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(54) **IMAGE RECOGNITION SYSTEM AND IMAGE RECOGNITION METHOD**

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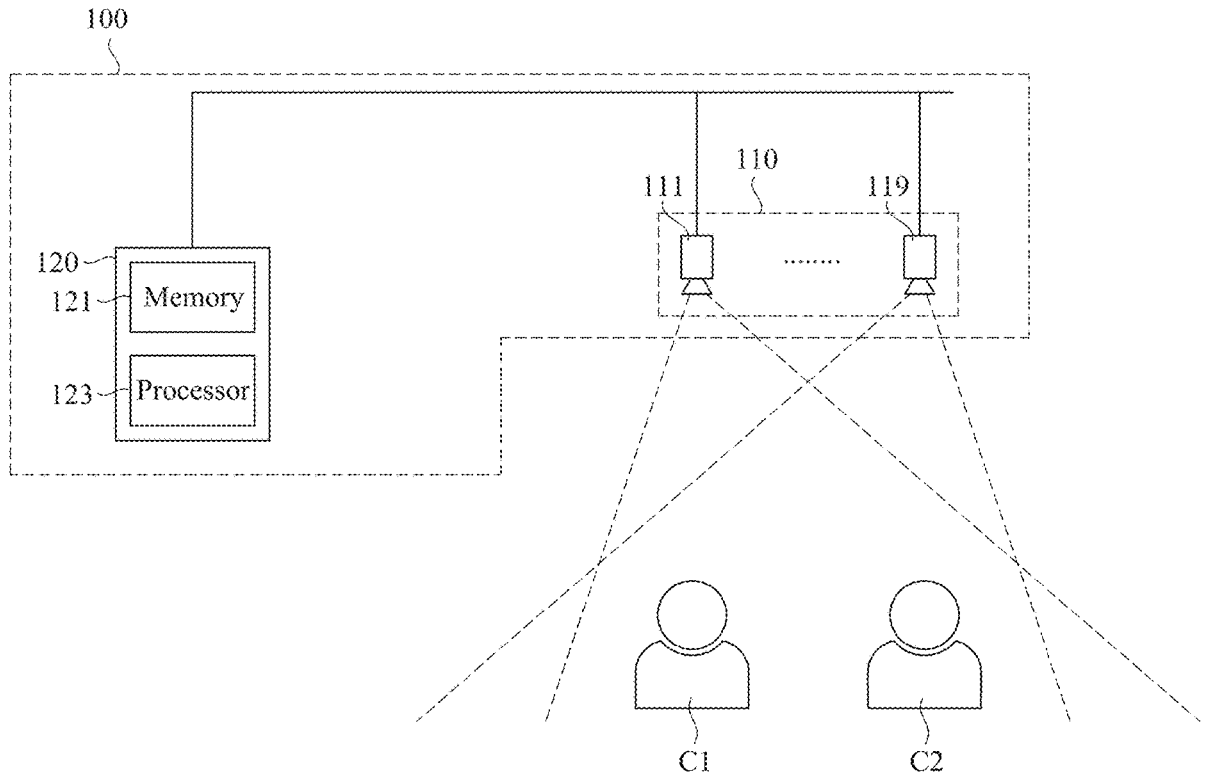
(57) **ABSTRACT**

An image recognition system includes at least one sensor, a memory and a processor. The at least one sensor is configured to capture a plurality of images. The memory is configured to store a plurality of commands. The processor is configured for obtaining the plurality of commands from the memory to perform the following steps: capturing at least two images in the building by at least one sensor. Person detection is performed on at least two images at the first time point to obtain a first feature frame.



