{th} repetition of the target product, the simulation module 702 is specifically configured to: (k) perform the outbound operation on the target product loaded in the allocated storage location at the i^{th} repetition based on a historical outbound quantity of the outbound operation at a preset x^{th} time of outbound operation within the historical time period to obtain a current outbound quantity; repeat the step (k) q times to obtain a plurality of outbound quantities, where q is an integer greater than or equal to 1; and calculate an average value of the plurality of outbound quantities and a standard deviation of the plurality of outbound quantities, and confirm the coefficient of variation based on the average value and the standard deviation.

[0188] A warehouse storage location allocation apparatus 800 shown in FIG. 8 may alternatively exist in another unit composition form, which is not limited herein, provided that corresponding functions is achieved.

[0189] In addition, FIG. 8 merely shows an embodiment of the warehouse storage location allocation apparatus 800, rather than all embodiments. All other embodiments obtained by a person skilled in the art based on embodiments of the warehouse storage location allocation apparatus in the present application without creative efforts shall fall within the protection scope of the present application.

[0190] An embodiment of the present application further provides an electronic device, which is integrated with any warehouse storage location allocation apparatus provided in embodiments of the present application, and the electronic device includes: one or more processors; a memory; and one or more application programs, where the one or more application programs are stored in the memory and are configured to be executed by the processor, to implement the warehouse storage location allocation method according to any one of the foregoing embodiments.

[0191] As shown in FIG. 8, FIG. 8 shows a schematic diagram of a structure of an electronic device related in an embodiment of the present application. The electronic device may include one or more processors 801, one or more memories 802, a power supply 803, an input unit 804, and the like. A person skilled in the art may understand that the structure of the electronic device shown in the figure does not constitute a limitation on the electronic device. The electronic device may include more or fewer components than those shown in the figure, or combine some components, or have different component arrangements.

[0192] The processor 801 is a control center of the electronic device, which is connected to various portions of the entire electronic device by using various interfaces and lines. The processor 801 executes various functions and data processing of the electronic device by running or executing a software program and/or a module stored in the memory 802 and using data stored in the memory 802, so as to perform overall monitoring on the electronic device. Optionally, the processor 801 may include one or more processing cores. The processor 801 may be a central processing unit (Central Processing Unit, CPU), or may be another general-purpose processor, a digital signal processor (Digital Signal Processor, DSP), an application-specific integrated circuit (Application-Specific Integrated Circuit, ASIC), a field-programmable gate array (Field-Programmable Gate Array, FPGA) or another programmable logic device, a discrete gate or a transistor logic device, a discrete hardware component, or the like. The general-purpose processor may be a microprocessor, or the processor may be any conventional processor or the like. Preferably, the processor 801 may be integrated with an application processor and a modem processor. The application processor mainly processes an operating system, an entity interface, an application program, and the like. The modem processor mainly processes wireless communication. It may be understood that, the modem processor may not be integrated into the processor 801.

[0193] The memory 802 may be configured to store a software program and a module. The processor 801 executes various functional applications and data processing by running the software program and the module that are stored in the memory 802. The memory 802 may

mainly include a program storage area and a data storage area. The program storage area may store an operating system, an application program required by at least one function (for example, a sound playing function or an image playing function), and the like. The data storage area may store data created based on use of the electronic device and the like. In addition, the memory 802 may include a high-speed random access memory, and may further include a non-volatile memory such as at least one magnetic disk storage device, a flash memory, or another volatile solid-state storage device. Correspondingly, the memory 802 may further include a memory controller to provide the processor 801 with access to the memory 802.

[0194] The electronic device further includes a power supply 803 that supplies power to each component. Preferably, the power supply 803 may be logically connected to the processor 801 through a power management system, so as to implement functions such as charging management, discharging management, and power consumption management by using the power management system. The power supply 803 may further include any component such as one or more direct current or alternating current power supplies, a recharge system, a power failure detection circuit, a power converter, an inverter, or a power status indicator.

[0195] The electronic device may further include the input unit 804. The input unit 804 may be configured to receive input digit or character information, and generate a keyboard, mouse, joystick, optical, or trackball signal input related to entity setting and function control.

[0196] Although not shown, a display unit or the like may be further included in the electronic device, and details are not described herein. In an exemplary embodiment, the processor 801 in the electronic device loads executable files corresponding to processes of one or more application programs into the memory 802, and the processor 801 runs the application programs stored in the memory 802, thereby implementing any warehouse storage location allocation method provided in embodiments of the present application.

[0197] In addition, FIG. 8 merely shows an embodiment of the electronic device, rather than all embodiments. All other embodiments obtained by a person skilled in the art based on embodiments of the electronic device in the present application without creative efforts shall fall within the protection scope of the present application.

