CLAIMS

1. A method for liveness detection, comprising:

acquiring a first depth map captured by a depth sensor and a first target image captured by an image sensor;

performing quality detection on the first depth map to obtain a quality detection result of the first depth map; and

determining a liveness detection result of a target object in the first target image based on the quality detection result of the first depth map.

2. The method according to claim 1, wherein the depth sensor is a Time-of-Flight (ToF) sensor or a structured light sensor; and/or

wherein the image sensor is an RGB sensor or a near-infrared sensor.

3. The method according to any one of claims 1 to 2, wherein performing quality detection on the first depth map to obtain the quality detection result of the first depth map comprises:

determining at least one invalid position in a region corresponding to the target object in the first depth map; and

obtaining the quality detection result of the first depth map based on the at least one invalid position in the region corresponding to the target object.

4. The method according to claim 3, wherein obtaining the quality detection result of the first depth map based on the at least one invalid position in the region corresponding to the target object comprises:

obtaining the quality detection result of the first depth map based on a proportion of the at least one invalid position in the region corresponding to the target object.

5. The method according to claim 3, wherein obtaining the quality detection result of the first depth map based on the at least one invalid position in the region corresponding to the target

object comprises:

obtaining the quality detection result of the first depth map based on the at least one invalid position in the region corresponding to the target object and a weight corresponding to the at least one invalid position.

6. The method according to any one of claims 3 to 5, wherein determining at least one invalid position in the region corresponding to the target object in the first depth map comprises:

determining a position in the region corresponding to the target object, which has a depth value equal to zero, as the invalid position.

7. The method according to any one of claims 3 to 6, further comprising:

performing key point detection on the first target image to obtain key point information of the target object; and

determining, based on the key point information of the target object, the region corresponding to the target object from the first depth map.

8. The method according to any one of claims 1 to 7, wherein performing quality detection on the first depth map to obtain the quality detection result of the first depth map comprises:

inputting the first depth map into a first neural network for processing to obtain a quality confidence score corresponding to the first depth map; and

obtaining the quality detection result of the first depth map based on the quality confidence score corresponding to the first depth map.

9. The method according to claim 8, wherein obtaining the quality detection result of the first depth map based on the quality confidence score corresponding to the first depth map comprises:

in response to the quality confidence score corresponding to the first depth map being greater than a first threshold, determining that the quality detection result of the first depth map is qualified in quality ; and/or

in response to the quality confidence score corresponding to the first depth map being less than or equal to the first threshold, determining that the quality detection result of the first depth

map is unqualified in quality.

10. The method according to any one of claims 1 to 9, further comprising: before performing quality detection on the first depth map to obtain a quality detection result of the first depth map,

aligning the first depth map with the first target image according to a parameter of the depth sensor and a parameter of the image sensor.

11. The method according to any one of claims 1 to 10, wherein determining the liveness detection result of the target object in the first target image based on the quality detection result of the first depth map comprises:

in response to the quality detection result of the first depth map being qualified in quality, obtaining the liveness detection result of the target object based on the first depth map and the first target image.

12. The method according to claim 11, wherein obtaining the liveness detection result of the target object based on the first depth map and the first target image comprises:

obtaining the liveness detection result of the target object based on the first depth map and key point information of the target object contained in the first target image.

13. The method according to claim 12, wherein obtaining the liveness detection result of the target object based on the first depth map and the key point information of the target object contained in the first target image comprises:

obtaining first feature information based on the first depth map and the key point information of the target object;

obtaining second feature information based on the key point information of the target object; and

determining the liveness detection result of the target object based on the first feature information and the second feature information.

14. The method according to claim 13, wherein obtaining first feature information based on the

first depth map and the key point information of the target object comprises:

inputting the first depth map and the key point information of the target object into a second neural network for processing to obtain first feature information; and

the obtaining second feature information based on the key point information of the target object comprises:

inputting the first target image and the key point information of the target object into a third neural network for processing to obtain the second feature information.

15. The method according to claim 13 or 14, wherein obtaining first feature information based on the first depth map and the key point information of the target object comprises:

performing convolution processing on the first depth map and the key point information of the target object to obtain a first convolution result;

performing down-sampling processing on the first convolution result to obtain a first down-sampling result; and

obtaining the first feature information based on the first down-sampling result; and/or

wherein obtaining second feature information based on the key point information of the target object comprises:

performing convolution processing on the first target image and the key point information of the target object to obtain a second convolution result;

performing down-sampling processing on the second convolution result to obtain a second down-sampling result; and

obtaining the second feature information based on the second down-sampling result.

16. The method according to any one of claims 13 to 15, wherein determining the liveness detection result of the target object based on the first feature information and the second feature information comprises:

performing full connection processing on the first feature information and the second feature information to obtain third feature information; and

determining the liveness detection result of the target object according to the third feature

information.

17. The method according to claim 16, wherein determining the liveness detection result according to the third feature information comprises:

obtaining, based on the third feature information, a probability of the target object being a living body; and

determining a liveness detection result of the target object according to the probability of the target object being a living body.

18. The method according to any one of claims 1 to 17, wherein determining the liveness detection result of the target object in the first target image based on the quality detection result of the first depth map comprises:

in response to the quality detection result of the first depth map being unqualified in quality, performing, liveness detection on the target object, without using the first depth map, to obtain the liveness detection result of the target object; and/or

in response to the quality detection result of the first depth map being unqualified in quality and a number of retries of the quality detection on a video sequence to which the first target image belongs reaches a second threshold, determining that the liveness detection result of the target object is that the target object is a non-living body, or performing liveness detection on the target object, without using the first depth map, to obtain a liveness detection result of the target object.

19. An electronic device, comprising:

a processor; and

a memory configured to store processor-executable instructions;

wherein the processor is configured to invoke the instructions stored in the memory, to execute the method according to any one of claims 1 to 18.

20. A computer-readable storage medium, having computer program instructions stored thereon, wherein when the computer program instructions are executed by a processor, the method according to any one of claims 1 to 18 is implemented.