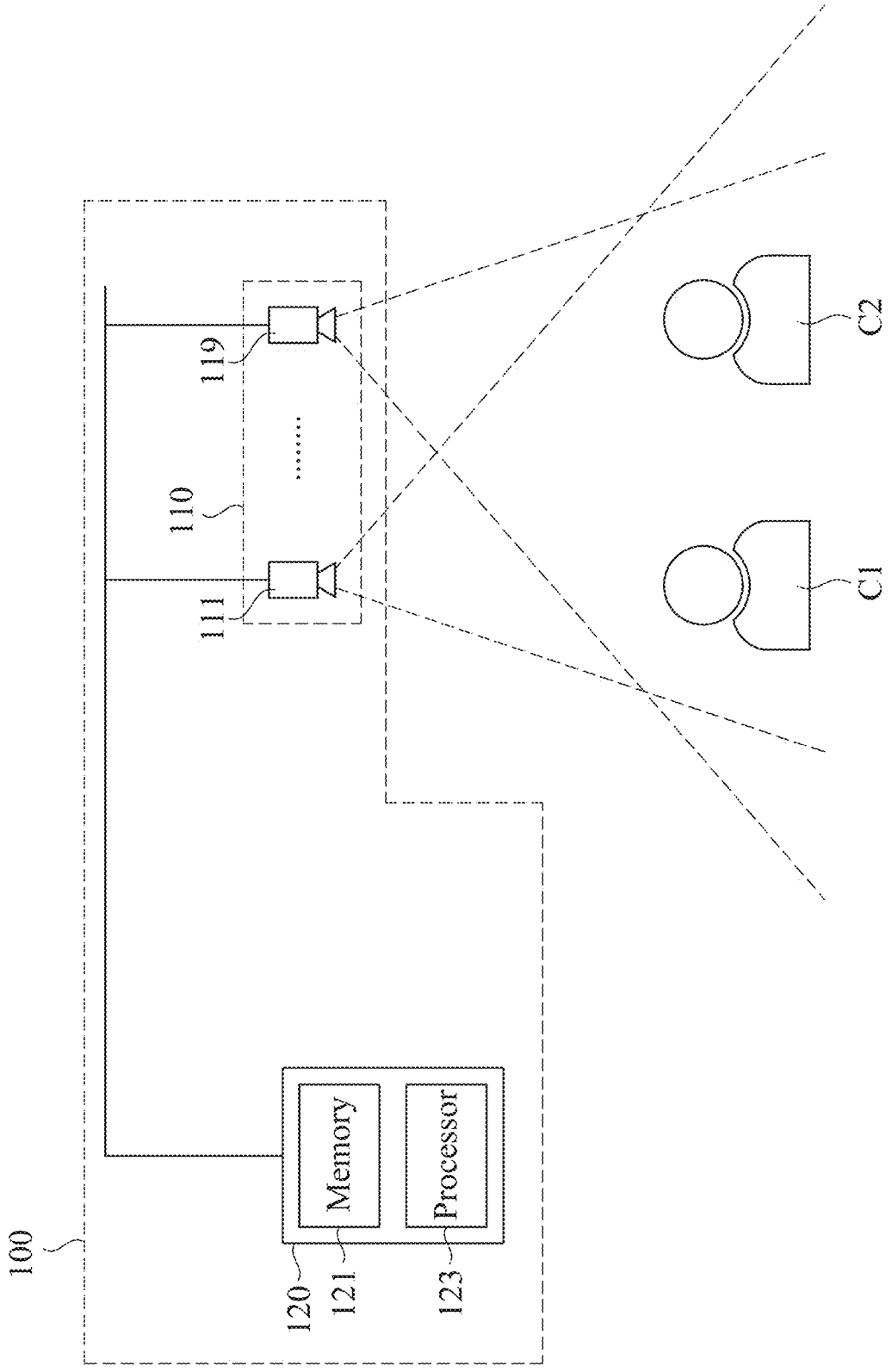


Fig. 1

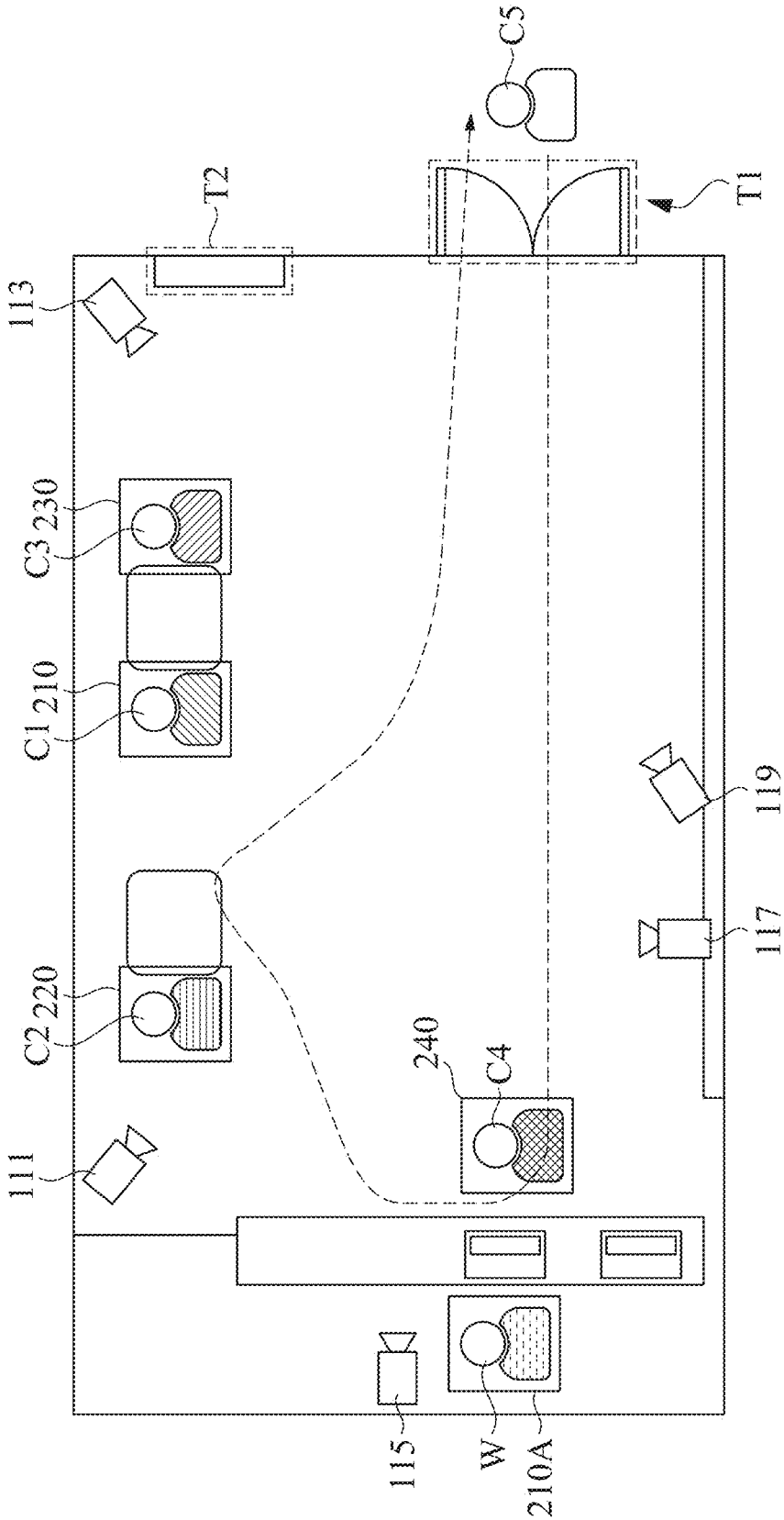


Fig. 2

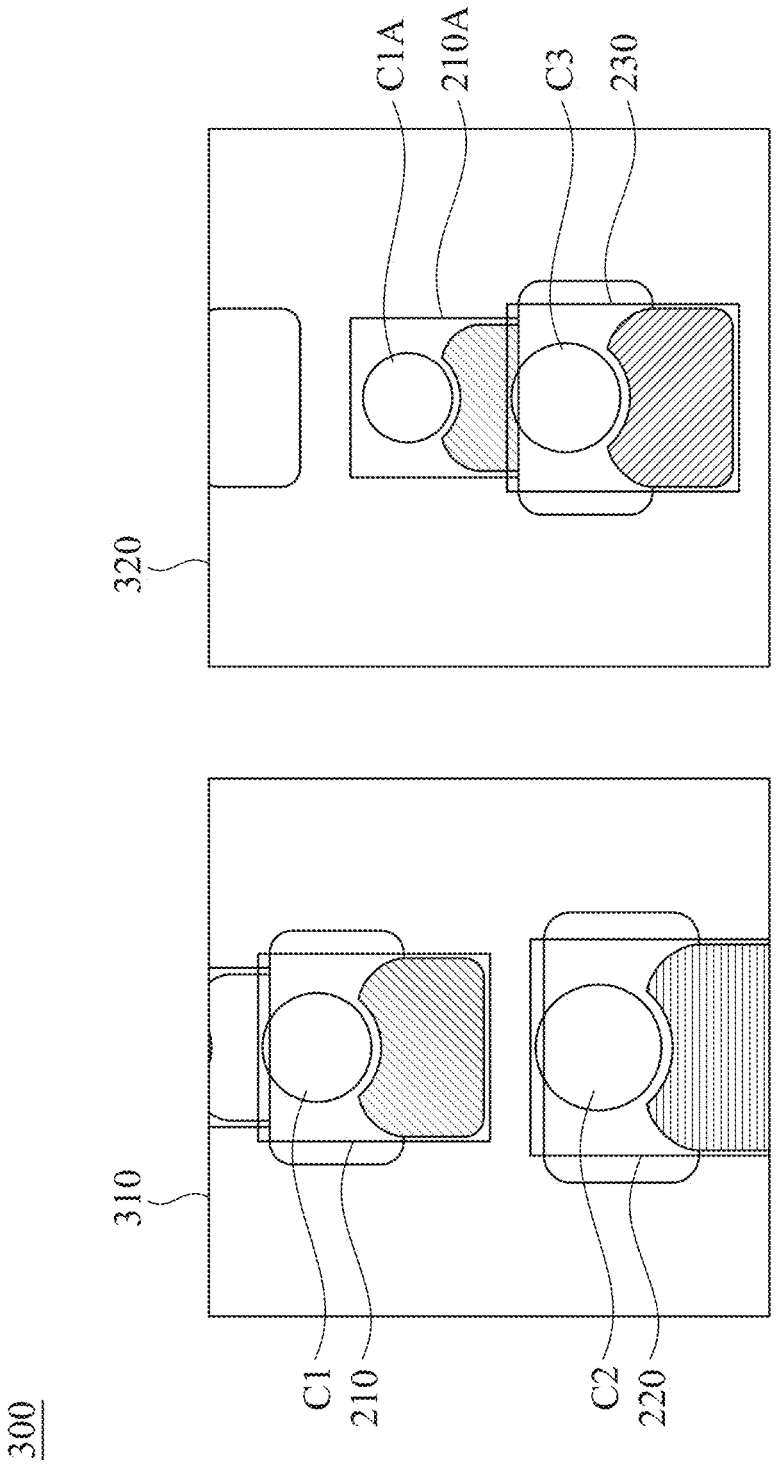


Fig. 3

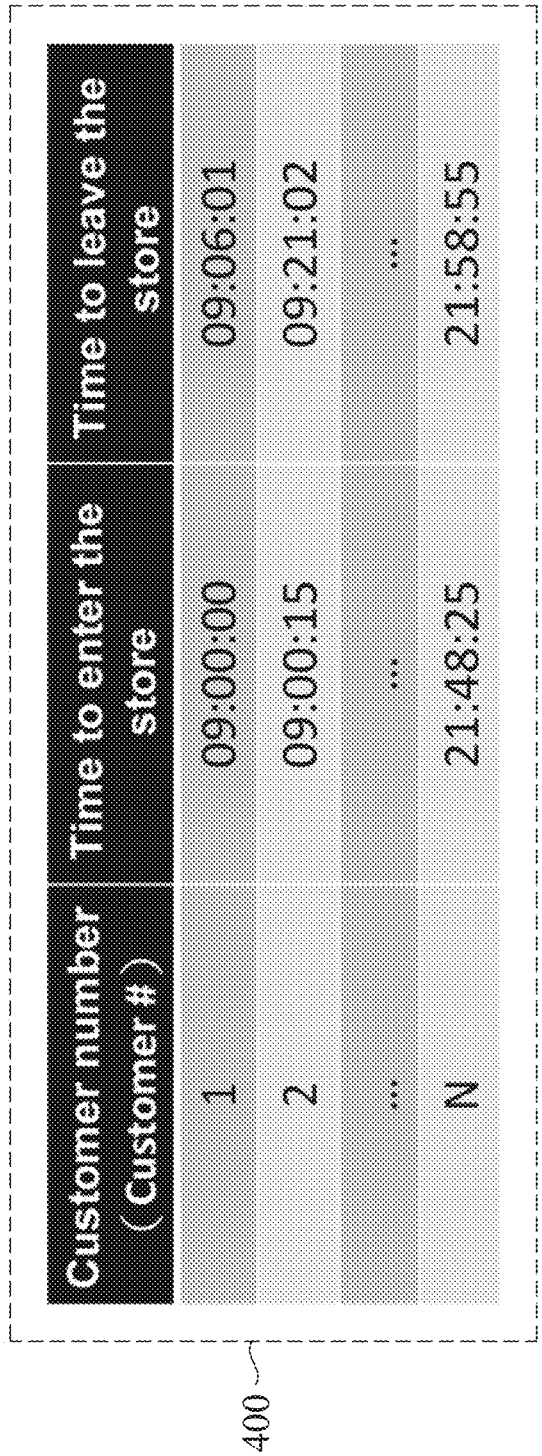

Customer number (Customer #)
Time to enter the store
Time to leave the store
1
09:00:00
09:06:01
2
09:00:15
09:21:02
...
...
...
N
21:48:25
21:58:55
400

