SUMMARY

[0005] An embodiment provides a method of determining authenticity of an official document. The method includes extracting image data of a plurality of security features of the official document from an image of the official document; applying a trained neural network to the extracted image data to determine a sharpness of each of the security features on the image of the official document; and determining whether the official document is authentic based on a sharpness classification of the security features. Training the neural network includes training a multi-label classification model to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest; applying a spatial attention module to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and optimizing parameters of the neural network based on optimizing a loss of the multi-label classification model over a plurality of labeled training images. The labeled training images include labeled images of official documents, and the regions of interest include selected cropped regions containing the security features on said official documents.

[0006] Another embodiment provides a system for determining authenticity of an official document. The system includes a processor and a computer-readable memory coupled to the processor and having instructions stored thereon that are executable by the processor to extract image data of a plurality of security features of the official document from an image of the official document; apply a trained neural network to the extracted image data to determine a sharpness of each of the security features on the image of the official document; and determine whether the official document is authentic based on a sharpness classification of the security features. The trained neural network includes a multi-label classification model trained to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest; a spatial attention module applied to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and neural network parameters optimized based on an optimization of a loss of the multi-label classification over a plurality of labeled training images. The labeled training images include labeled images of official documents, and the regions of interest include selected cropped regions containing the security features on said official documents.

[0007] Another embodiment provides an apparatus comprising an input device and a processing device. The input device can receive an image of the official

document. The processing device can for extract image data of a plurality of security features of the official document from the image of the official document and feed the extracted image data to a trained neural network to determine: a sharpness of each of the security features on the image of the official document and an authenticity of the official document based on a sharpness classification of the security features. The trained neural network includes a multi-label classification model trained to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest; a spatial attention module applied to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and neural network parameters optimized based on an optimization of a loss of the multi-label classification over a plurality of labeled training images. The labeled training images include labeled images of official documents, and the regions of interest include selected cropped regions containing the security features on said official documents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Embodiments will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

[0009] Figure 1 shows a flowchart illustrating a method of determining authenticity of an official document according to an embodiment.

[0010] Figure 2 shows a flowchart illustrating a detailed example implementation of the method of Figure 1.

[0011] Figure 3 shows a schematic diagram of an apparatus suitable for implementing the method of Figure 1.

[0012] Figure 4 shows a schematic diagram illustrating a computer system suitable for implementing the method of Figure 1.

[0013] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been depicted to scale. For example, the dimensions of some of the elements in the illustrations, block diagrams or

CLAIMS

1. A method of determining authenticity of an official document, the method comprising:

extracting image data of a plurality of security features of the official document from an image of the official document;

applying a trained neural network to the extracted image data to determine a sharpness of each of the security features on the image of the official document; and

determining whether the official document is authentic based on a sharpness classification of the security features,

wherein training the neural network comprises:

training a multi-label classification model to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest;

applying a spatial attention module to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and

optimizing parameters of the neural network based on optimizing a loss of the multi-label classification model over a plurality of labeled training images,

wherein the labeled training images comprise labeled images of official documents, and wherein the regions of interest comprise selected cropped regions containing the security features on said official documents.

2. The method as claimed in claim 1, wherein the at least one attribute comprises the sharpness of the security features on the labeled images of official documents.

3. The method as claimed in claim 1, wherein the at least one layer of the neural network comprises a last fully-connected layer.

4. The method as claimed in claim 1, wherein the official document comprises an identity card, and wherein the identity card is determined to be authentic if each of the security features on the image of the official document is classified as sharp.

5. The method as claimed in claim 1, wherein extracting the image data of the plurality of security features of the official document comprises:

extracting an image area corresponding to the official document from a single image of the official document; and

cropping the extracted image area to retain a plurality of regions containing the plurality of security features.

6. A system for determining authenticity of an official document, comprising:

a processor; and

a computer-readable memory coupled to the processor and having instructions stored thereon that are executable by the processor to:

extract image data of a plurality of security features of the official document from an image of the official document;

apply a trained neural network to the extracted image data to determine a sharpness of each of the security features on the image of the official document; and

determine whether the official document is authentic based on a sharpness classification of the security features,

wherein the trained neural network comprises:

a multi-label classification model trained to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest;

a spatial attention module applied to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and

neural network parameters optimized based on an optimization of a loss of the multi-label classification over a plurality of labeled training images,

wherein the labeled training images comprise labeled images of official documents, and wherein the regions of interest comprise selected cropped regions containing the security features on said official documents.

7. The system as claimed in claim 6, wherein the at least one attribute comprises the sharpness of the security features on the labeled images of official documents.

8. The system as claimed in claim 6, wherein the at least one layer of the neural network comprises a last fully-connected layer.

9. The system as claimed in claim 6, wherein the official document comprises an identity card, and wherein the instructions are executable by the processor to determine identity card to be authentic if each of the security features on the image of the official document is classified as sharp.

10. The method as claimed in claim 6, wherein the instructions that are executable by the processor to extract the image data of the plurality of security features of the official document further comprise instructions for:

extracting an image area corresponding to the official document from a single image of the official document; and

cropping the extracted image area to retain a plurality of regions containing the plurality of security features.

11. An apparatus comprising:

an input device for receiving an image of the official document; and

a processing device for extracting image data of a plurality of security features of the official document from the image of the official document and feeding the extracted image data to a trained neural network to determine:

a sharpness of each of the security features on the image of the official document; and

an authenticity of the official document based on a sharpness classification of the security features,

wherein the trained neural network comprises:

a multi-label classification model trained to classify a plurality of regions of interest, wherein the regions of interests are spatially distributed on a labeled training image, and wherein each label corresponds to a respective one of the regions of interest;

a spatial attention module applied to at least one layer of the neural network to learn a position and at least one attribute of each of the regions of interest; and

neural network parameters optimized based on an optimization of a loss of the multi-label classification over a plurality of labeled training images,

wherein the labeled training images comprise labeled images of official documents, and wherein the regions of interest comprise selected cropped regions containing the security features on said official documents.