CLAIMS

1. A method of segmenting image, comprising:

obtaining an image feature output from each of a plurality of processing blocks by performing a feature extraction on an image with the plurality of processing blocks;

obtaining a target image feature by performing at least two stages of fusion on the image features output from at least two adjacent-processing-blocks pairs of the plurality of processing blocks; and

determining a segmentation result for an object in the image according to the target image feature.

2. The method according to claim 1, wherein obtaining the target image feature by performing at least two stages of fusion on the image features output from at least two adjacent-processing-blocks pairs of the plurality of processing blocks, comprises:

obtaining first fusion features by performing a first-stage fusion on the image features output from each of the adjacent-processing-blocks pairs;

obtaining one or more second fusion features by performing a second-stage fusion on at least one adjacent-first-fusion-features pair of the first fusion features; and

determining the target image feature according to the one or more second fusion features.

3. The method according to claim 2, wherein determining the target image feature according to the one or more second fusion features comprises:

performing a subsequent fusion on the one or more second fusion features until a number of subsequent fusion feature obtained from the subsequent fusion is one;

taking the one subsequent fusion feature as the target image feature; and

adding element-wisely the image features output from each adjacent-processing-blocks pair during performing a fusion on the image features output from each adjacent-processing-blocks pair.

4. The method according to any one of claims 1-3, wherein

the plurality of processing blocks are connected in sequence; and/or,

the image features output from each adjacent-processing-blocks pair have a same size and a same number of channels.

5. The method according to any one of claims 1-4, wherein each of the plurality of processing blocks comprises at least one processing unit, each of which comprises at least one feature extracting layer and at least one feature adjusting layer;

obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the image with the plurality of processing blocks, comprises:

obtaining a first feature by performing a feature extraction on input of the processing block with the at least one feature extracting layer of the processing block; and

obtaining the image feature output from the processing block by performing an adjustment on the first feature with the feature adjusting layer of the processing block.

6. The method according to any one of claims 1-5, wherein, before obtaining a target image feature by performing at least two stages of fusion on the image features

output from at least two adjacent-processing-blocks pairs of the plurality of processing blocks, the method further comprises:

performing a feature reduction on the image feature output from a processing block M1 of the plurality of processing blocks; and

performing a feature expansion on the image feature output from a processing block M2 of the plurality of processing blocks;

wherein an input end of the processing block M2 is connected directly or indirectly to an output end of the processing block M1; and

wherein obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the image with the plurality of processing blocks, comprises:

obtaining a first image feature output from a processing block N1 of the plurality of processing blocks by performing a feature extraction on input of the processing block N1 with the processing block N1, wherein the input of the processing block N1 comprises the image and/or the image feature output from at least one processing block located before the processing block N1, and N1 is equal to or more than one; and

obtaining a second image feature output from a next processing block after the processing block N1 by inputting the first image feature into the next processing block for feature extraction.

7. The method according to claim 6, wherein obtaining a second image feature output from the next processing block after the processing block N1 by inputting the first image feature into the next processing block, comprises:

obtaining the second image feature output from the next processing block by

inputting the first image feature together with the image and/or the image feature output from at least one processing block N2 into the next processing block for feature extraction,

wherein an input end of the processing block N1 is directly or indirectly connected to an output end of the processing block N2; and

wherein, before inputting the first image feature together with the image and/or the image feature output from at least one processing block N2 into the next processing block for feature extraction, the method further comprises:

performing a fusion on the image features output from the at least one processing block N2; and

inputting an image feature obtained from the fusion into the next processing block after the processing block N1.

8. The method according to any one of claims 1 to 7, wherein,

before obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on an image with the plurality of processing blocks, the method further comprises:

obtaining an initial feature of the image by performing a feature extraction on the image with a convolutional layer; and

performing a feature extraction on the image with the plurality of processing blocks comprises:

inputting the initial feature into the plurality of processing blocks for the feature extraction.

9. The method according to any one of claims 1 to 8, wherein

the image is a remote sensing image, and

the object is land.

10. The method according to any one of claims 1 to 9, wherein the method is implemented by a segmentation neural network, the image is a land sample image, and the method further comprises:

obtaining a segmentation result of a road sample image by processing the road sample image with the segmentation neural network;

obtaining a first loss based on the object prediction result of the land sample image and label information of the land sample image;

obtaining a second loss based on the segmentation result of the road sample image and label information of the road sample image;

obtaining a total loss by performing a weighted summation on the first loss and the second loss; and

adjusting a parameter of the segmentation neural network based on the total loss;

wherein the target image feature is obtained based on a mixed feature, which is obtained by batch processing the land sample image and the road sample image with the segmentation neural network.

11. The method according to claim 10, wherein,

before obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on an image with the plurality of processing blocks, the method further comprises:

performing, according to a pre-set parameter, at least one of following enhancement on the sample image:

adjusting a size of the sample image,

rotating an angle of the sample image, and

changing brightness of the sample image;

obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on an image with the plurality of processing blocks comprises:

obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the image subjected to the at least one of enhancement with the plurality of processing blocks.