Fig. 4

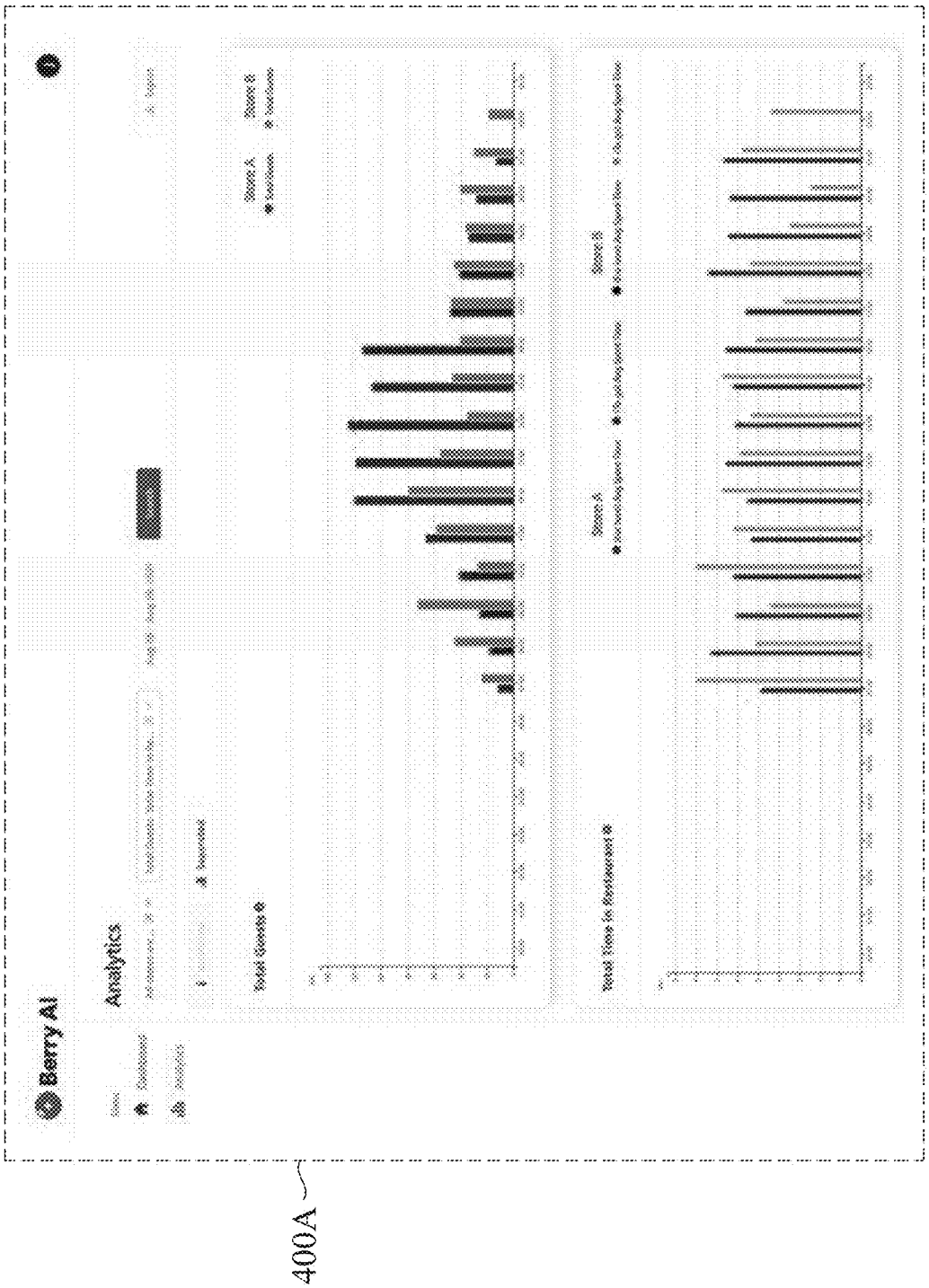


Fig. 5

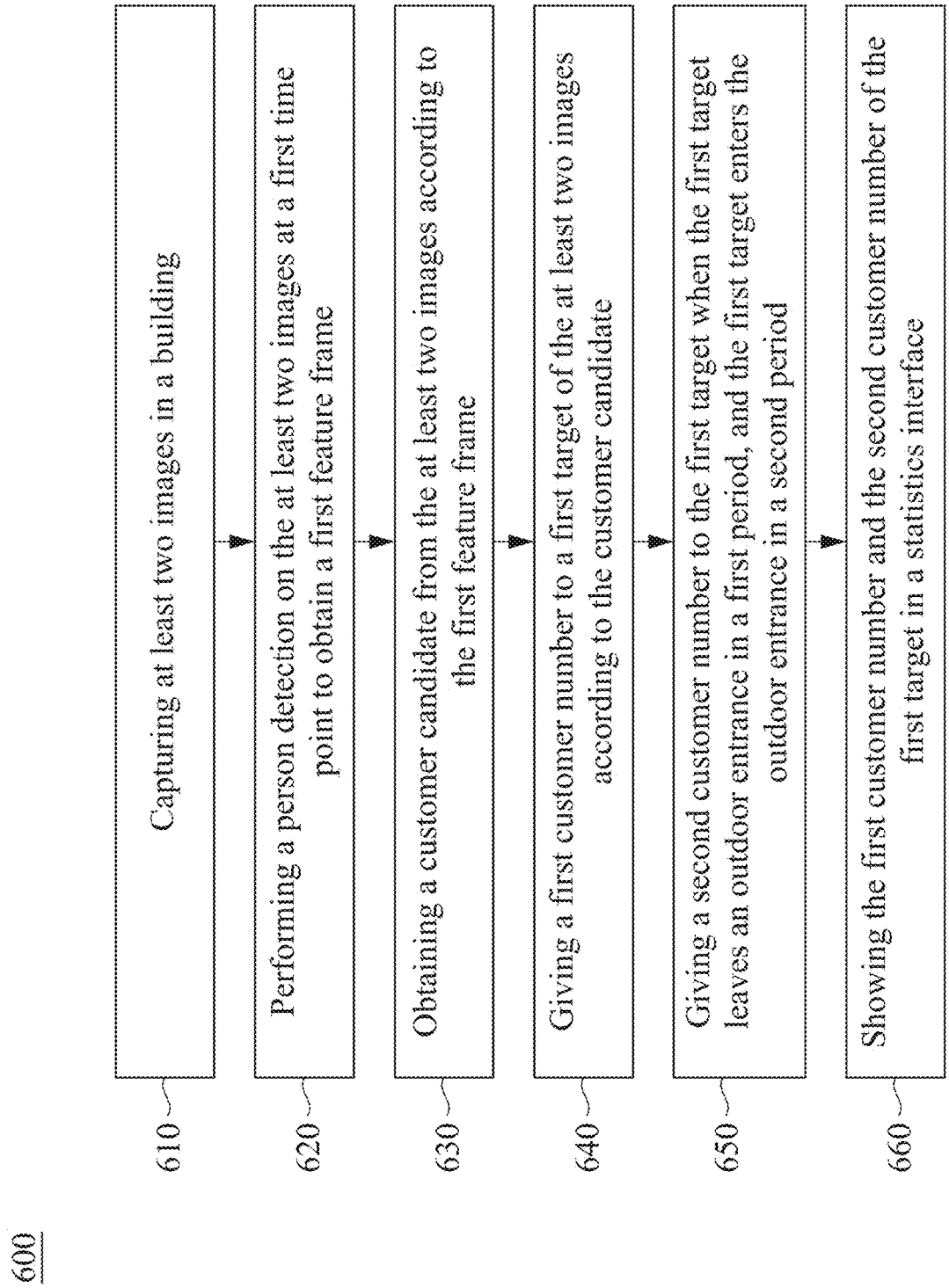

600
610
Capturing at least two images in a building
620
Performing a person detection on the at least two images at a first time point to obtain a first feature frame
630
Obtaining a customer candidate from the at least two images according to the first feature frame
640
Giving a first customer number to a first target of the at least two images according to the customer candidate
650
Giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period
660
Showing the first customer number and the second customer number of the first target in a statistics interface

