Image analysis for authenticating a product

Field of the invention

The present invention relates to image analysis for authenticating a product.

Background

Watches and other valuable objects, such as luxury or technical objects, are routinely counterfeited. Thus, there is a need to have a method for distinguishing between genuine and non-genuine products.

In many cases it is not possible or desirable to change the appearance or the functionality of the object. Therefore, marking or tagging the object is not a viable option.

The patent application US 2009/0028424 A1 discloses capturing images under varying illumination conditions, detecting temporal luminance variation from a plurality of captured images so as to estimate shadow area and perform images processing. The patent applications US 2002/0076422 A1, US 2013/0004079 A1, EP 1 143 375 A2 and US 2009/0141984 A1 disclose using feature point extraction of anchor and query images for image processing or authentication purpose.

Summary of the invention

In accordance with a first aspect of this disclosure, there is provided a method of authenticating a product, comprising:

- capturing an image of a product to be authenticated;
- determining a plurality of significant points of the captured image; and
- comparing the plurality of significant points of the captured image of the product to be authenticated with a plurality of significant points of a previously captured reference image of a genuine product to determine if the product to be authenticated is the same as the genuine product for authenticating the product.

Images of watches and other products are complex and information-rich. An advantage of comparing the significant points between two images over comparing the raw image data is that it provides a practical way of comparing the images which requires a lesser processing demand.

During the comparison it is important to discriminate between relevant differences i.e., differences between the two images that are indicative of non-genuineness and non-relevant differences i.e. differences between the two images that do not indicate non-genuineness and which arise from the imperfect control of measurement conditions, for

AMENDED CLAIMS
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1. A method of authenticating a product, comprising:

- capturing an image of a product to be authenticated;
- determining a plurality of significant points of the captured image;
- comparing the plurality of significant points of the captured image of the product to be authenticated with a plurality of significant points of a previously captured reference image of a genuine product to determine if the product to be authenticated is the same as the genuine product for authenticating the product;
- aligning a plurality of said significant points of the image of the product to be authenticated with a plurality of said significant points of the image of the genuine product prior to comparing the significant points, wherein comparing the plurality of significant points of the image of the product to be authenticated with the plurality of significant points of the image of the genuine product comprises determining if a significant point of the plurality of significant points of the image of the product to be authenticated is within a defined distance of a significant point of the plurality of significant points of the image of the genuine product; and
- determining a total number of significant points of the image of the product to be authenticated which are within said defined distance of a significant point of the image of the genuine product within a region of the image.

2. The method of claim 1, wherein aligning the significant points comprises determining two or more matching pairs between the plurality of significant points of the image of the product to be authenticated and the plurality of significant points of the image of the genuine product and using the two or more matching pairs to determine a transformation for aligning the significant points..

3. The method of claim 2, wherein each of the significant points of the image of the product to be authenticated and the significant points of the image of the genuine product comprises a descriptor, and wherein determining two or more matching pairs comprises comparing the descriptors of the plurality of significant points of the image of the product to be authenticated and the plurality of significant points of the image of the genuine product.

4. The method of claim 2 or claim 3, further comprising dividing the image of the product to be authenticated into a plurality of sub-regions, and aligning the plurality of

significant points of the image of the product to be authenticated and the plurality of significant points of the reference image of the genuine product separately for the sub-regions.

5. The method of claim 4, comprising determining a plurality of significant points of the image of the product to be authenticated prior to determining the sub-regions for assisting the determination of the sub-regions.

6. The method of any of the preceding claims, wherein comparing the plurality of significant points of the image of the product to be authenticated with the plurality of significant points of the image of the genuine product comprises determining if a significant point of the plurality of significant points of the image of the product to be authenticated is within a defined distance of a significant point of the plurality of significant points of the image of the genuine product for at least some of the significant points of the image of the product to be authenticated or for at least some of the significant points of the image of the genuine product within a region of the image.

7. The method of claim 6, further comprising applying a function to the sum to determine an output for comparison with a threshold value to determine the authenticity of the product.

8. The method of claim 7, wherein the function comprises dividing the sum by the total number of significant points of the image of the product to be authenticated within the region of the image or by the total number of significant points of the image of the genuine product within the region of the image to determine a ratio.

9. The method of any of the preceding claims, wherein the product is a timepiece.

10. The method of any of the preceding claims, wherein the captured image is a first image, and further comprising capturing a second image of the product for creating a composite image based on the first image and the second image for comparison with a reference image of a genuine product for authenticating the product.

