

CLAIMS

1. An image processing method, comprising:

obtaining a first image, identifying a facial region in the first image, and determining keypoint information related to the facial region, wherein the keypoint information comprises keypoint information of the facial region and external edge keypoint information, and a region corresponding to the external edge keypoint information comprises the facial region, wherein the region corresponding to the external edge keypoint information is larger than the facial region; and

determining a plurality of deformation regions based on the keypoint information related to the facial region, and performing image deformation processing on the facial region based on at least part of the plurality of deformation regions to generate a second image,

wherein performing image deformation processing on the facial region based on at least part of the plurality of deformation regions comprises:

determining a first target region to be processed in the facial region, wherein the first target region is an eye corner region; the eye corner region comprises an eye corner region of a left eye and or an eye corner region of a right eye;

determining a deformation region corresponding to the first target region from the plurality of deformation regions based on keypoint information corresponding to the first target region, comprising:

determining a third group of deformation regions corresponding to the eye corner region of the left eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the left eye, and/or determining a fourth group of deformation regions corresponding to the eye corner region of the right eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the right eye; and

performing image deformation processing on the deformation region corresponding to the first target region, comprising:

stretching or compressing the third group of deformation regions and/or the fourth group of deformation regions in a first specific direction to adjust a position of an eye corner in the left eye region and/or a position of an eye corner in the right eye region.

2. The method according to claim 1, wherein the keypoint information of the facial region comprises keypoint information of an organ of the facial region and keypoint information of

an edge of the facial region; the edge of the facial region corresponds to a contour of the facial region; and

the keypoint information of the organ comprises center keypoint information of the organ and/or contour keypoint information of the organ,

determining the plurality of deformation regions based on the keypoint information related to the facial region comprises:

determining the plurality of deformation regions based on any three adjacent keypoints corresponding to the keypoint information.

3. The method according to claim 1, wherein the first target region is an eye region; the eye region comprises the left eye region and/or the right eye region;

determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining a first group of deformation regions corresponding to the left eye region from the plurality of deformation regions based on keypoint information corresponding to the left eye region, and/or determining a second group of deformation regions corresponding to the right eye region from the plurality of deformation regions based on keypoint information corresponding to the right eye region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

performing image deformation processing on the first group of deformation regions and/or the second group of deformation regions;

wherein an image deformation direction of the first group of deformation regions is opposite to an image deformation direction of the second group of deformation regions so as to increase or decrease a distance between the left eye region and the right eye region.

4. The method according to claim 1, wherein the first target region is an eye region; the eye region comprises the left eye region and/or the right eye region;

determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining a fifth group of deformation regions corresponding to the left eye region

from the plurality of deformation regions based on keypoint information corresponding to the left eye region, and/or determining a sixth group of deformation regions corresponding to the right eye region from the plurality of deformation regions based on keypoint information corresponding to the right eye region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

performing deformation processing on the fifth group of deformation regions so that a contour keypoint of the left eye region is rotated with respect to a center keypoint of the left eye region, wherein a rotation angle of the contour keypoint of the left eye region satisfies a first set angle, and/or performing deformation processing on the sixth group of deformation regions so that a contour keypoint of the right eye region is rotated with respect to a center keypoint of the right eye region, wherein a rotation angle of the contour keypoint of the right eye region satisfies a second set angle.

5. The method according to claim 1, wherein the first target region is a nose region;

determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining a seventh group of deformation regions corresponding to the nose region from the plurality of deformation regions based on keypoint information corresponding to the nose region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

stretching or compressing the seventh group of deformation regions in a second specific direction to lengthen or shorten the nose region.

6. The method according to claim 1, wherein the first target region is a nosewing region;

determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining an eighth group of deformation regions corresponding to the nosewing region from the plurality of deformation regions based on keypoint information corresponding to the nosewing region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

compressing or stretching the eighth group of deformation regions in a third specific direction to narrow or widen the nosewing region.