[0198] A person of ordinary skill in the art may understand that all or some of the steps of the methods in the foregoing embodiments may be implemented by using an instruction, or by controlling related hardware by using an instruction. The instruction may be stored in a computer-readable storage medium, and may be loaded and executed by a processor.

[0199] Therefore, with reference to FIG. 9, an embodiment of the present application provides a computer-readable storage medium. The storage medium 900 may include: a read only

memory (ROM, Read Only Memory), a random access memory (RAM, Random Access Memory), a disk or an optical disc, and the like. The storage medium 900 stores a computer program 910, and the computer program 910 is loaded by a processor to execute the warehouse storage location allocation method according to any one of the foregoing embodiments.

[0200] In addition, FIG. 9 merely shows an embodiment of the computer-readable storage medium, rather than all embodiments. All other embodiments obtained by a person skilled in the art based on embodiments of the computer-readable storage medium in the present application without creative efforts shall fall within the protection scope of the present application.

[0201] In the foregoing embodiments, descriptions of the embodiments have different focuses. For a portion that is not described in detail in an embodiment, refer to the foregoing detailed descriptions of other embodiments, and details are not described herein again.

[0202] During specific implementation, the foregoing units or structures may be implemented as separate entities, or may be randomly combined to be implemented as one or more entities. For specific implementation of the foregoing units or structures, reference may be made to the foregoing method embodiments, and details are not described herein again.

[0203] The foregoing describes in detail a warehouse storage location allocation method and apparatus, an electronic device and a storage medium provided in embodiments of the present application. The principles and implementations of the present application are described herein through specific examples. The description about embodiments of the present application is merely provided to help understand the method and core ideas of the present application. In addition, a person skilled in the art may make variations and modifications to the present application in terms of specific implementations and application scopes according to the ideas of the present application. Therefore, the content of the specification shall not be construed as a limitation on the present application.

CLAIMS

What is claimed is:

1. A warehouse storage location allocation method, comprising:

(a) acquiring storage location allocation information at an i^{th} repetition in a target warehouse, wherein the storage location allocation information at the i^{th} repetition comprises a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, wherein i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2;

(b) performing, based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, simulated replenishment for the target warehouse, to obtain product replenishment information at the i^{th} repetition of the target product, wherein the product replenishment information at the i^{th} repetition comprises at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition; and

(c) determining whether the product replenishment information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, wherein the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

2. The warehouse storage location allocation method according to claim 1, further comprising:

(d) confirming that the product replenishment information at the i^{th} repetition does not satisfy the preset allocation condition; and

repeating steps (a) to (d) until an n^{th} repetition to obtain product replenishment information at the n^{th} repetition that satisfies the preset allocation condition, and confirming storage location allocation information at the n^{th} repetition as the target storage location allocation information.

3. The warehouse storage location allocation method according to claim 1, further comprising:

confirming that the product replenishment information at the i^{th} repetition satisfies the preset allocation condition; and

confirming the storage location allocation information at the i^{th} repetition as the target

storage location allocation information.

4. The warehouse storage location allocation method according to any one of claims 1 to 3, wherein the product replenishment times information comprises a quantity of emergency replenishment times that emergency replenishment is initiated for the target product, the at least one indicator comprises the quantity of emergency replenishment times, the corresponding preset indicator value is a preset quantity of replenishment times, and the preset allocation condition is that the quantity of emergency replenishment times is less than the preset quantity of replenishment times.

5. The warehouse storage location allocation method according to any one of claims 1 to 4, wherein the daily stock information comprises a coefficient of variation of a daily post-replenishment stock quantity of the target product within the historical time period, the at least one replenishment indicator comprises the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period, the corresponding preset indicator value is a preset coefficient value, and the preset allocation condition is that the coefficient of variation of the daily post-replenishment stock quantity of the target product within the historical time period is less than the preset coefficient value.

6. The warehouse storage location allocation method according to any one of claims 1 to 5, wherein when i = 2, the acquiring the storage location allocation information at the i^{th} repetition in the target warehouse comprises:

increasing an initial quantity of allocated storage locations to obtain storage location allocation information at a 2^{nd} repetition.