Fig. 6

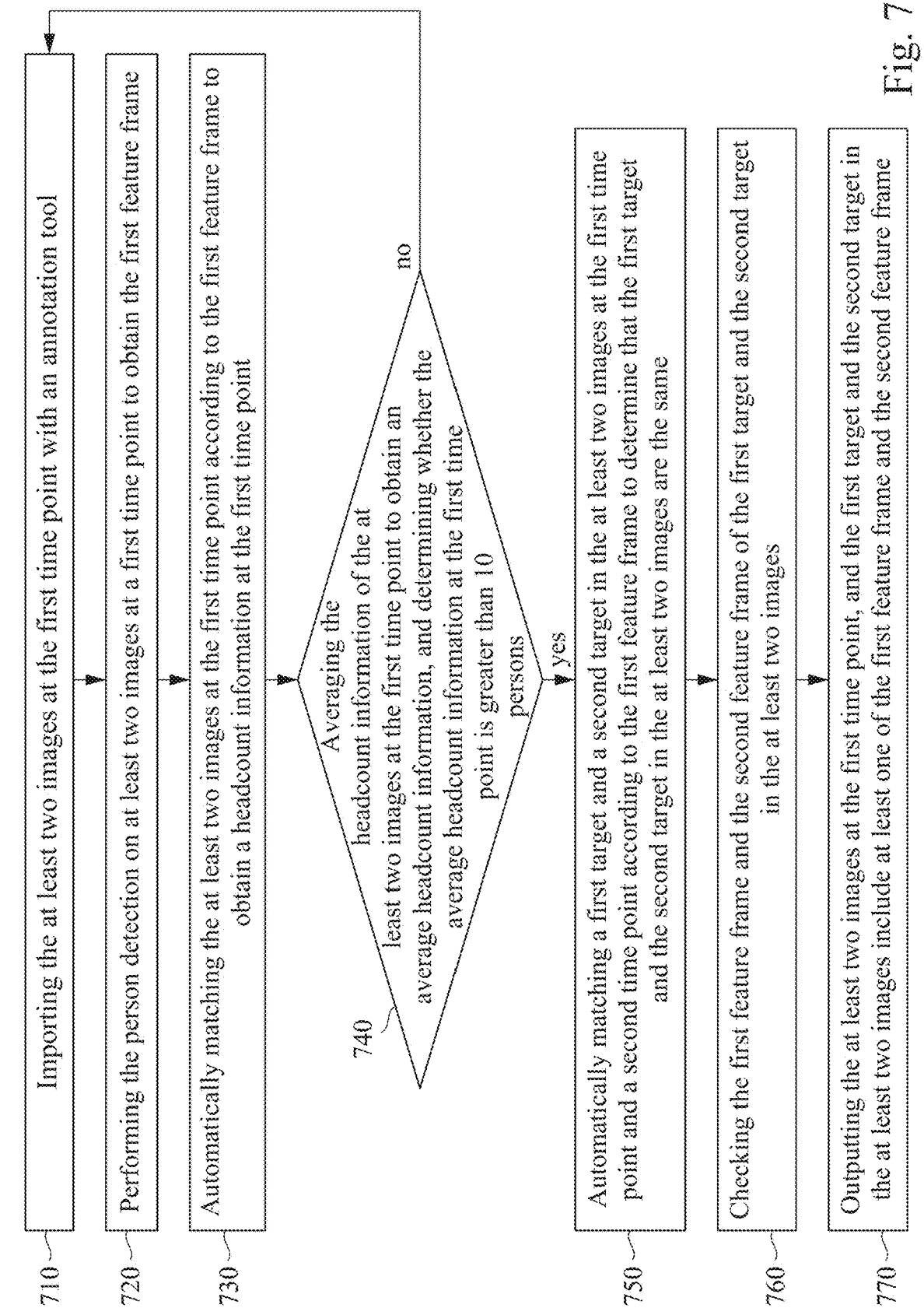

700
710
Importing the at least two images at the first time point with an annotation tool
720
Performing the person detection on at least two images at a first time point to obtain the first feature frame
730
Automatically matching the at least two images at the first time point according to the first feature frame to obtain a headcount information at the first time point
740
Averaging the headcount information of the at least two images at the first time point to obtain an average headcount information, and determining whether the average headcount information at the first time point is greater than 10 persons
no
yes
750
Automatically matching a first target and a second target in the at least two images at the first time point and a second time point according to the first feature frame to determine that the first target and the second target in the at least two images are the same
760
Checking the first feature frame and the second feature frame of the first target and the second target in the at least two images
770
Outputting the at least two images at the first time point, and the first target and the second target in the at least two images include at least one of the first feature frame and the second feature frame

Fig. 7

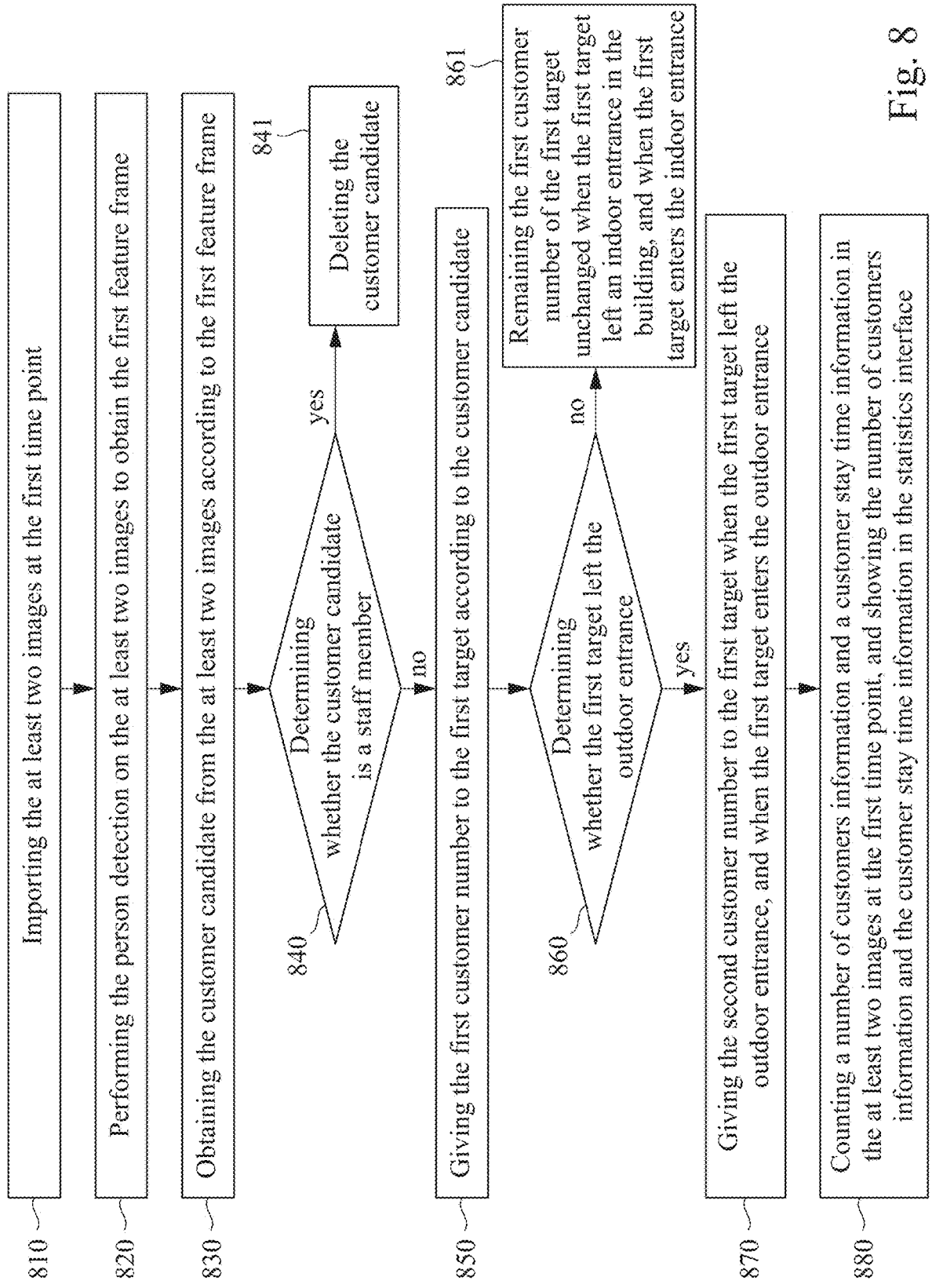

800
810
Importing the at least two images at the first time point
820
Performing the person detection on the at least two images to obtain the first feature frame
830
Obtaining the customer candidate from the at least two images according to the first feature frame
840
Determining whether the customer candidate is a staff member
yes
841
Deleting the customer candidate
no
850
Giving the first customer number to the first target according to the customer candidate
860
Determining whether the first target left the outdoor entrance
no
861
Remaining the first customer number of the first target unchanged when the first target left an indoor entrance in the building, and when the first target enters the indoor entrance
yes
870
Giving the second customer number to the first target when the first target left the outdoor entrance, and when the first target enters the outdoor entrance
880
Counting a number of customers information and a customer stay time information in the at least two images at the first time point, and showing the number of customers information and the customer stay time information in the statistics interface

