

Claims

What is claimed is:

1. A computerized system for automatic packing determination, comprising:
 - at least one processor; and
 - at least one non-transitory storage medium comprising instructions that, when executed by the at least one processor, cause the at least one processor to perform steps comprising:
 - receiving, from a remote system, an order comprising at least one item;
 - searching at least one data store to determine dimensions associated with the at least one item;
 - modifying dimensions of at least one largest item of the order using a factor;
 - selecting a data structure representing a first package, the data structure comprising a size of the first package;
 - iteratively simulating packing the items into the first package based on the modified dimensions, until all items are packed in the selected package;
 - generating at least one set of instructions for packing the items into the selected package; and
 - sending the generated instructions to a second system for display, the instructions including at least one item identifier and one package identifier.
2. The system of claim 1, wherein iteratively simulating packing further comprises:
 - determining dimensions of each item of the order;

determining the largest item of each item in the order based on the determined dimensions;

simulating packing the largest item into the first package;

calculating a plurality of remaining spaces in the first package by subtracting the dimensions of the largest item from the dimensions of the first package;

instantiating at least one data structure corresponding to the calculated remaining spaces, each data structure comprising a size of an associated calculated remaining space; and

iteratively simulating packing at least one remaining item in the group into at least one of the calculated remaining spaces.

3. The system of claim 2, wherein

iteratively simulating packing further comprises:

selecting a first largest-volume item by determining an item with the largest volume, where volume is calculated by multiplying a length of each item, a width of each item, and a height of each item;

iteratively simulating packing the first largest-volume item into a package;

selecting a next largest-volume item by determining an item with the second largest volume;

repeatedly simulating packing the next largest-volume item into the package until all items are packed;
and

generating a first list of packages for packing by largest volume;

selecting a first largest-side item by determining an item with a longest single dimension;

iteratively simulating packing the first largest-side item into a package;
selecting a next largest-side item by determining an item with a second-longest single dimension;
repeatedly simulating packing the next largest-side item into the package until all items are packed; and
generating a second list of packages for packing by largest volume; and

wherein generating the at least one set of instructions comprises:

selecting one of the first list or the second list; and
generating the instructions based on the selected list.

4. The system of claim 3, wherein selecting one of the first list or the second list comprises selecting a list requiring:
 - a smaller number of packages,
 - a lower cost, or
 - a higher fill rate.
5. The system of claim 1, wherein iteratively simulating packing the largest item into the first package further comprises:
 - determining dimensions of each item of the order;
 - determining the largest item of each item in the order based on the determined dimensions;
 - simulating packing each item into the first package using a first orientation for each item;
 - determining a fill rate for the first package based on packing each item into the first package using the first orientation;

repeatedly modifying the first orientation for each item and determining a fill rate for the first package by simulating packing each item using at least one modified first orientation; and
selecting a set of orientations for the items based on maximization of fill rate.

6. The system of claim 1, wherein:

searching at least one data store further comprises determining a tag associated with the item, the tag being selected from normal or fragile; and

each tag is associated with a different factor, the factor for the normal tag being smaller than the factor for the fragile tag.

7. The system of claim 6, wherein modifying dimensions of an item using a factor further comprises:

determining a tag associated with an item;

determining a factor associated with the tag; and

modifying the dimensions of the item based on the determined factor.

8. The system of claim 1, wherein if the simulating determines that the at least one item does not fit into the selected package:

choosing a larger package, and

iteratively simulating packing each item until all items are packed in the larger package.

9. The system of claim 1, wherein the generated instructions are configured to cause the second system to display information on a user interface and further comprise:

instructions for placement of each item to be packed;

an order of placement for each item to be packed; or
a computer-generated image depicting each item to be packed.

10. A method for generating packing instructions, comprising:
 - receiving, from a remote system, an order comprising at least one item;
 - searching at least one data store to determine dimensions associated with the at least one item;
 - modifying dimensions of at least one largest item of the order using a factor;
 - selecting a data structure representing a first package, the data structure comprising a size of the first package;
 - iteratively simulating packing the items into the first package based on the modified dimensions, until all items are packed in the selected package;
 - generating at least one set of instructions for packing the items into the selected package; and
 - sending the generated instructions to a second system for display, the instructions including at least one item identifier and one package identifier.
11. The system of claim 10, wherein iteratively simulating packing further comprises:
 - determining dimensions of each item of the order;
 - determining the largest item of each item in the order based on the determined dimensions;
 - simulating packing the largest item into the first package;
 - calculating a plurality of remaining spaces in the first package by subtracting the dimensions of the largest item from the dimensions of the first package;

instantiating at least one data structure corresponding to the calculated remaining spaces, each data structure comprising a size of an associated calculated remaining space; and

iteratively simulating packing at least one remaining item in the group into at least one of the calculated remaining spaces.