7. The method according to claim 1, wherein the first target region is a chin region or a philtrum region; determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining a ninth group of deformation regions corresponding to the chin region or the philtrum region from the plurality of deformation regions based on keypoint information corresponding to the chin region or the philtrum region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

compressing or stretching the ninth group of deformation regions in a fourth specific direction to shorten or lengthen the chin region or the philtrum region.

8. The method according to claim 1, wherein the first target region is a mouth region; determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

determining a tenth group of deformation regions corresponding to the mouth region from the plurality of deformation regions based on keypoint information corresponding to the mouth region; and

performing image deformation processing on the deformation region corresponding to the first target region comprises:

performing compressing processing on the tenth group of deformation regions in a direction from an edge of the mouth region to a center of the mouth region, or performing stretching processing on the tenth group of deformation regions in a direction from the center of the mouth region to the edge of the mouth region.

9. The method according to claim 1, determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information

corresponding to the first target region comprises:

- determining an eleventh group of deformation regions corresponding to the facial region from the plurality of deformation regions based on the keypoint information of an edge of the facial region; and

- performing image deformation processing on the deformation region corresponding to the first target region comprises:

- performing compressing processing on the eleventh group of deformation regions in a direction from the edge of the facial region to a midline of the facial region, or performing stretching processing on the eleventh group of deformation regions in a direction from the midline of the facial region to the edge of the facial region.

10. The method according to claim 1, wherein the first target region is a forehead region; determining the deformation region corresponding to the first target region from the plurality of deformation regions based on the keypoint information corresponding to the first target region comprises:

- determining a twelfth group of deformation regions corresponding to the forehead region from the plurality of deformation regions based on keypoint information of the forehead region; and

- performing image deformation processing on the deformation region corresponding to the first target region comprises:

- performing stretching or compressing processing on the twelfth group of deformation regions in a fifth specific direction to raise or lower a hairline of the facial region, wherein the fifth specific direction is a direction in which a keypoint of the forehead region points to an eyebrow center closest to the keypoint of the forehead region, or the fifth specific direction is a direction in which the keypoint of the forehead region gets away from the eyebrow center closest to the keypoint of the forehead region.

11. The method according to claim 10, wherein the keypoint information of the forehead region is determined by:

- determining at least three keypoints of the forehead region; and

- determining the keypoint information of the forehead region based on the at least three keypoints and information of a first group of contour points below eyes in the facial region, wherein a first keypoint of the at least three keypoints is located on a midline of the

forehead region; and a second keypoint and a third keypoint of the at least three keypoints are located on two sides of the midline, and

wherein determining the keypoint information of the forehead region based on the at least three keypoints and the information of the first group of contour points below the eyes in the facial region comprises:

performing curve fitting based on keypoints located at two ends in the first group of contour points below the eyes in the facial region and the at least three keypoints to obtain curve fitting keypoint information; and

performing interpolation processing on the curve fitting keypoint information based on a curve interpolation algorithm to obtain the keypoint information of the forehead region.

12. The method according to claim 1, wherein determining the keypoint information related to the facial region comprises:

obtaining the keypoint information of an organ of the facial region and the keypoint information of an edge of the facial region by performing detection on the facial region through a facial keypoint detection algorithm; and obtaining the external edge keypoint information based on the keypoint information of the edge of the facial region.

13. The method according to claim 12, wherein obtaining the keypoint information of the edge of the facial region comprises: obtaining information of a first group of contour points below eyes in the facial region; and

determining information of a second group of contour points of the forehead region, and determining the keypoint information of the edge of the facial region based on the information of the first group of contour points and the information of the second group of contour points,

wherein obtaining the external edge keypoint information based on the keypoint information of the edge of the facial region comprises:

determining a relative position relationship between the keypoint information of the edge of the facial region and a center point of the facial region, wherein the relative position relationship comprises a distance between a keypoint of the edge of the facial region and the center point of the facial region, and a direction of the keypoint of the edge of the facial region with respect to the center point of the facial region; and

extending, based on the relative position relationship, a keypoint of a first edge toward an outside of the facial region by a preset distance to obtain an external edge keypoint

corresponding to the keypoint of the first edge, wherein the keypoint of the first edge is any one of keypoints of the edge of the facial region, and the preset distance is related to a distance between the keypoint of the first edge and the center point of the facial region.