Fig. 8

IMAGE RECOGNITION SYSTEM AND IMAGE RECOGNITION METHOD

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Taiwan Application Serial Number 110141384, filed Nov. 5, 2021, which is herein incorporated by reference in its entirety.

BACKGROUND

Field of Invention

[0002] The present disclosure relates to a recognition system and a recognition method. More particularly, the present disclosure relates to an image recognition system and an image recognition method.

Description of Related Art

[0003] Nowadays, enterprises operating in the catering industry or fast food industry pay attention to the speed and time of rotation between customers and different customers on site, but generally speaking, they need to let the staff visually assess the headcount on site, which makes the assessment inaccurate, and if they want to quantify it, they need to spend manpower and time on statistics and records.

SUMMARY

[0004] The present disclosure provides an image recognition system. The image recognition system, comprising: at least one sensor, a memory, and a processor. The at least one sensor is configured to capture a plurality of images. The memory is configured to store a plurality of commands. The processor is configured to obtain a plurality of commands from the memory to perform the following steps: capturing at least two images in a building by the at least one sensor; performing a person detection on the at least two images at a first time point to obtain a first feature frame; obtaining a customer candidate from the at least two images according to the first feature frame; giving a first customer number to a first target of the at least two images according to the customer candidate; giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period; and showing the first customer number and the second customer number of the first target in a statistics interface.

[0005] The present disclosure provides an image recognition method. The image recognition method comprises following steps: capturing at least two images in a building; performing a person detection on at least two images at a first time point to obtain a first feature frame; obtaining a customer candidate from the at least two images according to the first feature frame; giving a first customer number to a first target of the at least two images according to the customer candidate; giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period; and showing the first customer number and the second customer number of the first target in a statistics interface.

[0006] Therefore, based on the technical content of the present disclosure, the image recognition system and the image recognition method shown in the embodiment of the present disclosure can automatically quantify and record the number of customers visiting the store.

[0007] It is to be understood that both the foregoing general description and the following detailed description are by examples, and are intended to provide further explanation of the present disclosure as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present disclosure can be more fully understood by reading the following detailed description of the embodiment, with reference made to the accompanying drawings as follows:

[0009] FIG. **1** shows a schematic diagram of an image recognition system according to one embodiment of the present disclosure.

[0010] FIG. **2** shows a schematic diagram of the usage context of an image recognition system according to one embodiment of the present disclosure.

[0011] FIG. **3** shows a schematic diagram of images captured by an image recognition system according to one embodiment of the present disclosure.

[0012] FIG. **4** shows a schematic diagram of the statistics interface of an image recognition system according to one embodiment of the present disclosure.

[0013] FIG. **5** shows a schematic diagram of the statistics interface of an image recognition system according to one embodiment of the present disclosure.

[0014] FIG. **6** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure.

[0015] FIG. **7** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure.

[0016] FIG. **8** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure.

DETAILED DESCRIPTION

[0017] Reference will now be made in detail to the present embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0018] FIG. **1** shows a schematic diagram of an image recognition system according to one embodiment of the present disclosure. As the figure shows, the image recognition system **100** includes at least one sensor **110** and a host **120**. In addition, the host **120** includes a memory **121** and a processor **123**. In terms of connection relationship, the at least one sensor **110** is coupled to the host **120**. In the host **120**, the processor **123** is coupled to the memory **121**. In another embodiment, the at least one sensor **110**, the memory **121** and the processor **123** may be provided in a single device, but the present disclosure is not limited to the embodiment.

[0019] For automatically quantifying and recording the number of customers visiting the store, the present disclosure provides the image recognition system **100** as shown in FIG. **1**, and the detailed description of its related operations is as shown below.

[0020] In one embodiment, the at least one sensor **110** is configured to capture a plurality of images. The memory **121** is configured to store a plurality of commands. The proces-

sor **123** is configured to obtain a plurality of commands from the memory **121** to perform the following steps: capturing the at least two images in a building by the at least one sensor **110**; performing a person detection on at least two images at first time point to obtain a first feature frame; obtaining a customer candidate from the at least two images according to the first feature frame; giving a first customer number to a first target of the at least two images according to the customer candidate; giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period; and showing the first customer number and the second customer number of the first target in a statistics interface.

[0021] In order to make the above operations of the image recognition system **100** easy to understand, please refer to FIG. **2**, FIG. **3** and FIG. **4** together. FIG. **2** shows a schematic diagram of the usage context of an image recognition system according to one embodiment of the present disclosure. FIG. **3** shows a schematic diagram of images captured by an image recognition system according to one embodiment of the present disclosure. FIG. **4** shows a schematic diagram of the statistics interface of an image recognition system according to one embodiment of the present disclosure.

[0022] Please refer to FIG. **1** to FIG. **4** together, with respect to operations, in one embodiment, the processor **123** obtains a plurality of commands from the memory **121** to control the at least one sensor **110** to capture the at least two images (e.g. the images **310** and **320**) in a building. For example, the processor **123** can control the sensor **111** and/or the sensor **119** to capture the images **310** and **320** in the building.

[0023] Subsequently, the processor **123** performs a person detection on at least two images (such as the images **310** and **320**) at a first time point to obtain a first feature frame **210**. For example, the person detection can be differentiated detection through clothing and apparel.

[0024] Then, the processor **123** obtains a customer candidate from the at least two images (e.g. the images **310** and **320**) according to the first feature frame **210**. For example, the customer candidate may be the personal characteristics distinguished according to the characteristics of different clothes.

[0025] Afterward, the processor **123** gives a first customer number to a first target C**1** of the at least two images (e.g. the images **310** and **320**) according to the customer candidate. For example, the first target C**1** can be a customer, the first customer number can be given to the customer C**1**, and the first customer number can be a positive integer, but the present disclosure is not limited to this.

[0026] Subsequently, when the first target C**1** leaves an outdoor entrance T**1** in a first period, and the first target C**1** enters the outdoor entrance T**1** in a second period, the processor **123** gives the second customer number to the first target C**1**. For example, the first target C**1** can be a customer. When customer C**1** left the outdoor entrance T**1** at 9:00 a.m., and enters the outdoor entrance T**1** at 9:05 a.m., the second customer number is given to the customer C**1**, the second customer number can be a positive integer, but the present disclosure is not limited to this.