7. The warehouse storage location allocation method according to any one of claims 1 to 6, wherein the acquiring the storage location allocation information at the i^{th} repetition in the target warehouse comprises:

acquiring a capacity of each storage location in at least one storage location in the target warehouse, a loading rate at which the target product is loaded in the at least one storage location on a basis of at least one type of target outbound specification, and a volume of each type of the target outbound specification in the at least one type of the target outbound specification, wherein the at least one type of the target outbound specification is used for representing a packaging specification in which the target product is loaded in the at least one

storage location, and one storage location corresponds to one type of the target outbound specification;

confirming, based on the capacity of the storage location, the loading rate at which the target product is loaded in the storage location on the basis of the target outbound specification, and the volume of the target outbound specification, a quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification;

confirming, based on the historical outbound information and the quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification, a quantity of allocated storage locations of the target outbound specification; and

confirming, based on the quantity of the allocated storage locations of the target outbound specification, the initial storage location allocation information.

8. The warehouse storage location allocation method according to claim 7, wherein the confirming, based on the historical outbound information and the quantity of specifications that the target product is loaded in the storage location on the basis of the target outbound specification, the quantity of the allocated storage locations of the target outbound specification comprises:

confirming, based on the historical outbound information, a monthly average quantity of target outbound specifications, and acquiring a monthly replenishment frequency corresponding to the target outbound specifications; and

confirming, based on the monthly average quantity of the target outbound specifications, the monthly replenishment frequency corresponding to the target outbound specifications, and the quantity of the specifications that the target product is loaded in the storage location on the basis of the target outbound specification, the quantity of the allocated storage locations of the target outbound specification.

9. The warehouse storage location allocation method according to any one of claims 1 to 8, wherein the performing, based on the storage location allocation information at the i^{th} repetition and the historical outbound information, the simulated replenishment for the target warehouse, to obtain the product replenishment information at the i^{th} repetition of the target product comprises:

confirming, based on the quantity of the allocated storage locations at the i^{th} repetition and a quantity of specifications that the target product is loaded in a single storage location on a basis of the target outbound specification, a replenishment lower limit quantity at the i^{th}

repetition of the target outbound specification;

confirming, based on the historical outbound information, the replenishment lower limit quantity at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification, a replenishment upper limit quantity of storage locations at the i^{th} repetition of the target outbound specification;

confirming, based on the upper limit quantity of the storage locations at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification, a replenishment upper limit quantity at the i^{th} repetition of the target outbound specification; and

performing, based on the replenishment lower limit quantity at the i^{th} repetition, the replenishment upper limit quantity at the i^{th} repetition and the historical outbound information, the simulated replenishment for the target warehouse, to obtain the product replenishment information at the i^{th} repetition of the target product.

10. The warehouse storage location allocation method according to claim 9, wherein the historical outbound information comprises a daily historical outbound quantity and a daily pre-outbound stock quantity, and the performing, based on the replenishment lower limit quantity at the i^{th} repetition, the replenishment upper limit quantity at the i^{th} repetition and the historical outbound information, the simulated replenishment for the target warehouse, to obtain the product replenishment information at the i^{th} repetition for the target product, comprises:

confirming a historical outbound quantity and a pre-outbound stock quantity on a preset historical date within the historical time period as a current outbound quantity and a current pre-outbound stock quantity, respectively;

obtaining, by performing replenishment based on the current outbound quantity, the current pre-outbound stock quantity, the replenishment upper limit quantity at the i^{th} repetition and the replenishment lower limit quantity at the i^{th} repetition, a current post-replenishment stock quantity on the preset historical date; and

obtaining, by confirming the current post-replenishment stock quantity on the preset historical date as a new current pre-outbound stock quantity and confirming a historical outbound quantity on a day after the preset historical date as a new current outbound quantity and performing iterative replenishment, a historical daily post-replenishment stock quantity.

11. A warehouse storage location allocation method, comprising:

acquiring storage location allocation information at an i^{th} repetition in a target warehouse, wherein the storage location allocation information at the i^{th} repetition comprises a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, wherein i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2;

performing, based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, a simulated outbound operation for the target warehouse, to obtain outbound information at the i^{th} repetition of the target product, wherein the outbound information at the i^{th} repetition comprises at least one of following indicators: product replenishment times or a coefficient of variation indicating outbound stability of the target product at the i^{th} repetition; and

determining whether the outbound information at the i^{th} repetition satisfies a preset allocation condition to confirm target storage location allocation information, wherein the preset allocation condition is that the at least one indicator is less than a corresponding preset indicator value.