12. The method of claim 11, wherein

iteratively simulating packing further comprises:

selecting a first largest-volume item by determining an item with the largest volume, where volume is calculated by multiplying a length of each item, a width of each item, and a height of each item;

iteratively simulating packing the first largest-volume item into a package;

selecting a next largest-volume item by determining an item with the second largest volume;

repeatedly simulating packing the next largest-volume item into the package until all items are packed;
and

generating a first list of packages for packing by largest volume;

selecting a first largest-side item by determining an item with a longest single dimension;

iteratively simulating packing the first largest-side item into a package;

selecting a next largest-side item by determining an item with a second-longest single dimension;

repeatedly simulating packing the next largest-side item into the package until all items are packed; and

generating a second list of packages for packing by
largest volume; and

wherein generating the at least one set of instructions comprises:

selecting one of the first list or the second list; and

generating the instructions based on the selected list.

13. The method of claim 12, wherein selecting one of the first list or the second list comprises selecting a list requiring:

a smaller number of packages,

a lower cost, or

a higher fill rate.

14. The method of claim 10, wherein iteratively simulating packing the largest item into the first package further comprises:

determining dimensions of each item of the order;

determining the largest item of each item in the order based on the
determined dimensions;

simulating packing each item into the first package using a first
orientation for each item;

determining a fill rate for the first package based on packing each item
into the first package using the first orientation;

repeatedly modifying the first orientation for each item and determining
a fill rate for the first package by simulating packing each item
using at least one modified first orientation; and

selecting a set of orientations for the items based on maximization of fill
rate.

15. The method of claim 10, wherein:

searching at least one data store further comprises determining a tag associated with the item, the tag being selected from normal or fragile; and

each tag is associated with a different factor, the factor for the normal tag being smaller than the factor for the fragile tag.

16. The method of claim 15, wherein modifying dimensions of an item using a factor further comprises:
 - determining a tag associated with an item;
 - determining a factor associated with the tag; and
 - modifying the dimensions of the item based on the determined factor.
17. The method of claim 10, wherein if the simulating determines that the at least one item does not fit into the selected package:
 - choosing a larger package, and
 - iteratively simulating packing each item until all items are packed in the larger package.
18. The method of claim 10, wherein the generated instructions are configured to cause the second system to display information on a user interface and further comprise:
 - instructions for placement of each item to be packed;
 - an order of placement for each item to be packed; or
 - a computer-generated image depicting each item to be packed.
19. A computerized system for automatic packing determination, comprising:
 - at least one processor; and

at least one non-transitory storage medium comprising instructions that, when executed by the at least one processor, cause the at least one processor to perform steps comprising:

receiving, from a remote system, an order comprising at least one item;

searching at least one data store to determine dimensions associated with the at least one item;

modifying dimensions of at least one largest item of the order using a factor;

selecting a data structure representing a first package, the data structure comprising a size of the first package;

iteratively simulating packing the items into the first package based on the modified dimensions, until all items are packed in the selected package;

generating at least one set of instructions for packing the items into the selected package;

sending the generated instructions to a second system for display, the instructions including at least one item identifier and one package identifier;

wherein the generated instructions include:

instructions for placement of each item to be packed;

an order of placement for each item to be packed;
and

a computer-generated image depicting each item to be packed.

20. The system of claim 19, wherein iteratively simulating packing further comprises:

simulating packing the largest item into the first package;

calculating a plurality of remaining spaces in the first package by
subtracting the dimensions of the largest item from the
dimensions of the first package;

instantiating at least one data structure corresponding to the calculated
remaining spaces, each data structure comprising a size of an
associated calculated remaining space; and

iteratively simulating packing at least one remaining item in the group
into at least one of the calculated remaining spaces.