[0027] Then, the processor **123** shows the first customer number and the second customer number of the first target C**1** in a statistics interface **400**.

[0028] Please refer to FIG. **1** and FIG. **2**, in one embodiment, the at least one sensor **110** is positioned on a top of an interior of the building, and the at least one sensor **110** is configured to capture the at least two images (e.g. the images **310** and **320**) in a top view manner, in a side view manner, or in a top view at a specific angle manner. For example, the at least one sensor **110** can include a plurality of sensors **111**~**119**, and the sensors **111**~**119** can be positioned on the top of the interior of the building.

[0029] Please refer to FIG. **2**, in one embodiment, the building includes at least one of a restaurant and a fast food shop. For example, the building can be the restaurant or the fast food shop.

[0030] In one embodiment, the at least one sensor **110** includes at least one of a camera and a camcorder. For example, the at least one sensor **110** can be the camera or the camcorder.

[0031] FIG. **5** shows a schematic diagram of the statistics interface of an image recognition system according to one embodiment of the present disclosure.

[0032] Please refer to FIG. **4** and FIG. **5**, in one embodiment, statistics interface (e.g. statistics interfaces **400**, **400**A) includes a web Interface. For example, the web Interface can be an application program interface used to connect to the Internet.

[0033] FIG. **6** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure. In order to make the image recognition method **600** of FIG. **6** easier to understand, please refer to FIGS. **2**, **3**, **4**, and **6** together. The image recognition method **600** of FIG. **6** includes the following steps:

[0034] Step **610**: capturing at least two images (e.g. the images **310** and **320**) in a building;

[0035] Step **620**: performing a person detection on the at least two images (e.g.

[0036] the images **310** and **320**) at a first time point to obtain a first feature frame **210**;

[0037] Step **630**: obtaining a customer candidate from the at least two images (e.g. the images **310** and **320**) according to the first feature frame **210**;

[0038] Step **640**: giving a first customer number to a first target C**1** of the at least two images (e.g. the images **310** and **320**) according to the customer candidate;

[0039] Step **650**: giving a second customer number to the first target when the first target C**1** leaves an outdoor entrance T**1** in a first period, and the first target C**1** enters the outdoor entrance T**1** in a second period;

[0040] Step **660**: showing the first customer number and the second customer number of the first target in a statistics interface **400**.

[0041] FIG. **7** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure. In order to make the image recognition method **700** of FIG. **7** easier to understand, please refer to FIGS. **2**, **3**, and **7** together. The image recognition method **700** of FIG. **7** includes the following steps:

[0042] Step **710**: importing the at least two images (e.g. the images **310** and **320**) at the first time point with an annotation tool;

[0043] Step **720**: performing the person detection on at least two images (e.g. the images **310** and **320**) at a first time point to obtain the first feature frame **210**;

[0044] Step **730**: automatically matching the at least two images (e.g. the images **310** and **320**) at the first time point

according to the first feature frame to obtain a headcount information at the first time point;

[0045] Step **740**: averaging the headcount information of the at least two images (e.g. the images **310** and **320**) at the first time point to obtain an average headcount information, and determining whether the average headcount information at the first time point is greater than 10 persons;

[0046] Step **750**: automatically matching a first target C**1** and a second target C**1** A in the at least two images (e.g. the images **310** and **320**) at the first time point and a second time point according to the first feature frame **210** to determine that the first target C**1** and the second target C**1**A in the at least two images (e.g. the images **310** and **320**) are the same;

[0047] Step **760**: checking the first feature frame **210** and the second feature frame (e.g. second feature frames **210**A, **220**, **230**) of the first target C**1** and the second target (e.g. second target C**1**A, C**2**, or C**3**) in the at least two images (e.g. the images **310** and **320**);

[0048] Step **770**: outputting the at least two images (e.g. the images **310** and **320**) at the first time point, and the first target C**1** and the second target (e.g. second targets C**1**A, C**2**, or C**3**) in the at least two images (e.g. the images **310** and **320**) include at least one of the first feature frame **210** and the second feature frame (e.g. second feature frame **210**A, **220**, **230**).

[0049] In one embodiment, please refer to the step **740**, importing the at least two images (e.g. the images **310** and **320**) at another time (e.g. a third time point) by the annotation tool when the average headcount information is less than 10.

[0050] In one embodiment, please refer to the step **740**, when the average headcount information is greater than 10, the step **750** is executed to automatically match the first target C**1** and the second target C**1**A in the at least two images (e.g. the images **310** and **320**) at the first time point and the second time point according to the first feature frame **210** to determine that the first target C**1** and the second target C**1**A in the at least two images (e.g. the images **310** and **320**) are the same.

[0051] In one embodiment, please refer to the step **760**, it can be further check whether the first feature frame **210** and the second feature frame of the first target C**1** and the second target (e.g. the second targets C**1**A and C**3**) in the at least two images (e.g. the images **310** and **320**) are different.

[0052] In one embodiment, please refer to the step **760**, when the first target C**1** of the first feature frame **210** and the second target C**3** of the second feature frame **230** are different, then the image recognition method **700** can amend the first feature frame **210** or the second feature frame **230**.

[0053] In one embodiment, please refer to the step **760**, when it is checked that the first target C**1** and the second target C**1**A do not have the first feature frame, the image recognition method **700** can mark the first feature frame **210** by the annotation tool for the first target C**1** or the second target C**1**A.

[0054] In one embodiment, the image recognition method **700** is a process of learning and training using the annotation tool. For example, the image recognition method **700** can be a learning process of algorithm training using the annotation tool.

[0055] FIG. **8** shows a flowchart of an image recognition method according to an alternative implementation of the present disclosure. In order to make the image recognition method **800** of FIG. **8** easier to understand, please refer to FIGS. **2**, **3**, and **8** together. The image recognition method **800** of FIG. **8** includes the following steps:

[0056] Step **810**: importing the at least two images (e.g. the images **310** and **320**) at the first time point;

[0057] Step **820**: performing the person detection on the at least two images (e.g.

[0058] the images **310** and **320**) to obtain the first feature frame **210**;

[0059] Step **830**: obtaining the customer candidate from the at least two images (e.g. the images **310** and **320**) according to the first feature frame **210**;

[0060] Step **840**: determining whether the customer candidate is a staff member W;

[0061] Step **841**: deleting the customer candidate;

[0062] Step **850**: giving the first customer number to the first target C**1** according to the customer candidate;

[0063] Step **860**: determining whether the first target C**1** left the outdoor entrance T**1**;

[0064] Step **861**: remaining the first customer number of the first target unchanged when the first target C**1** left an indoor entrance in the building, and when the first target C**1** enters the indoor entrance;

[0065] Step **870**: giving the second customer number to the first target when the first target C**1** left the outdoor entrance, and when the first target C**1** enters the outdoor entrance;

[0066] Step **880**: counting a number of customers information and a customer stay time information in the at least two images (e.g. the images **310** and **320**) at the first time point, and showing the number of customers information and the customer stay time information in the statistics interface.