11. The method of claim 10, wherein the step of capturing the first image of the product is carried out when the product is illuminated from a first direction and wherein the step of capturing the second image of the product is carried out when the product is illuminated from ~~a second direction, wherein the second direction is different to the first direction.~~

12. The method of claim 10 or claim 11, wherein the step of capturing the first image is carried out at a first exposure time, and wherein the step of capturing the second image is carried out at a second exposure time, wherein the first exposure time is different to the second exposure time.

13. The method of any of claims 10 to 12, further comprising receiving imaging instructions comprising the conditions for capturing the image or images of the product to be authenticated, and capturing the image or images of the product according to the instructions.

14. The method of claim 13, wherein the imaging instructions convey substantially similar or the same conditions under which the reference image or images of a genuine product were captured at an earlier point in time so that the product to be authenticated can be imaged under substantially similar or the same conditions as the genuine product.

Claims

1. A method of authenticating a product, comprising:

capturing an image of a product to be authenticated;

determining a plurality of significant points ($T_1,\ldots,T_7$) of the captured image;

comparing the plurality of significant points of the captured image of the product to be authenticated with a plurality of significant points ($R_1,\ldots,R_6$) of a previously captured reference image of a genuine product to determine if the product to be authenticated is the same as the genuine product for authenticating the product;

aligning a plurality of said significant points of the image of the product to be authenticated with a plurality of said significant points of the image of the genuine product prior to comparing the significant points, wherein comparing the plurality of significant points of the image of the product to be authenticated with the plurality of significant points of the image of the genuine product comprises determining if a significant point of the plurality of significant points of the image of the product to be authenticated is within a defined distance (r) of a significant point of the plurality of significant points of the image of the genuine product; and

determining a total number of significant points of the image of the product to be authenticated which are within said defined distance of a significant point of the image of the genuine product within a region of the image.

2. The method of claim 1, wherein aligning the significant points comprises determining two or more matching pairs between the plurality of significant points of the image of the product to be authenticated and the plurality of significant points of the image of the genuine product and using the two or more matching pairs to determine a transformation for aligning the significant points.

3. The method of claim 2, wherein each of the significant points of the image of the product to be authenticated and the significant points of the image of the genuine product comprises a descriptor, and wherein determining two or more matching pairs comprises comparing the descriptors of the plurality of significant points of the image of the product to be authenticated and the plurality of significant points of the image of the genuine product.

4. The method of claim 2 or claim 3, further comprising dividing the image of the product to be authenticated into a plurality of sub-regions, and aligning the plurality of significant points of the image of the product to be authenticated and the plurality of significant points of the reference image of the genuine product separately for the sub-regions.

5. The method of claim 4, comprising determining a plurality of significant points of the image of the product to be authenticated prior to determining the sub-

regions for assisting the determination of the sub-regions.

6. The method of any of the preceding claims, wherein comparing the plurality of significant points of the image of the product to be authenticated with the plurality of significant points of the image of the genuine product comprises determining if a significant point of the plurality of significant points of the image of the product to be authenticated is within a defined distance of a significant point of the plurality of significant points of the image of the genuine product for at least some of the significant points of the image of the product to be authenticated or for at least some of the significant points of the image of the genuine product within a region of the image.

7. The method of claim 6, further comprising applying a function to the sum to determine an output for comparison with a threshold value to determine the authenticity of the product.

8. The method of claim 7, wherein the function comprises dividing the sum by the total number of significant points of the image of the product to be authenticated within the region of the image or by the total number of significant points of the image of the genuine product within the region of the image to determine a ratio.

9. The method of any of the preceding claims, wherein the product is a timepiece.

10. The method of any of the preceding claims, wherein the captured image is a first image, and further comprising capturing a second image of the product for creating a composite image based on the first image and the second image for comparison with a reference image of a genuine product for authenticating the product.

11. The method of claim 10, wherein the step of capturing the first image of the product is carried out when the product is illuminated from a first direction and wherein the step of capturing the second image of the product is carried out when the product is illuminated from a second direction, wherein the second direction is different to the first direction.

12. The method of claim 10 or claim 11, wherein the step of capturing the first image is carried out at a first exposure time, and wherein the step of capturing the second image is carried out at a second exposure time, wherein the first exposure time is different to the second exposure time.

13. The method of any of claims 10 to 12, further comprising receiving imaging instructions comprising the conditions for capturing the image or images of the product to be authenticated, and capturing the image or images of the product according to the instructions.

14. The method of claim 13, wherein the imaging instructions convey substantially similar or the same

conditions under which the reference image or images of a genuine product were captured at an earlier point in time so that the product to be authenticated can be imaged under substantially similar or the same conditions as the genuine product.