14. The method according to claim 1, further comprising:

determining a deflection parameter for the facial region, and determining a deformation parameter and a deformation direction corresponding to each deformation region in the at least part of the plurality of deformation regions based on the deflection parameter, so that image deformation processing is performed on the deformation region according to the corresponding deformation parameter and deformation direction.

15. The method according to claim 14, wherein determining the deflection parameter for the facial region comprises:

determining a left edge keypoint, a right edge keypoint, and a center keypoint of any region in the facial region, wherein the region comprises at least one of: a cheek region, a nose region, or a mouth region;

determining a first distance between the left edge keypoint and the center keypoint, and determining a second distance between the right edge keypoint and the center keypoint; and

determining the deflection parameter for the facial region based on the first distance and the second distance.

16. The method according to claim 1, further comprising:

identifying a second target region in the facial region, and performing feature processing on the second target region to generate a third image,

wherein the second target region comprises at least one of: a periocular region, a nasolabial fold region, a tooth region, an eye region, or a submalar triangle region.

17. An image processing apparatus, comprising:

a memory storing processor-executable instructions; and

a processor arranged to execute the processor-executable instructions to perform operations of:

obtaining a first image, identifying a facial region in the first image, and determining keypoint information related to the facial region, wherein the keypoint information comprises

keypoint information of the facial region and external edge keypoint information, and a region corresponding to the external edge keypoint information comprises the facial region, wherein the region corresponding to the external edge keypoint information is larger than the facial region; and

determining a plurality of deformation regions based on the keypoint information related to the facial region, and performing image deformation processing on the facial region based on at least part of the plurality of deformation regions to generate a second image,

wherein performing image deformation processing on the facial region based on at least part of the plurality of deformation regions comprises:

determining a first target region to be processed in the facial region, wherein the first target region is an eye corner region; the eye corner region comprises an eye corner region of a left eye and or an eye corner region of a right eye;

determining a deformation region corresponding to the first target region from the plurality of deformation regions based on keypoint information corresponding to the first target region, comprising:

determining a third group of deformation regions corresponding to the eye corner region of the left eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the left eye, and/or determining a fourth group of deformation regions corresponding to the eye corner region of the right eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the right eye; and

performing image deformation processing on the deformation region corresponding to the first target region, comprising:

stretching or compressing the third group of deformation regions and/or the fourth group of deformation regions in a first specific direction to adjust a position of an eye corner in the left eye region and/or a position of an eye corner in the right eye region.

18. A non-transitory computer-readable storage medium having stored thereon computer-readable instructions that, when executed by a processor, cause the processor to perform operations of an image processing method, the method comprising:

obtaining a first image, identifying a facial region in the first image, and determining keypoint information related to the facial region, wherein the keypoint information comprises keypoint information of the facial region and external edge keypoint information, and a region

corresponding to the external edge keypoint information comprises the facial region, wherein the region corresponding to the external edge keypoint information is larger than the facial region; and

determining a plurality of deformation regions based on the keypoint information related to the facial region, and performing image deformation processing on the facial region based on at least part of the plurality of deformation regions to generate a second image,

wherein performing image deformation processing on the facial region based on at least part of the plurality of deformation regions comprises:

determining a first target region to be processed in the facial region, wherein the first target region is an eye corner region; the eye corner region comprises an eye corner region of a left eye and or an eye corner region of a right eye;

determining a deformation region corresponding to the first target region from the plurality of deformation regions based on keypoint information corresponding to the first target region, comprising:

determining a third group of deformation regions corresponding to the eye corner region of the left eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the left eye, and/or determining a fourth group of deformation regions corresponding to the eye corner region of the right eye from the plurality of deformation regions based on keypoint information corresponding to the eye corner region of the right eye; and

performing image deformation processing on the deformation region corresponding to the first target region, comprising:

stretching or compressing the third group of deformation regions and/or the fourth group of deformation regions in a first specific direction to adjust a position of an eye corner in the left eye region and/or a position of an eye corner in the right eye region.