detection precision, the apparatus may further comprise a reference tag (optional) which is provided in the first region and may also be an RFID tag. Since the reference tag is in the first region, the first processing unit 103 may perform a clustering on the collected tags of the target objects based on the reference tag, and classify tags of target objects successfully clustered with the reference tag into the first region tag cluster. The reference tag may be provided on the first sensor.

[0081] In this embodiment, the second sensor 102 may collect the reference tag (the collection method is the same as that described above), the first processing unit 103 may extract signal characteristics of the reference tag, perform a clustering on signal characteristics extracted from the tags in the first region tag cluster with the signal characteristics of the reference tag, and remove the tags for which the clustering fails from the first region tag cluster and move them into the second region tag cluster. In addition, the first processing unit 103 may perform a clustering on signal characteristics extracted from the tags in the second region tag cluster with the signal characteristics of the reference tag, and remove the tags for which the clustering succeeds from the second region tag cluster and move them into the first region tag cluster. In addition, in order to avoid the tags moving back and forth between the clusters, a threshold may be set to ensure that the clustering converges

[0082] In this embodiment, for details of the clustering, reference can be made to the related art, and therefore detailed description is omitted herein. For example, the clustering may be performed using a clustering algorithm such as a K-average algorithm or a nearest neighbor algorithm.

[0083] In this embodiment, the first sensor 101 provided in the first region (e.g., the paying region) may be a sensor for payment and gate control, or any other sensor for checkout. The first sensor 101 detects the tags of the target objects in the first region tag cluster, which may be tags of the objects purchased by the consumer, i.e., the tags of the target objects for which payment is ongoing, and verifies the consumer by referring to a payment and checkout system. If the customer is verified, the sensor for payment and gate control may automatically open the gate to allow the consumer to leave, therefore the purchase in the unmanned retail store is completed.

[0084] In this embodiment, the respective units and sensors of the apparatus for detecting an object may communicate data through a network (such as a local area network) connection.

[0085] According to this embodiment, by classifying the target objects detected by sensors into regions, it is possible to identify accurately the objects held by a consumer in a predetermined region, and therefore to reduce the miss detection and false detection.

[0086] In addition, by providing the reference tag in the predetermined region, and conducting a clustering on other tags collected based on the reference tag, it is possible to further reduce the

[0116] Step 404: collecting, by a second sensor provided in a second region, tags of target objects;

[0117] Step 405: classifying the tags of the target objects collected by the second sensor, to obtain a first region tag cluster and a second region tag cluster, wherein the first region tag cluster comprises tags of target objects in a first region, and the second region tag cluster comprises tags of target objects in the second region;

[0118] Step 406: filtering the tags of the target objects in the first region based on the auxiliary information to redetermine the first region tag cluster;

[0119] Step 407: detecting, by a first sensor provided in the first region, the tags of the target objects in the first region tag cluster.

[0120] For implementations of steps 401 to 407 in this embodiment, reference may be made to the apparatus for detecting an object in Embodiment 2, and therefore detailed description is omitted herein.

[0121] In this embodiment, before step 404, the method may further comprise (optional and not illustrated):

[0122] detecting, by a fourth sensor provided in the first region, entry of person into the first region; and

[0123] activating the second sensor and/or the first sensor to collect tags, i.e., to perform steps 404 to 407, in response to detection of entry of person into the first region by the fourth sensor.

[0124] Fig. 5 is a schematic diagram of an application scenario of the apparatus for detecting an object in this embodiment. As illustrated in Fig. 5, the apparatus for detecting an object is applied to an unmanned retail store, the first sensor is a sensor for payment and gate control (provided in the paying region), and the second sensor is an array antenna installed at the top of the to-pay region inside a checkout gate. The target objects are classified into regions based on the tags collected by the second sensor, and then the first sensor 101 detects the tags of the target objects in the paying region, i.e., the tags of the target objects held by the customer who is leaving the store, and verifies the consumer by referring to a payment and checkout system. If the customer is verified, the sensor for payment and gate control may automatically open the gate to allow the consumer to leave, therefore the purchase in the unmanned retail store is completed.

[0125] In accordance with the above embodiment, the objects held by the consumer in a predetermined region can be accurately identified, and the miss detection and false detection is suppressed.

[0126] In addition, with the auxiliary detection by the third sensor, it is possible to avoid confusing the target objects purchased by the consumer with the goods on the shelves in the store and therefore avoid false detection. In addition, by using the fourth sensor for activating the main

information.

[0140] The processing module 701 may re-filter the tags of the target objects in the first region based on the auxiliary information to obtain the first region tag cluster.

[0141] For implementation of the processing module 701 in this embodiment, reference may be made to the first processing unit or the second processing unit in Embodiment 1 or 2 and the central processing unit 810 described below, and therefore detailed description is omitted herein.

[0142] Fig. 8 is a schematic diagram of a hardware structure of an apparatus for processing data. As illustrated in Fig. 8, the apparatus for processing data may comprise an interface (not illustrated), a central processing unit (CPU) 810, and a memory 820 coupled to the central processing unit 810, wherein the memory 820 may store various data. In addition, the memory 820 may also store a program for data processing which is executed under the control of the central processing unit 810, and various preset values, predetermined conditions, and the like.

[0143] In one embodiment, some functions of data processing may be integrated into the central processing unit 810, and the central processing unit 810 may be configured to classify tags of target objects in a predetermined region based on signal characteristics of collected tags of the target objects in the predetermined region, to obtain a first region tag cluster and a second region tag cluster. The first region tag cluster comprises tags of target objects in a first region, the second region tag cluster comprises tags of target objects in a second region, and the predetermined region comprises the first region and the second region.

