

CLAIMS

What is claimed is:

1. A handheld object recognition method, comprising:

obtaining location information of each of one or more detected objects in a to-be-recognized image, and obtaining
5 a first label of each detected object, wherein the location information of each detected object is location information of the detected object in the to-be-recognized image, the first label of the detected object indicates a type of the detected object, and the type of the detected object is used to represent a handheld relationship of the detected object;

obtaining a handheld object from the one or more detected objects based on the first label of each detected object,
and obtaining location information of the handheld object from the location information of the one or more detected
10 objects; and

recognizing the handheld object in the to-be-recognized image based on the location information of the handheld object to obtain a recognition result of the handheld object.

2. The method according to claim 1, wherein the first label comprises a subclass label, the subclass label indicates a first type of the detected object, and the obtaining a first label of each detected object comprises:

15 after obtaining a first eigenvector of the to-be-recognized image, performing a first convolution operation on the first eigenvector of the to-be-recognized image to obtain a second eigenvector of the to-be-recognized image; and

performing a first full connection operation on the second eigenvector of the to-be-recognized image to obtain the first label of each detected object, wherein the first type comprises an object in a handheld state and an object in a non-handheld state.

20 3. The method according to claim 2, wherein the first type further comprises a hand holding an object and a hand not holding an object.

4. The method according to claim 3, wherein the first label further comprises a superclass label, the superclass label indicates a second type of the detected object, the first type is a subclass of the second type, and the obtaining a first label of each detected object further comprises:

25 after obtaining the first eigenvector of the to-be-recognized image, performing a second convolution operation on the first eigenvector to obtain a third eigenvector of the to-be-recognized image;

performing a fusion operation on the second eigenvector and the third eigenvector to obtain a fourth eigenvector of the to-be-recognized image;

performing a third convolution operation on the fourth eigenvector to obtain a fifth eigenvector of the to-be-recognized image; and
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performing a second full connection operation on the fifth eigenvector to obtain the superclass label of each detected object, wherein the second type comprises a hand and an object.

5. The method according to any one of claims 1 to 4, wherein the obtaining location information of each of one or more detected objects in a to-be-recognized image comprises:

5 after obtaining the first eigenvector of the to-be-recognized image, performing a bounding box regression operation on the one or more detected objects in the to-be-recognized image based on the first eigenvector of the to-be-recognized image to obtain the location information of each of the one or more detected objects.

6. The method according to any one of claims 1 to 5, wherein the recognizing the handheld object in the to-be-recognized image based on the location information of the handheld object to obtain a recognition result of the handheld object comprises:

cropping, from the to-be-recognized image based on the location information of the handheld object, an image block comprising the handheld object, wherein the image block is a part of the to-be-recognized image;

performing feature extraction on the handheld object in the image block to obtain a first eigenvector of the handheld object;

15 determining a reference label of the handheld object and a first confidence level based on the first eigenvector of the handheld object, wherein the first confidence level is a probability that a label of the handheld object is the reference label; and

obtaining the recognition result of the handheld object based on the reference label of the handheld object and the first confidence level.

7. The method according to claim 6, wherein the recognition result comprises the label of the handheld object or a second label, the second label indicates that the handheld object is not recognized, an incremental feature database comprises S eigenvectors and a label corresponding to each of the S eigenvectors, S is an integer greater than or equal to 0, and the obtaining the recognition result of the handheld object based on the reference label of the handheld object and the first confidence level comprises:

25 when the first confidence level is higher than a preset confidence level, determining the reference label of the handheld object as the label of the handheld object;

when the first confidence level is not higher than the preset confidence level, obtaining S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors, wherein the S second confidence levels one to one correspond to the S eigenvectors, and a second confidence level corresponding to a j^{th} eigenvector in the S eigenvectors is used to represent a probability that the label of the handheld object is a label corresponding to the j^{th} eigenvector; and

if the S second confidence levels are all lower than the preset confidence level, determining that the second label is the label of the handheld object, and if a confidence level higher than the preset confidence level exists in the S second confidence levels, determining that a label corresponding to a target eigenvector is the label of the handheld object, wherein the target eigenvector is an eigenvector corresponding to a highest confidence level higher than the preset confidence level.

