CLAIMS

1. An image processing method, comprising:

performing step-by-step convolution processing on an image to be processed to obtain a convolution result;

obtaining a positioning result through positioning processing according to the convolution result;

performing step-by-step deconvolution processing on the positioning result to obtain a deconvolution result; and

performing segmentation processing on the deconvolution result to segment a target object from the image to be processed.

2. The method according to claim 1, wherein performing step-by-step convolution processing on the image to be processed to obtain the convolution result comprises:

performing step-by-step convolution processing on the image to be processed to obtain at least one feature map having gradually decreasing resolution as the convolution result.

3. The method according to claim 2, wherein performing step-by-step convolution processing on the image to be processed to obtain the at least one feature map having the gradually decreasing resolution as the convolution result comprises:

performing convolution processing on the image to be processed, wherein the obtained feature map serves as a feature map to be convolved;

when the resolution of the feature map to be convolved does not reach a first threshold, performing convolution processing on the feature map to be convolved and taking the obtained result as a feature map to be convolved again; and

when the resolution of the feature map to be convolved reaches the first threshold, taking all the feature maps having the gradually decreasing resolution as the convolution result.

4. The method according to any one of claims 1 to 3, wherein obtaining the positioning result through positioning processing according to the convolution result comprises:

performing segmentation processing according to the convolution result to obtain a segmentation result; and

performing positioning processing on the convolution result according to the segmentation result to obtain the positioning result.

5. The method according to claim 4, wherein performing segmentation processing according to the convolution result to obtain the segmentation result comprises:

performing segmentation processing on the feature map having the lowest resolution in the convolution result to obtain the segmentation result.

6. The method according to claim 4 or 5, wherein performing positioning processing on the convolution result according to the segmentation result to obtain the positioning result comprises:

determining corresponding position information of the target object in the convolution result according to the segmentation result; and

performing positioning processing on the convolution result according to the position information to obtain the positioning result.

7. The method according to claim 6, wherein determining the corresponding position information of the target object in the convolution result according to the segmentation result comprises:

reading a coordinate position of the segmentation result; and

taking the coordinate position as an area center, and respectively determining, in the convolution result, an area position capable of fully covering the target object in the feature map at each resolution as the corresponding position information of the target object in the convolution result.

8. The method according to claim 6 or 7, wherein performing positioning processing on the convolution result according to the position information to obtain the positioning result comprises:

respectively performing cropping processing on the feature map at each resolution in the convolution result according to the position information to obtain the positioning result.

9. The method according to any one of claims 1 to 7, wherein performing step-by-step deconvolution processing on the positioning result to obtain the deconvolution result comprises:

taking the feature map having the lowest resolution in all the feature maps comprised in the positioning result as a feature map to be deconvolved;

when the resolution of the feature map to be deconvolved does not reach a second threshold, performing deconvolution processing on the feature map to be deconvolved to obtain a deconvolution processing result;

determining a next feature map of the feature map to be deconvolved in the positioning result according to a gradually increasing resolution order;

fusing the deconvolution processing result and the next feature map, and taking the fusing result as a feature map to be deconvolved again; and

when the resolution of the feature map to be deconvolved reaches the second threshold, taking the feature map to be deconvolved as the deconvolution result.

10. The method according to any one of claims 1 to 9, wherein the segmentation processing comprises:

performing softmax regression on an object to be segmented to obtain a regression result; and

performing maximum value comparison on the regression result to complete the segmentation processing on the object to be segmented.

11. The method according to any one of claims 1 to 10, wherein the method is implemented by a neural network, and the neural network comprises a first segmentation sub-network and a second segmentation sub-network,

wherein the first segmentation sub-network is configured to perform step-by-step convolution processing and segmentation processing on the image to be processed, and the second segmentation sub-network is configured to perform step-by-step deconvolution processing and segmentation processing on the positioning result.

12. The method according to claim 11, wherein a training process for the neural network comprises:

training the first segmentation sub-network according to a preset training set; and

training the second segmentation sub-network according to the preset training set and the trained

first segmentation sub-network.

13. The method according to any one of claims 1 to 12, before performing step-by-step convolution processing on the image to be processed to obtain the convolution result, further comprising:

adjusting the image to be processed to preset resolution.

14. The method according to any one of claims 1 to 13, wherein the image to be processed is a three-dimensional medical image.

15. An image processing apparatus, comprising:

a convolution module, configured to perform step-by-step convolution processing on an image to be processed to obtain a convolution result;

a positioning module, configured to obtain a positioning result through positioning processing according to the convolution result;

a deconvolution module, configured to perform step-by-step deconvolution processing on the positioning result to obtain a deconvolution result; and

a target object obtaining module, configured to perform segmentation processing on the deconvolution result to segment a target object from the image to be processed.

16. The apparatus according to claim 15, wherein the convolution module is configured to:

perform step-by-step convolution processing on the image to be processed to obtain at least one feature map having gradually decreasing resolution as the convolution result.

17. The apparatus according to claim 16, wherein the convolution module is further configured to:

perform convolution processing on the image to be processed, wherein the obtained feature map serves as a feature map to be convolved;

when the resolution of the feature map to be convolved does not reach a first threshold, perform convolution processing on the feature map to be convolved and take the obtained result as a feature map to be convolved again; and

when the resolution of the feature map to be convolved reaches the first threshold, take all the feature maps having the gradually decreasing resolution as the convolution result.

18. The apparatus according to any one of claim 15 to 17, wherein the positioning module comprises:

a segmentation sub-module, configured to perform segmentation processing according to the convolution result to obtain a segmentation result; and

a positioning sub-module, configured to perform positioning processing on the convolution result according to the segmentation result to obtain the positioning result.

19. An electronic device, comprising:

a processor; and

a memory configured to store processor executable instructions;

wherein the processor is configured to: execute the method according to any one of claims 1 to 14.

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 14 is implemented.