

WHAT IS CLAIMED IS:

1. A method of recognizing characters of a claim document, comprising:

after a server receives a claim document image to be subjected to character recognition, performing region segmentation on the claim document image according to a frame line layout of a claim document frame format of the claim document image received by the server, thus obtaining one or multiple segmented regions;

calling a convolutional neural network model to analyze all the obtained segmented regions so as to obtain first segmented regions which are recognized by an optical character recognition engine and second segmented regions which not be recognized by the optical character recognition engine; and

performing character recognition on all the first segmented regions by using the optical character recognition engine to recognize the characters in all the first segmented regions, and calling an LSTM (Long Short-Term Memory) model to perform the character recognition on all the second segmented regions to recognize characters in all the second segmented regions;

which is characterized in that the training process of the convolutional neural network model is as follows:

A. for a predetermined claim document frame format, obtaining a preset number of claim document image samples based on the claim document frame format;

B. performing region segmentation on each claim document image sample according to the frame line layout of the claim document frame format, and determining third segmented regions misrecognized by the optical character recognition engine and fourth segmented regions correctly recognized by the optical character recognition engine in all the claim document image samples;

C. classifying all the third segmented regions into a first training set, and classifying all the fourth segmented regions into a second training set;

D. extracting a first preset ratio of segmented regions from the first training set and the second training set respectively as segmented regions for training, and taking the residual segmented regions in the first training set and the second training set as segmented regions for verification;

E. performing model training by using all the extracted segmented regions for training so as to generate the predetermined analysis model, and verifying the generated predetermined analysis model by using all the segmented regions for verification;

F. if the verification pass rate is greater than or equal to a preset threshold value, completing the training, or if the verification pass rate is less than the preset threshold value, increasing the number of claim document image samples, and repeatedly executing the steps A, B, C, D and E till the verification pass rate is greater than or equal to the preset threshold value.

2. The method of recognizing the characters of the claim document according to claim 1, which is characterized in that the training process of the LSTM model is as follows:

obtaining a preset number of segmented region samples, and labeling all the segmented region samples by characters included in these segmented region samples;

classifying the preset number of segmented region samples into a first data set and a second data set according to a preset ratio, taking the first data set as a training set, and taking the second data set as a test set;

sending the first data set into an LSTM network for model training, performing the character recognition on the segmented region samples in the second data set by using the trained model every preset time, and comparing recognized characters with the labels of the segmented region samples so as to calculate errors between the recognized characters and the labels;

if the errors of the characters recognized by the trained model are diverged, adjusting preset training parameters for retraining till the errors of the characters recognized by the trained model may be converged;

if the errors of the characters recognized by the trained model are converged, ending the model training, and taking the generated model as the trained predetermined recognition model.

3. The method of recognizing the characters of the claim document according to claim 1, which is characterized in that the segmented regions are regions having minimum areas, which are surrounded by frame lines of the claim document frame format and do not include the frame lines.

4. A device of recognizing characters of a claim document, comprising:

a segmentation module, which is used for performing region segmentation on a claim document image according to a frame line layout of a claim document frame format after receiving the claim document image to be subjected to character recognition of the claim document image, thus obtaining one or multiple segmented regions;

a recognition module, which is used for calling a convolutional neural network model to analyze all the obtained segmented regions so as to obtain first segmented regions which are recognized by an optical character recognition engine and second

segmented regions which not be recognized by the optical character recognition engine, and performing character recognition on all the first segmented regions by using the optical character recognition engine to recognize the characters in all the first segmented regions, and calling an LSTM (Long Short-Term Memory) model to perform the character recognition on all the second segmented regions to recognize characters in all the second segmented regions;

which is characterized in that the training process of the convolutional neural network model is as follows:

A. for a predetermined claim document frame format, obtaining a preset number of claim document image samples based on the claim document frame format;

B. performing region segmentation on each claim document image sample according to the frame line layout of the claim document frame format, and determining third segmented regions misrecognized by the optical character recognition engine and fourth segmented regions correctly recognized by the optical character recognition engine in all the claim document image samples;