8. The method according to claim 7, wherein each of the S eigenvectors comprises k sub-eigenvectors, and the obtaining S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors comprises:

for any eigenvector A in the S eigenvectors, obtaining k third confidence levels through calculation based on the first eigenvector of the handheld object and the k sub-eigenvectors of the eigenvector A, wherein the third confidence level is used to represent a probability that the label of the handheld object is a label corresponding to the eigenvector A; and

obtaining, through calculation based on the k third confidence levels, a second confidence level corresponding to the eigenvector A.

9. The method according to claim 7 or 8, wherein after the determining a recognition result of the handheld object based on a first eigenvector of the handheld object, the method further comprises:

presenting the recognition result of the handheld object to a user.

10. The method according to claim 9, wherein the method further comprises:

receiving first information of the user, wherein the first information comprises a third label of the handheld object;

and

saving the third label of the handheld object and the first eigenvector of the handheld object into an incremental recognition database.

11. The method according to claim 9, wherein the method further comprises:

receiving second information of the user, wherein the second information indicates the user to flip the handheld object, and the second information comprises the third label of the handheld object;

obtaining a plurality of frames of first images of the handheld object, wherein the plurality of frames of first images are images of the handheld object at different angles;

obtaining a plurality of third eigenvectors of the handheld object based on the plurality of frames of first images, wherein the plurality of third eigenvectors one-to-one correspond to the plurality of frames of first images;

clustering the plurality of third eigenvectors based on a clustering algorithm to obtain the k sub-eigenvectors;

and

saving the third label and a second eigenvector of the handheld object into the incremental recognition database, wherein the second eigenvector is obtained based on the k sub-eigenvectors, or the second eigenvector comprises the k sub-eigenvectors.

125. A handheld object recognition method, comprising:

5 obtaining location information of each of one or more detected objects in a to-be-recognized image, and obtaining a first label of each detected object, wherein the location information of each detected object is location information of the detected object in the to-be-recognized image, the first label of the detected object indicates a type of the detected object, and the type of the detected object is used to represent a handheld relationship of the detected object;

10 obtaining a handheld object from the one or more detected objects based on the first label of each detected object, and obtaining location information of the handheld object from the location information of the one or more detected objects;

cropping, from the to-be-recognized image based on the location information of the handheld object, an image block comprising the handheld object, wherein the image block is a part of the to-be-recognized image;

15 sending an object recognition request to an object recognition server, wherein the object recognition request carries the image block; and

receiving a response message of the object recognition server, wherein the response message carries a recognition result of the handheld object.

136. The method according to claim 125, wherein the first label comprises a subclass label, the subclass label indicates a first type of the detected object, and the obtaining a first label of each detected object comprises:

20 after obtaining a first eigenvector of the to-be-recognized image, performing a first convolution operation on the first eigenvector of the to-be-recognized image to obtain a second eigenvector of the to-be-recognized image; and

performing a first full connection operation on the second eigenvector of the to-be-recognized image to obtain the first label of each detected object, wherein the first type comprises an object in a handheld state and an object in a non-handheld state.

25 14. The method according to claim 13, wherein the first type further comprises a hand holding an object and a hand not holding an object.

15. The method according to claim 14, wherein the first label further comprises a superclass label, the superclass label indicates a second type of the detected object, the first type is a subclass of the second type, and the obtaining a first label of each detected object further comprises:

30 after obtaining the first eigenvector of the to-be-recognized image, performing a second convolution operation on the first eigenvector to obtain a third eigenvector of the to-be-recognized image;

performing a fusion operation on the second eigenvector and the third eigenvector to obtain a fourth eigenvector of the to-be-recognized image;

performing a third convolution operation on the fourth eigenvector to obtain a fifth eigenvector of the to-be-recognized image; and

5 performing a second full connection operation on the fifth eigenvector to obtain the superclass label of each detected object, wherein the second type comprises a hand and an object.