12. The method according to any one of claims 1 to 11, wherein, before obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the image with the plurality of processing blocks, the method further comprises:

cropping the image based on a cropping frame with a pre-set size so as to obtain at least one cropped image;

obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the image with the plurality of processing blocks comprises:

obtaining the image feature output from each of the plurality of processing blocks by performing a feature extraction on the at least one cropped image with the plurality of processing blocks.

13. An device for segmenting image, comprising:

an image processing module, configured to obtain image features output from each of a plurality of processing blocks by performing a feature extraction on the image with the plurality of processing blocks;

a fusing module, configured to obtain a target image feature by performing at least two stages of fusion on image features output from at least two adjacent-processing-blocks pairs of the plurality of processing blocks; and

a segmenting module, configured to determine an object segmentation result for the image based on the target image feature.

14. A method of training a land segmentation neural network, comprising:

obtaining a predicted segmentation result of the at least one land sample image and a predicted segmentation result of the at least one road sample image by inputting at least one land sample image and at least one road sample image into the land segmentation neural network; and

adjusting a parameter of the land segmentation neural network based on the predicted segmentation result of the at least one land sample image and the predicted segmentation result of the at least one road sample image.

15. The method according to claim 14, wherein the land segmentation neural network comprises a plurality of processing blocks connected in sequence, a fusion network, and a segmentation network;

obtaining the predicted segmentation result of the at least one land sample image

and the predicted segmentation result of the at least one road sample image by inputting the at least one land sample image and the at least one road sample image into the land segmentation neural network comprises:

obtaining sample image features output from each of the plurality of processing blocks by performing a feature extraction on the at least one land sample image and the at least one road sample image with the plurality of processing blocks;

obtaining a target sample image feature by performing at least two stages of fusion on the sample image features output from at least two adjacent-processing-blocks pairs of the plurality of processing blocks with the fusion network; and

obtaining the predicted segmentation result of the at least one land sample image and the predicted segmentation result of the at least one road sample image base on the target sample image feature with the segmentation network.

16. The method according to claim 15, wherein obtaining sample image features output from each of the plurality of processing blocks by performing a feature extraction on the at least one land sample image and the at least one road sample image with the plurality of processing blocks comprises:

obtaining at least two sample image feature groups of each of at least one the land sample image and at least two sample image feature groups of each of the at least one road sample image by processing each of the at least one land sample image and each of the at least one road sample images with the plurality of processing blocks;

wherein obtaining the target sample image feature by performing the at least two stages of fusion on the sample image features output from the at least two adjacent-processing-blocks pairs of the plurality of processing blocks with the fusion network,

comprises:

obtaining a land sample image feature of each of the at least one land sample image by performing at least two stages of fusion on at least two sample image feature groups of each of the at least one land sample image; and

obtaining road sample image feature of each of the at least one road sample image by performing at least two stages of fusion on at least two sample image feature groups of each of the at least one road sample image;

wherein the target sample image feature comprises the land sample image feature of the at least one land sample image and the road sample image feature of the at least one road sample image.

17. The method according to claim 15 or 16, wherein the land segmentation neural network further comprises a slicing layer;

before obtaining the predicted segmentation result of the at least one land sample image and the predicted segmentation result of the at least one road sample image base on the target sample image feature, the method further comprises:

separating the land sample image feature from the road sample image feature contained in the target sample image feature with the slicing layer;

obtaining the predicted segmentation result of the land sample image by inputting the land sample image feature into the segmentation neural network for processing; and

obtaining the predicted segmentation result of the road sample image by inputting the road sample image feature into the segmentation neural network for processing;

wherein the land sample image and the road sample image have label information, respectively;

adjusting the parameter of the land segmentation neural network based on the predicted segmentation result of the at least one land sample image and the predicted segmentation result of the at least one road sample image comprises:

obtaining a first loss based on the predicted segmentation result of the land sample image and the label information of the land sample image;

obtaining a second loss based on the predicted segmentation result of the road sample image and the label information of the road sample image;

obtaining a total loss by performing a weighted summation on the first loss and the second loss; and

adjusting the parameter of the land segmentation neural network based on the total loss.

18. A device for training a land segmentation neural network, comprising:

a result predicting module, configured to obtain a predicted segmentation result of the at least one land sample image and a predicted segmentation result of the at least one road sample image by inputting at least one land sample image and at least one road sample image into the land segmentation neural network； and

a parameter adjustment module, configured to adjust a parameter of the land segmentation neural network based on the predicted segmentation result of the at least one land sample image and the predicted segmentation result of the at least one road sample image.

19. An electronic apparatus, comprising: memory configured to store executable instructions;

and a processor, configured to communicate with the memory to execute the executable instructions so as to implement operations of the method of segmenting image according to any one of claims 1 to 12, or configured to communicate with the memory to execute the executable instruction so as to implement operations of the method of training the land segmentation neural network according to any one of claims 14 to 17.

20. A computer-readable storage medium configured to store computer-readable instructions, wherein in a case that the instructions are executed, operations of the method of segmenting image according to any one of claims 1 to 12 are implemented, or operations of the method of training the land segmentation neural network according to any one of claims 14 to 17 are implemented.