C. classifying all the third segmented regions into a first training set, and classifying all the fourth segmented regions into a second training set;

D. extracting a first preset ratio of segmented regions from the first training set and the second training set respectively as segmented regions for training, and taking the residual segmented regions in the first training set and the second training set as segmented regions for verification;

E. performing model training by using all the extracted segmented regions for training so as to generate the predetermined analysis model, and verifying the

generated predetermined analysis model by using all the segmented regions for verification;

F. if the verification pass rate is greater than or equal to a preset threshold value, completing the training, or if the verification pass rate is less than the preset threshold value, increasing the number of claim document image samples, and repeatedly executing the steps A, B, C, D and E till the verification pass rate is greater than or equal to the preset threshold value.

5. The device of recognizing the characters of the claim document according to claim 4, which is characterized in that the training process of the LSTM model is as follows:

obtaining a preset number of segmented region samples, and labeling all the segmented region samples by characters included in these segmented region samples;

classifying the preset number of segmented region samples into a first data set and a second data set according to a preset ratio, taking the first data set as a training set, and taking the second data set as a test set;

sending the first data set into an LSTM network for model training, performing the character recognition on the segmented region samples in the second data set by using the trained model every preset time, and comparing recognized characters with the labels of the segmented region samples so as to calculate errors between the recognized characters and the labels;

if the errors of the characters recognized by the trained model are diverged, adjusting preset training parameters for retraining till the errors of the characters recognized by the trained model may be converged;

if the errors of the characters recognized by the trained model are converged, ending the model training, and taking the generated model as the trained predetermined recognition model.

6. The device of recognizing the characters of the claim document according to claim 4, which is characterized in that the segmented regions are regions having minimum areas, which are surrounded by frame lines of the claim document frame format and do not include the frame lines.

7. A server of recognizing characters of a claim document, comprising a memory and a processor, which is characterized in that the memory stores a program of recognizing the characters of the claim document, and the program of recognizing the characters of the claim document is executed by the processor to realize the following steps:

after the server receives a claim document image to be subjected to character recognition, performing region segmentation on the claim document image according to a frame line layout of a claim document frame format of the claim document image received by the server, thus obtaining one or multiple segmented regions;

calling a convolutional neural network model to analyze all the obtained segmented regions so as to obtain first segmented regions which are recognized by an optical character recognition engine and second segmented regions which not be recognized by the optical character recognition engine; and

performing character recognition on all the first segmented regions by using the optical character recognition engine to recognize the characters in all the first segmented regions, and calling an LSTM (Long Short-Term Memory) model to

perform the character recognition on all the second segmented regions to recognize characters in all the second segmented regions;

which is characterized in that the training process of the convolutional neural network model is as follows:

A. for a predetermined claim document frame format, obtaining a preset number of claim document image samples based on the claim document frame format;

B. performing region segmentation on each claim document image sample according to the frame line layout of the claim document frame format, and determining third segmented regions misrecognized by the optical character recognition engine and fourth segmented regions correctly recognized by the optical character recognition engine in all the claim document image samples;

C. classifying all the third segmented regions into a first training set, and classifying all the fourth segmented regions into a second training set;

D. extracting a first preset ratio of segmented regions from the first training set and the second training set respectively as segmented regions for training, and taking the residual segmented regions in the first training set and the second training set as segmented regions for verification;

E. performing model training by using all the extracted segmented regions for training so as to generate the predetermined analysis model, and verifying the generated predetermined analysis model by using all the segmented regions for verification;

F. if the verification pass rate is greater than or equal to a preset threshold value, completing the training, or if the verification pass rate is less than the preset threshold value, increasing the number of claim document image samples, and repeatedly

executing the steps A, B, C, D and E till the verification pass rate is greater than or equal to the preset threshold value.