16. The method according to any one of claims 12 to 15, wherein the obtaining location information of each of one or more detected objects in a to-be-recognized image comprises:

10 after obtaining the first eigenvector of the to-be-recognized image, performing a bounding box regression operation on the one or more detected objects in the to-be-recognized image based on the first eigenvector of the to-be-recognized image to obtain the location information of each of the one or more detected objects.

17. The method according to any one of claims 12 to 16, wherein after the receiving a response message of the object recognition server, the method further comprises:

presenting the recognition result of the handheld object to a user.

15 18. The method according to claim 17, wherein the method further comprises:

receiving first information of the user, wherein the first information comprises a third label of the handheld object; and

20 sending a first message to the object recognition server, wherein the first message carries the third label of the handheld object, and the first message indicates the object recognition server to save the third label of the handheld object and a first eigenvector of the handheld object into an incremental recognition database.

19. The method according to claim 17, wherein the method further comprises:

receiving second information of the user, wherein the second information indicates the user to flip the handheld object, and the second information comprises the third label of the handheld object;

25 obtaining a plurality of frames of first images of the handheld object, wherein the plurality of frames of first images are images of the handheld object at different angles; and

sending a second message to the object recognition server, wherein the second message carries the third label and the plurality of frames of first images of the handheld object, and the second message indicates the object recognition server to obtain a second eigenvector of the handheld object based on the plurality of frames of first images, and save the third label and the second eigenvector of the handheld object into the incremental recognition database.

30 20. A handheld object recognition method, comprising:

receiving an object recognition request sent by a handheld object recognition apparatus, wherein the object

recognition request carries an image block comprising a handheld object;

performing feature extraction on the handheld object in the image block to obtain a first eigenvector of the handheld object;

5 determining a reference label of the handheld object and a first confidence level based on the first eigenvector of the handheld object, wherein the first confidence level is a probability that a label of the handheld object is the reference label;

obtaining a recognition result of the handheld object based on the reference label of the handheld object and the first confidence level; and

10 sending, to the handheld object recognition apparatus, a response message used to respond to the object recognition request, wherein the response message carries the recognition result of the handheld object.

218. The method according to claim 207, wherein the recognition result comprises the label of the handheld object or a second label, the second label indicates that the handheld object is not recognized, an incremental feature database comprises S eigenvectors and a label corresponding to each of the S eigenvectors, S is an integer greater than or equal to 0, and the obtaining a recognition result of the handheld object based on the reference label of the handheld object and the first confidence level comprises:

when the first confidence level is higher than a preset confidence level, determining the reference label of the handheld object as the label of the handheld object;

20 when the first confidence level is not higher than the preset confidence level, obtaining S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors, wherein the S second confidence levels one-to-one correspond to the S eigenvectors, and a second confidence level corresponding to a j^{th} eigenvector in the S eigenvectors is used to represent a probability that the label of the handheld object is a label corresponding to the j^{th} eigenvector; and

25 if the S second confidence levels are all lower than the preset confidence level, determining that the second label is the label of the handheld object, and if a confidence level higher than the preset confidence level exists in the S second confidence levels, determining that a label corresponding to a target eigenvector is the label of the handheld object, wherein the target eigenvector is an eigenvector corresponding to a highest confidence level higher than the preset confidence level.

30 ~~22. The method according to claim 21, wherein each of the S eigenvectors comprises k sub-eigenvectors, and the obtaining S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors comprises:~~

~~for any eigenvector A in the S eigenvectors, obtaining k third confidence levels through calculation based on the~~

first eigenvector of the handheld object and the k sub-eigenvectors of the eigenvector A, wherein the third confidence level is used to represent a probability that the label of the handheld object is a label corresponding to the eigenvector A; and

obtaining, through calculation based on the k third confidence levels, a second confidence level corresponding to the eigenvector A.

23. The method according to any one of claims 20 to 22, wherein the method further comprises:

receiving a first message sent by the handheld object recognition apparatus, wherein the first message carries a third label of the handheld object; and

saving the third label of the handheld object and the first eigenvector of the handheld object into an incremental recognition database.