[0067] In one embodiment, please refer to the step **840**, when the customer candidate is the staff member W, the step **841** is executed to delete the customer candidate. For example, the identification of the first feature frame **210** is through clothing, the customer generally wears casual clothes, and the staff member W wears shop uniforms, so it is excluded from the customer candidate.

[0068] In one embodiment, please refer to the step **840**, when the customer candidate is not the staff member W, the step **850** is executed to give the first customer number to the first target C**1** according to the customer candidate.

[0069] In one embodiment, please refer to the step **860**, when the first target C**1** left an indoor entrance T**1** in the building, and when the first target C**1** enters the indoor entrance, the step **861** is executed, the first customer number of the first target C**1** remains unchanged.

[0070] It can be seen from the above implementation of the present disclosure that the application of the present disclosure has the following advantages. The image recognition system and the image recognition method shown in the embodiment of the present disclosure can automatically quantify and record the number of customers visiting the store.

[0071] Although the present disclosure has been described in considerable detail with reference to certain embodiments thereof, other embodiments are possible. Therefore, the spirit and scope of the appended claims should not be limited to the description of the embodiments contained herein.

[0072] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present disclosure without departing from the scope or spirit of the present disclosure. In view of the

foregoing, it is intended that the present disclosure cover modifications and variations of the present disclosure provided they fall within the scope of the following claims.

What is claimed is:

1. An image recognition system, comprising:

at least one sensor, configured to capture a plurality of images;

a memory, configured to store a plurality of commands; and

a processor, configured to obtain a plurality of commands from the memory to perform the following steps:

capturing at least two images in a building by the at least one sensor;

performing a person detection on the at least two images at a first time point to obtain a first feature frame;

obtaining a customer candidate from the at least two images according to the first feature frame;

giving a first customer number to a first target of the at least two images according to the customer candidate;

giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period; and

showing the first customer number and the second customer number of the first target in a statistics interface.

2. The image recognition system of claim **1**, wherein the at least one sensor is positioned on a top of an interior of the building, and the at least one sensor is configured to capture the at least two images in a top view manner, in a side view manner, or in a top view at a specific angle manner.

3. The image recognition system of claim **1**, wherein the building comprises at least one of a restaurant and a fast food shop.

4. The image recognition system of claim **1**, wherein the at least one sensor comprises at least one of a camera and a camcorder.

5. The image recognition system of claim **1**, wherein the statistics interface comprises a web Interface.

6. An image recognition method, comprising:

capturing at least two images in a building;

performing a person detection on the at least two images at a first time point to obtain a first feature frame;

obtaining a customer candidate from the at least two images according to the first feature frame;

giving a first customer number to a first target of the at least two images according to the customer candidate;

giving a second customer number to the first target when the first target leaves an outdoor entrance in a first period, and the first target enters the outdoor entrance in a second period; and

showing the first customer number and the second customer number of the first target in a statistics interface.

7. The image recognition method of claim **6**, further comprising:

importing the at least two images at the first time point with an annotation tool.

8. The image recognition method of claim **7**, wherein the step of performing the person detection on the at least two images at the first time point to obtain the first feature frame comprises:

automatically matching the at least two images at the first time point according to the first feature frame to obtain a headcount information at the first time point; and

averaging the headcount information of the at least two images at the first time point to obtain an average headcount information, and determining whether the average headcount information at the first time point is greater than 10 persons.

9. The image recognition method of claim **8**, wherein the step of performing the person detection on the at least two images at the first time point to obtain the first feature frame further comprises:

automatically matching a first target and a second target in the at least two images at the first time point and a second time point according to the first feature frame to determine that the first target and the second target in the at least two images are the same.

10. The image recognition method of claim **9**, wherein the step of averaging the headcount information of the at least two images at the first time point to obtain the average headcount information, and determining whether the average headcount information at the first time point is greater than 10 persons comprises:

importing the at least two images at a third time point by the annotation tool when the average headcount information is less than 10; and

automatically matching the first target and the second target in the at least two images at the first time point and the second time point according to the first feature frame to determine that the first target and the second target in the at least two images are the same when the average headcount information is greater than 10.

11. The image recognition method of claim **10**, wherein the step of automatically matching the first target and the second target in the at least two images at the first time point and the second time point according to the first feature frame to determine that the first target and the second target in the at least two images are the same comprises:

checking the first feature frame and a second feature frame of the first target and the second target in the at least two images.

12. The image recognition method of claim **11**, wherein the step of checking the first feature frame and the second feature frame of the first target and the second target in the at least two images comprises:

checking whether the first feature frame of the first target and the second feature frame of second target in the at least two images are different.

13. The image recognition method of claim **12**, wherein the step of checking the first feature frame and the second feature frame of the first target and second target in the at least two images further comprises:

amending the first feature frame or the second feature frame when the first feature frame of the first target and the second feature frame of the second target are different.

14. The image recognition method of claim **11**, wherein the step of checking the first feature frame and the second feature frame of the first target and second target in the at least two images further comprises:

marking the first feature frame for the first target or the second target by the annotation tool when the first target and the second target do not have the first feature frame.

15. The image recognition method of claim **14**, further comprising:

outputting the at least two images at the first time point, and the first target and the second target in the at least two images comprise at least one of the first feature frame and the second feature frame.

16. The image recognition method of claim **15**, wherein the step of obtaining the customer candidate from the at least two images according to the first feature frame comprises:

importing the at least two images at the first time point; and

performing the person detection on the at least two images to obtain the first feature frame.

17. The image recognition method of claim **16**, wherein the step of obtaining the customer candidate from the at least two images according to the first feature frame further comprises:

determining whether the customer candidate is a staff member.

18. The image recognition method of claim **17**, wherein the step of determining whether the customer candidate is the staff member comprises:

deleting the customer candidate when the customer candidate is the staff member; and

giving the first customer number to the first target according to the customer candidate when the customer candidate is not the staff member.

19. The image recognition method of claim **18**, wherein the step of giving the second customer number to the first target when the first target leaves the outdoor entrance in the first period, and the first target enters the outdoor entrance in the second period comprises:

determining whether the first target leaves the outdoor entrance;

giving the second customer number to the first target when the first target left the outdoor entrance, and when the first target enters the outdoor entrance; and

remaining the first customer number of the first target unchanged when the first target left an indoor entrance in the building, and when the first target enters the indoor entrance.

20. The image recognition method of claim **19**, wherein the step of showing the first customer number and the second customer number of the first target in the statistics interface comprises:

counting a number of customers information and a customer stay time information in the at least two images at the first time point; and

showing the number of customers information and the customer stay time information in the statistics interface.

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