8. The server of recognizing the characters of the claim document according to claim 7, which is characterized in that the training process of the LSTM model is as follows:

obtaining a preset number of segmented region samples, and labeling all the segmented region samples by characters included in these segmented region samples;

classifying the preset number of segmented region samples into a first data set and a second data set according to a preset ratio, taking the first data set as a training set, and taking the second data set as a test set;

sending the first data set into an LSTM network for model training, performing the character recognition on the segmented region samples in the second data set by using the trained model every preset time, and comparing recognized characters with the labels of the segmented region samples so as to calculate errors between the recognized characters and the labels;

if the errors of the characters recognized by the trained model are diverged, adjusting preset training parameters for retraining till the errors of the characters recognized by the trained model may be converged;

if the errors of the characters recognized by the trained model are converged, ending the model training, and taking the generated model as the trained predetermined recognition model.

9. The server of recognizing the characters of the claim document according to claim 7, which is characterized in that the segmented regions are regions having

minimum areas, which are surrounded by frame lines of the claim document frame format and do not include the frame lines.

10. A computer readable storage medium, which is characterized in that the computer readable storage medium stores a program of recognizing the characters of the claim document, and the program of recognizing the characters of the claim document is executed by at least one processor to realize the following steps:

after a server receives a claim document image to be subjected to character recognition on the claim document image, performing region segmentation according to a frame line layout of a claim document frame format of the claim document image received by the server, thus obtaining one or multiple segmented regions;

calling a convolutional neural network model to analyze all the obtained segmented regions so as to obtain first segmented regions which are recognized by an optical character recognition engine and second segmented regions which not be recognized by the optical character recognition engine; and

performing character recognition on all the first segmented regions by using the optical character recognition engine to recognize the characters in all the first segmented regions, and calling an LSTM (Long Short-Term Memory) model to perform the character recognition on all the second segmented regions to recognize characters in all the second segmented regions;

which is characterized in that the training process of the convolutional neural network model is as follows:

A. for a predetermined claim document frame format, obtaining a preset number of claim document image samples based on the claim document frame format;

B. performing region segmentation on each claim document image sample according to the frame line layout of the claim document frame format, and determining third segmented regions misrecognized by the optical character recognition engine and fourth segmented regions correctly recognized by the optical character recognition engine in all the claim document image samples;

C. classifying all the third segmented regions into a first training set, and classifying all the fourth segmented regions into a second training set;

D. extracting a first preset ratio of segmented regions from the first training set and the second training set respectively as segmented regions for training, and taking the residual segmented regions in the first training set and the second training set as segmented regions for verification;

E. performing model training by using all the extracted segmented regions for training so as to generate the predetermined analysis model, and verifying the generated predetermined analysis model by using all the segmented regions for verification;

F. if the verification pass rate is greater than or equal to a preset threshold value, completing the training, or if the verification pass rate is less than the preset threshold value, increasing the number of claim document image samples, and repeatedly executing the steps A, B, C, D and E till the verification pass rate is greater than or equal to the preset threshold value.

11. The computer readable storage medium according to claim 10, which is characterized in that the training process of the LSTM model is as follows:

obtaining a preset number of segmented region samples, and labeling all the segmented region samples by characters included in these segmented region samples;

classifying the preset number of segmented region samples into a first data set and a second data set according to a preset ratio, taking the first data set as a training set, and taking the second data set as a test set;

sending the first data set into an LSTM network for model training, performing the character recognition on the segmented region samples in the second data set by using the trained model every preset time, and comparing recognized characters with the labels of the segmented region samples so as to calculate errors between the recognized characters and the labels;

if the errors of the characters recognized by the trained model are diverged, adjusting preset training parameters for retraining till the errors of the characters recognized by the trained model may be converged;

if the errors of the characters recognized by the trained model are converged, ending the model training, and taking the generated model as the trained predetermined recognition model.

12. The computer readable storage medium according to claim10, which is characterized in that the segmented regions are regions having minimum areas, which are surrounded by frame lines of the claim document frame format and do not include the frame lines.