24. The method according to any one of claims 20 to 22, wherein the method further comprises:

receiving a second message sent by the handheld object recognition apparatus, wherein the second message carries a third label and a plurality of frames of first images of the handheld object, and the plurality of frames of first images are images of the handheld object at different angles;

obtaining a plurality of third eigenvectors of the handheld object based on the plurality of frames of first images, wherein the plurality of third eigenvectors one to one correspond to the plurality of frames of first images;

clustering the plurality of third eigenvectors based on a clustering algorithm to obtain the k sub-eigenvectors; and

saving the third label and a second eigenvector of the handheld object into the incremental recognition database, wherein the second eigenvector is obtained based on the k sub-eigenvectors, or the second eigenvector comprises the k sub-eigenvectors.

25. A handheld object recognition apparatus, comprising:

an obtaining unit, configured to: obtain location information of each of one or more detected objects in a to-be-recognized image, and obtain a first label of each detected object, wherein the location information of each detected object is location information of the detected object in the to-be-recognized image, the first label of the detected object indicates a type of the detected object, and the type of the detected object is used to represent a handheld relationship of the detected object, wherein

the obtaining unit is further configured to: obtain a handheld object from the one or more detected objects based on the first label of each detected object, and obtain location information of the handheld object from the location information of the one or more detected objects; and

a recognition unit, configured to recognize the handheld object in the to-be-recognized image based on the

location information of the handheld object to obtain a recognition result of the handheld object.

2610. The apparatus according to claim 259, wherein the first label comprises a subclass label, the subclass label indicates a first type of the detected object, and when obtaining the first label of each detected object, the obtaining unit is specifically configured to:

5 after obtaining a first eigenvector of the to-be-recognized image, perform a first convolution operation on the first eigenvector of the to-be-recognized image to obtain a second eigenvector of the to-be-recognized image; and perform a first full connection operation on the second eigenvector of the to-be-recognized image to obtain the first label of each detected object, wherein the first type comprises an object in a handheld state and an object in a non-handheld state.

10 2711. The apparatus according to claim 2610, wherein the first type further comprises a hand holding an object and a hand not holding an object.

2812. The apparatus according to claim 2711, wherein the first label further comprises a superclass label, the superclass label indicates a second type of the detected object, the first type is a subclass of the second type, and when obtaining the first label of each detected object, the obtaining unit is further configured to:

15 after obtaining the first eigenvector of the to-be-recognized image, perform a second convolution operation on the first eigenvector to obtain a third eigenvector of the to-be-recognized image;

perform a fusion operation on the second eigenvector and the third eigenvector to obtain a fourth eigenvector of the to-be-recognized image;

perform a third convolution operation on the fourth eigenvector to obtain a fifth eigenvector of the to-be-recognized image; and

20 perform a second full connection operation on the fifth eigenvector to obtain the superclass label of each detected object, wherein the second type comprises a hand and an object.

~~29. The apparatus according to any one of claims 25 to 28, wherein when obtaining the location information of each of the one or more detected objects in the to-be-recognized image, the obtaining unit is specifically configured to:~~

~~after obtaining the first eigenvector of the to-be-recognized image, perform a bounding box regression operation on the one or more detected objects in the to-be-recognized image based on the first eigenvector of the to-be-recognized image to obtain the location information of each of the one or more detected objects.~~

~~30. The apparatus according to any one of claims 25 to 29, wherein the recognition unit is specifically configured to:~~
~~crop, from the to-be-recognized image based on the location information of the handheld object, an image block~~

comprising the handheld object, wherein the image block is a part of the to-be-recognized image;

perform feature extraction on the handheld object in the image block to obtain a first eigenvector of the handheld object;

determine a reference label of the handheld object and a first confidence level based on the first eigenvector of the handheld object, wherein the first confidence level is a probability that a label of the handheld object is the reference label; and

obtain the recognition result of the handheld object based on the reference label of the handheld object and the first confidence level.