12. The warehouse storage location allocation method according to claim 11, wherein the historical outbound information comprises a historical outbound quantity of each outbound operation within the historical time period, and the outbound information at the i^{th} repetition comprises the product replenishment times at the i^{th} repetition, wherein the performing, based on the storage location allocation information at the i^{th} repetition and the historical outbound information within the historical time period, the simulated outbound operation for the target warehouse, to obtain the product replenishment information at the i^{th} repetition of the target product comprises:

(e) performing the outbound operation on the target product loaded in the allocated storage location at the i^{th} repetition based on a historical outbound quantity of the outbound operation at a preset x^{th} time within the historical time period to obtain a current stock quantity;

(f) confirming whether to perform replenishment for the target product;

(g) when it is confirmed that the target product does not require replenishment, repeating the steps (e) and (f) j times until it is determined that replenishment is required for the target product, wherein j is an integer greater than or equal to 1;

(h) performing replenishment for the target product when it is confirmed that replenishment is required for the target product; and

repeating the steps (e) to (h) m times to obtain the product replenishment times at the i^{th} repetition, wherein m is an integer greater than or equal to 1.

13. The warehouse storage location allocation method according to claim 12, further comprising:

confirming, based on the quantity of the allocated storage locations at the i^{th} repetition and a quantity of specifications that the target product is loaded in a single storage location on a basis of the target outbound specification, a replenishment lower limit quantity at the i^{th} repetition of a target outbound specification;

confirming, based on the historical outbound information, the replenishment lower limit quantity at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification, a replenishment upper limit quantity of storage locations at the i^{th} repetition of the target outbound specification; and

confirming, based on the upper limit quantity of the storage locations at the i^{th} repetition and the quantity of the specifications that the target product is loaded in the single storage location on the basis of the target outbound specification, a replenishment upper limit quantity at the i^{th} repetition of the target outbound specification.

14. The warehouse storage location allocation method according to claim 13, wherein the confirming whether to perform replenishment for the target product comprises:

confirming, based on the current stock quantity and the replenishment lower limit quantity at the i^{th} repetition, whether to perform replenishment for the target product.

15. The warehouse storage location allocation method according to claim 13, wherein the confirming whether to perform replenishment for the target product comprises:

confirming, based on the current stock quantity, a historical outbound quantity of a next outbound operation subsequent to the preset ordinal quantity and the replenishment lower limit quantity at the i^{th} repetition, whether to perform replenishment for the target product.

16. The warehouse storage location allocation method according to any one of claims 13 to 15, wherein the performing replenishment for the target product when it is confirmed that replenishment is required for the target product comprises:

performing, based on the replenishment upper limit quantity at the i^{th} repetition,

replenishment for the target product.

17. The warehouse storage location allocation method according to claim 11, wherein the historical outbound information comprises a historical outbound quantity of each outbound operation within the historical time period, and the outbound information at the i^{th} repetition comprises the coefficient of variation at the i^{th} repetition, wherein the performing, based on the storage location allocation information at the i^{th} repetition and the historical outbound information within the historical time period, the simulated outbound operation for the target warehouse, to obtain the product replenishment information at the i^{th} repetition of the target product comprises:

(k) performing the outbound operation on the target product loaded in the allocated storage location at the i^{th} repetition based on a historical outbound quantity of the outbound operation at a preset x^{th} time within the historical time period to obtain a current outbound quantity;

repeating the step (k) q times to obtain a plurality of outbound quantities, wherein q is an integer greater than or equal to 1; and

calculating an average value of the plurality of outbound quantities and a standard deviation of the plurality of outbound quantities, and confirming, based on the average value and the standard deviation, the coefficient of variation.

18. A warehouse storage location allocation apparatus, comprising:

an acquiring module, configured to acquire storage location allocation information of an i^{th} repetition in a target warehouse, wherein the storage location allocation information at the i^{th} repetition comprises a quantity of allocated storage locations at the i^{th} repetition for a target product in the target warehouse, and when i = 1, the storage location allocation information at the i^{th} repetition is initial storage location allocation information, wherein i is an integer greater than or equal to 1 and less than or equal to n, and n is an integer greater than or equal to 2;

a simulation module, configured to perform simulated replenishment for the target warehouse based on the storage location allocation information at the i^{th} repetition and historical outbound information within a historical time period, to obtain product replenishment information at the i^{th} repetition of the target product, wherein the product replenishment information at the i^{th} repetition comprises at least one of the following: product replenishment times information or daily stock information at the i^{th} repetition; and

a determining module, configured to determine whether the product replenishment information at the i^{th} repetition satisfies a preset allocation condition to determine target storage

location allocation information, wherein the preset allocation condition is that at least one indicator of the product replenishment information at the i^{th} repetition is less than a corresponding preset indicator value.

19. An electronic device, wherein the electronic device comprises:

one or more processors;

a memory; and

one or more application programs, wherein the one or more application programs are stored in the memory and are configured to be executed by the one or more processors to implement the warehouse storage location allocation method according to any one of claims 1 to 17.

20. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program is configured to be loaded by a processor to execute the warehouse storage location allocation method according to any one of claims 1 to 17.