[0144] In this embodiment, the central processing unit 810 may be further configured to perform a clustering on the collected tags of the target objects based on a reference tag provided in the first region, and classify tags of target objects successfully clustered with the reference tag into the first region tag cluster.

[0145] In this embodiment, the central processing unit 810 may be further configured to determine whether target objects in a third region have moved based on signal characteristics of collected tags of the target objects in the third region; perform a clustering on tags of target objects that have moved, and take a result of the clustering as auxiliary information; and re-filter the tags of the target objects in the first region based on the auxiliary information to obtain the first region tag cluster.

[0146] In this embodiment, the central processing unit 810 may be further configured to activate a collection of tags of target objects in a predetermined region upon detection of entry of person into the first region.

[0147] It should be noted that the apparatus may further comprise a communication module 830 for receiving signals collected by respective sensors, etc., and for components of which

CLAIMS

WHAT IS CLAIMED IS:

1. An apparatus for detecting an object, comprising:

a first sensor provided in a first region;

a second sensor provided in a second region;

a first processing unit configured to classify tags of target objects collected by said second sensor, to obtain a first region tag cluster and a second region tag cluster, wherein said first region tag cluster comprises tags of target objects in said first region, and said second region tag cluster comprises tags of target objects in said second region,

wherein said first sensor is configured to detect the tags of the target objects in said first region tag cluster based on a classification result of said first processing unit.

2. The apparatus according to claim 1, further comprising a reference tag provided in said first region, wherein the first processing unit is further configured to perform a clustering on the collected tags of the target objects based on said reference tag, and classify tags of target objects successfully clustered with said reference tag into said first region tag cluster, and preferably, said first processing unit is further configured to extract signal characteristics of the collected tags of the target objects for clustering.

3. The apparatus according to claim 1 or 2, wherein said second sensor is an array antenna.

4. The apparatus according to any one of claims 1 to 3, further comprising:

a third sensor provided in a third region and configured to collect tags of target objects in said third region;

a second processing unit configured to determine whether the target objects in said third region have moved based on the tags collected by said third sensor, preferably, wherein the second processing unit is further configured to perform a clustering on tags of target objects that have moved, and take a result of the clustering as auxiliary information, and wherein the first processing unit is further configured to filter the tags of the target objects in said first region based on the auxiliary information of the second processing unit, to obtain said first region tag cluster.

5. The apparatus according to any one of claims 1 to 4, further comprising:

a fourth sensor provided in the first region and configured to detect entry of person into said first region,

wherein said fourth sensor is further configured to activate said second sensor and/or said first sensor to collect the tags upon detection of entry of person into said first region.

6. A method for detecting an object, comprising:

collecting, by a second sensor provided in a second region, tags of target objects;

classifying the tags of the target objects collected by said second sensor, to obtain a first region tag cluster and a second region tag cluster, wherein said first region tag cluster comprises tags of target objects in a first region, and said second region tag cluster comprises tags of target objects in said second region; and

detecting, by a first sensor provided in said first region, the tags of the target objects in said first region tag cluster.

7. The method according to claim 6, further comprising:

performing a clustering on the collected tags of the target objects based on a reference tag provided in said first region, and classifying tags of target objects successfully clustered with said reference tag into said first region tag cluster, and preferably, said clustering comprises extracting signal characteristics of said collected tags of the target objects for clustering.

8. The method according to claim 6 or 7, wherein said second sensor is an array antenna.

9. The method according to any one of claims 6 to 8, further comprising:

collecting, by a third sensor provided in a third region, tags of target objects in said third region;

determining whether the target objects in said third region have moved based on the tags collected by said third sensor, preferably, wherein the method further comprises:

performing a clustering on tags of target objects that have moved, and taking a result of the clustering as auxiliary information, and wherein classifying the tags of the target objects collected by said second sensor to obtain the first region tag cluster further comprises:

filtering the tags of the target objects in said first region based on said auxiliary information to obtain said first region tag cluster.

10. The method according to any one of claims 6 to 9, further comprising:

detecting, by a fourth sensor provided in said first region, entry of person into said first region; and

activating the second sensor and/or the first sensor to collect tags in response to detection of entry of person into said first region.

11. A method for processing data, comprising:

classifying tags of target objects in a predetermined region based on signal characteristics of collected tags of the target objects in said predetermined region, to obtain a first region tag cluster and a second region tag cluster, wherein said first region tag cluster comprises tags of target objects in a first region, said second region tag cluster includes tags of target objects in a second region, and said predetermined region includes the first region and the second region.

12. The method according to claim 11, further comprising:

determining whether target objects in a third region have moved based on signal characteristics of collected tags of the target objects in said third region, preferably, wherein the method further comprises:

performing a clustering on tags of target objects that have moved, and taking a result of the clustering as auxiliary information; and

re-filtering the tags of the target objects in said first region based on said auxiliary information to obtain said first region tag cluster.

13. An apparatus for processing data, comprising:

a processing module configured to classify tags of target objects in a predetermined region based on signal characteristics of collected tags of the target objects in said predetermined region, to obtain a first region tag cluster and a second region tag cluster, wherein said first region tag cluster comprises tags of target objects in a first region, said second region tag cluster includes tags of target objects in a second region, and said predetermined region includes the first region and the second region.

14. The apparatus according to claim 13, wherein said processing module is further configured to determine whether target objects in a third region have moved based on signal characteristics of collected tags of the target objects in said third region, preferably, wherein said processing module is further configured to perform a clustering on tags of target objects that have moved, and take a result of the clustering as auxiliary information; and

re-filtering the tags of the target objects in said first region based on said auxiliary information to obtain said first region tag cluster.

15. A computer readable storage medium on which a computer program is stored, wherein said computer program is configured to implement, when being executed, the steps of the method according to claim 11 or 12.