31. The apparatus according to claim 30, wherein the recognition result comprises the label of the handheld object or a second label, the second label indicates that the handheld object is not recognized, an incremental feature database comprises S eigenvectors and a label corresponding to each of the S eigenvectors, S is an integer greater than or equal to 0, and when obtaining the recognition result of the handheld object based on the reference label of the handheld object and the first confidence level, the recognition unit is specifically configured to:

when the first confidence level is higher than a preset confidence level, determine the reference label of the handheld object as the label of the handheld object;

when the first confidence level is not higher than the preset confidence level, obtain S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors, wherein the S second confidence levels one to one correspond to the S eigenvectors, and a second confidence level corresponding to a j^{th} eigenvector in the S eigenvectors is used to represent a probability that the label of the handheld object is a label corresponding to the j^{th} eigenvector; and

if the S second confidence levels are all lower than the preset confidence level, determine that the second label is the label of the handheld object, and if a confidence level higher than the preset confidence level exists in the S second confidence levels, determine that a label corresponding to a target eigenvector is the label of the handheld object, wherein the target eigenvector is an eigenvector corresponding to a highest confidence level higher than the preset confidence level.

32. The apparatus according to claim 31, wherein each of the S eigenvectors comprises k sub-eigenvectors, and when obtaining the S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors comprises, the recognition unit is specifically configured to:

for any eigenvector A in the S eigenvectors, obtain k third confidence levels through calculation based on the first eigenvector of the handheld object and the k sub-eigenvectors of the eigenvector A, wherein the third confidence level is used to represent a probability that the label of the handheld object is a label corresponding to the eigenvector

A; and

~~obtain, through calculation based on the k third confidence levels, a second confidence level corresponding to the eigenvector A.~~

~~33. The apparatus according to claim 31 or 32, wherein the apparatus further comprises:~~

~~a display unit, configured to display the recognition result of the handheld object to a user after the recognition unit determines the recognition result of the handheld object based on the first eigenvector of the handheld object.~~

~~34. The apparatus according to claim 33, wherein the apparatus further comprises:~~

~~a receiving unit, configured to receive first information of the user, wherein the first information comprises a third label of the handheld object; and~~

~~a saving unit, configured to save the third label of the handheld object and the first eigenvector of the handheld object into an incremental recognition database.~~

~~35. The apparatus according to claim 33, wherein the apparatus further comprises:~~

~~a receiving unit, configured to receive second information of the user, wherein the second information indicates the user to flip the handheld object, and the second information comprises a third label of the handheld object, wherein~~

~~the obtaining unit is further configured to: obtain a plurality of frames of first images of the handheld object, wherein the plurality of frames of first images are images of the handheld object at different angles, and obtain a plurality of third eigenvectors of the handheld object based on the plurality of frames of first images, wherein the plurality of third eigenvectors one to one correspond to the plurality of frames of first images;~~

~~a clustering unit, configured to cluster the plurality of third eigenvectors based on a clustering algorithm to obtain the k sub-eigenvectors; and~~

~~a saving unit, configured to save the third label and a second eigenvector of the handheld object into an incremental recognition database, wherein the second eigenvector is obtained based on the k sub-eigenvectors, or the second eigenvector comprises the k sub-eigenvectors.~~

~~36~~13. A handheld object recognition apparatus, comprising:

~~an obtaining unit, configured to: obtain location information of each of one or more detected objects in a to-be-recognized image, and obtain a first label of each detected object, wherein the location information of each detected object is location information of the detected object in the to-be-recognized image, the first label of the detected object indicates a type of the detected object, and the type of the detected object is used to represent a handheld relationship of the detected object, wherein~~

~~the obtaining unit is further configured to: obtain a handheld object from the one or more detected objects based on the first label of each detected object, and obtain location information of the handheld object from the location~~

information of the one or more detected objects;

a cropping unit, configured to crop, from the to-be-recognized image based on the location information of the handheld object, an image block comprising the handheld object, wherein the image block is a part of the to-be-recognized image;

5 a sending unit, configured to send an object recognition request to an object recognition server, wherein the object recognition request carries the image block; and

a receiving unit, configured to receive a response message of the object recognition server, wherein the response message carries a recognition result of the handheld object.

10 ~~37~~14. The apparatus according to claim ~~36~~13, wherein the first label comprises a subclass label, the subclass label indicates a first type of the detected object, and when obtaining the first label of each detected object, the obtaining unit is specifically configured to:

after obtaining a first eigenvector of the to-be-recognized image, perform a first convolution operation on the first eigenvector of the to-be-recognized image to obtain a second eigenvector of the to-be-recognized image; and

15 perform a first full connection operation on the second eigenvector of the to-be-recognized image to obtain the first label of each detected object, wherein the first type comprises an object in a handheld state and an object in a non-handheld state.

~~38. The apparatus according to claim 37, wherein the first type further comprises a hand holding an object and a hand not holding an object.~~

20 ~~39. The apparatus according to claim 38, wherein the first label further comprises a superclass label, the superclass label indicates a second type of the detected object, the first type is a subclass of the second type, and when obtaining the first label of each detected object, the obtaining unit is further specifically configured to:~~

~~after obtaining the first eigenvector of the to-be-recognized image, perform a second convolution operation on the first eigenvector to obtain a third eigenvector of the to-be-recognized image;~~

25 ~~perform a fusion operation on the second eigenvector and the third eigenvector to obtain a fourth eigenvector of the to-be-recognized image;~~

~~perform a third convolution operation on the fourth eigenvector to obtain a fifth eigenvector of the to-be-recognized image; and~~

~~perform a second full connection operation on the fifth eigenvector to obtain the superclass label of each detected object, wherein the second type comprises a hand and an object.~~

30 ~~40. The apparatus according to any one of claims 36 to 39, wherein when obtaining the location information of each of the one or more detected objects in the to-be-recognized image, the obtaining unit is specifically configured~~

to:

after obtaining the first eigenvector of the to-be-recognized image, perform a bounding box regression operation on the one or more detected objects in the to-be-recognized image based on the first eigenvector of the to-be-recognized image to obtain the location information of each of the one or more detected objects.

5 41. The apparatus according to any one of claims 36 to 40, wherein the apparatus further comprises:

a display unit, configured to: after the receiving unit receives the response message of the object recognition server, display the recognition result of the handheld object to a user.

42. The apparatus according to claim 41, wherein

10 the receiving unit is further configured to receive first information of the user, wherein the first information comprises a third label of the handheld object; and

the sending unit is further configured to send a first message to the object recognition server, wherein the first message carries the third label of the handheld object, and the first message indicates the object recognition server to save the third label of the handheld object and a first eigenvector of the handheld object into an incremental recognition database.

15 43. The apparatus according to claim 41, wherein the apparatus further comprises:

the receiving unit, further configured to receive second information of the user, wherein the second information indicates the user to flip the handheld object, and the second information comprises a third label of the handheld object;

the obtaining unit, further configured to obtain a plurality of frames of first images of the handheld object, wherein the plurality of frames of first images are images of the handheld object at different angles; and

20 the sending unit, further configured to send a second message to the object recognition server, wherein the second message carries the third label and the plurality of frames of first images of the handheld object, and the second message indicates the object recognition server to obtain a second eigenvector of the handheld object based on the plurality of frames of first images, and save the third label and the second eigenvector of the handheld object into the incremental recognition database.

25 44. An object recognition server, comprising:

a receiving unit, configured to receive an object recognition request sent by a handheld object recognition apparatus, wherein the object recognition request carries an image block comprising a handheld object;

a feature extraction unit, configured to perform feature extraction on the handheld object in the image block to obtain a first eigenvector of the handheld object;

30 a determining unit, configured to determine a reference label of the handheld object and a first confidence level based on the first eigenvector of the handheld object, wherein the first confidence level is a probability that a label of

the handheld object is the reference label;

an obtaining unit, configured to obtain a recognition result of the handheld object based on the reference label of the handheld object and the first confidence level; and

a sending unit, configured to send, to the handheld object recognition apparatus, a response message used to respond to the object recognition request, wherein the response message carries the recognition result of the handheld object.

4516. The server according to claim 4415, wherein the recognition result comprises the label of the handheld object or a second label, the second label indicates that the handheld object is not recognized, an incremental feature database comprises S eigenvectors and a label corresponding to each of the S eigenvectors, S is an integer greater than or equal to 0, and the obtaining unit is specifically configured to:

when the first confidence level is higher than a preset confidence level, determine the reference label of the handheld object as the label of the handheld object;

when the first confidence level is not higher than the preset confidence level, obtain S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors, wherein the S second confidence levels one-to-one correspond to the S eigenvectors, and a second confidence level corresponding to a j^{th} eigenvector in the S eigenvectors is used to represent a probability that the label of the handheld object is a label corresponding to the j^{th} eigenvector; and

if the S second confidence levels are all lower than the preset confidence level, determine that the second label is the label of the handheld object, and if a confidence level higher than the preset confidence level exists in the S second confidence levels, determine that a label corresponding to a target eigenvector is the label of the handheld object, wherein the target eigenvector is an eigenvector corresponding to a highest confidence level higher than the preset confidence level.

4617. The server according to claim 4516, wherein each of the S eigenvectors comprises k sub-eigenvectors, and when obtaining the S second confidence levels based on the first eigenvector of the handheld object and the S eigenvectors comprises, the obtaining unit is specifically configured to:

for any eigenvector A in the S eigenvectors, obtain k third confidence levels through calculation based on the first eigenvector of the handheld object and the k sub-eigenvectors of the eigenvector A, wherein the third confidence level is used to represent a probability that the label of the handheld object is a label corresponding to the eigenvector A; and

obtain, through calculation based on the k third confidence levels, a second confidence level corresponding to the eigenvector A.

47. The server according to any one of claims 44 to 46, wherein the server further comprises:
the receiving unit, further configured to receive a first message sent by the handheld object recognition apparatus,
wherein the first message carries a third label of the handheld object; and

a saving unit, configured to save the third label of the handheld object and the first eigenvector of the handheld
5 object into an incremental recognition database.

48. The server according to any one of claims 44 to 46, wherein the server further comprises:
the receiving unit, further configured to receive a second message sent by the handheld object recognition
apparatus, wherein the second message carries a third label and a plurality of frames of first images of the handheld
object, and the plurality of frames of first images are images of the handheld object at different angles;

10 the obtaining unit, further configured to obtain a plurality of third eigenvectors of the handheld object based on
the plurality of frames of first images, wherein the plurality of third eigenvectors one to one correspond to the plurality
of frames of first images;

a clustering unit, configured to cluster the plurality of third eigenvectors based on a clustering algorithm to obtain
the k sub eigenvectors; and

15 a saving unit, configured to save the third label and a second eigenvector of the handheld object into an
incremental recognition database, wherein the second eigenvector is obtained based on the k sub eigenvectors, or the
second eigenvector comprises the k sub eigenvectors.

49. A handheld object recognition apparatus, comprising:

a memory, configured to store instructions; and

20 a processor, coupled to the memory, wherein

when executing the instructions, the processor performs the method according to any one of claims 1 to 19.

50. An object recognition server, comprising:

a memory, configured to store instructions; and

a processor, coupled to the memory, wherein

25 when executing the instructions, the processor performs the method according to any one of claims 20 to 24.

5118. A chip system, wherein the chip system is applied to an electronic device; the chip system comprises one or
more interface circuits and one or more processors; the interface circuit and the processor are interconnected by using a
line; the interface circuit is configured to: receive a signal from a memory of the electronic device, and send the signal to
the processor; the signal comprises computer instructions stored in the memory; and when the processor executes the
30 computer instructions, the electronic device performs the method according to any one of claims 1 to 244.

5219. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer

program, the computer program comprises program instructions, and when the program instructions are executed by a processor, the processor is enabled to perform the method according to any one of claims 1 to ~~244~~.

~~5320~~5320. A computer program product, comprising computer instructions, wherein when the computer instructions are run on an electronic device, the electronic device is enabled to perform the method according to any one of claims

5 1 to ~~244~~.