CLAIMS

What is claimed is:

1. A method of image stitching using at least one processor, the method comprising:

generating a first stitched image based on a plurality of input images and based on an image domain stitching process;

generating a guidance vector field based on a plurality of gradient fields of the plurality of input images and based on a gradient domain stitching process; and

generating a second stitched image based on solving a first optimization problem based on the first stitched image and the guidance vector field,

wherein the first optimization problem is configured as a cost function comprising an image domain function and a gradient domain function, and wherein the gradient domain function dominates the cost function.

2. The method according to claim 1, wherein

the image domain function is defined in an image domain and based on the first stitched image, and

the gradient domain function is defined in a gradient domain and based on the guidance vector field.

3. The method according to claim 2, wherein

the image domain function is configured to provide a measure of fidelity between the second stitched image and the first stitched image; and

the gradient domain function is configured to provide a measure of fidelity between a gradient field of the second stitched image and the guidance vector field.

4. The method according to claim 3, wherein said solving the first optimization problem comprises:

decomposing the cost function into a plurality of spatial dimensions associated with the second stitched image to obtain a plurality of one-dimensional (1D) cost functions, respectively; and

solving, for each of the plurality of 1D cost functions, the 1D cost function based on solving a corresponding linear equation.

5. The method according to claim 2, further comprising geometrically aligning the plurality of input images to produce a plurality of aligned input images, wherein

said generating the first stitched image based on the plurality of input images is based on the plurality of aligned input images, and

said generating the guidance vector field based on the plurality of gradient fields of the plurality of input images is based on a plurality of gradient fields of the plurality of aligned input images.

6. The method according to claim 2, further comprising:

converting the plurality of input images from Red, Green and Blue (RGB) color space to Luminance-Bandwidth-Chrominance (YUV) color space; and

adjusting, for each of the plurality of input images, a luminance component of the input image based on a correction parameter determined for the input image to produce a color corrected input image so as to obtain a plurality of color corrected input images, wherein

said generating the first stitched image based on the plurality of input images is based on the plurality of corrected input images, and

said generating the guidance vector field based on the plurality of gradient fields of the plurality of input images is based on a plurality of gradient fields of the plurality of color corrected input images.

7. The method according to claim 6, further comprising:

determining a plurality of correction parameters for the plurality of input images, respectively, based on solving a second optimization problem configured for matching, for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, the luminance components of the pair of adjacent input images in the overlapping region thereof.

8. The method according to claim 6, wherein said generating the first stitched image comprises:

for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, determining a pixel value of each pixel of the first stitched image in the overlapping region based on a weighted combination of corresponding pixels of the pair of adjacent input images.

9. The method according to claim 6, wherein said generating the guidance vector field comprises:

for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, determining a gradient at each pixel of the guidance vector field in the overlapping region based on a weighted combination of gradients at corresponding pixels of the pair of adjacent input images.

10. The method according to claim 9, wherein said generating the guidance vector field further comprises adjusting the guidance vector field based on a plurality of correction parameters determined for the plurality of input images, respectively.

11. A system for image stitching, the system comprising:

a memory; and

at least one processor communicatively coupled to the memory and configured to:

generate a first stitched image based on a plurality of input images and based on an image domain stitching process;

generate a guidance vector field based on a plurality of gradient fields of the plurality of input images and based on a gradient domain stitching process; and

generate a second stitched image based on solving a first optimization problem based on the first stitched image and the guidance vector field,

wherein the first optimization problem is configured as a cost function comprising an image domain function and a gradient domain function, and wherein the gradient domain function dominates the cost function.

12. The system according to claim 11, wherein

the image domain function is defined in an image domain and based on the first stitched image, and

the gradient domain function is defined in a gradient domain and based on the guidance vector field.

13. The system according to claim 12, wherein

the image domain function is configured to provide a measure of fidelity between the second stitched image and the first stitched image; and

the gradient domain function is configured to provide a measure of fidelity between a gradient field of the second stitched image and the guidance vector field.

14. The system according to claim 13, wherein said solving the first optimization problem comprises:

decomposing the cost function into a plurality of spatial dimensions associated with the second stitched image to obtain a plurality of one-dimensional (1D) cost functions, respectively; and

solving, for each of the plurality of 1D cost functions, the 1D cost function based on solving a corresponding linear equation.

15. The system according to claim 12, wherein the at least one processor is further configured to:

convert the plurality of input images from Red, Green and Blue (RGB) color space to Luminance-Bandwidth-Chrominance (YUV) color space; and

adjust, for each of the plurality of input images, a luminance component of the input image based on a correction parameter determined for the input image to produce a color corrected input image so as to obtain a plurality of color corrected input images, wherein

said generate the first stitched image based on the plurality of input images is based on the plurality of color corrected input images, and

said generate the guidance vector field based on the plurality of gradient fields of the plurality of input images is based on a plurality of gradient fields of the plurality of color corrected input images.

16. The system according to claim 15, wherein the at least one processor is further configured to:

determine a plurality of correction parameters for the plurality of input images, respectively, based on solving a second optimization problem configured for matching, for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, the luminance components of the pair of adjacent input images in the overlapping region thereof.

17. The system according to claim 15, wherein said generating the first stitched image comprises:

for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, determining a pixel value of each pixel of the first stitched image in the overlapping region based on a weighted combination of corresponding pixels of the pair adjacent of input images.

18. The system according to claim 15, wherein said generate the guidance vector field comprises:

for each pair of adjacent input images amongst the plurality of input images having an overlapping region therebetween, determining a gradient at each pixel of the guidance vector field in the overlapping region based on a weighted combination of gradients at corresponding pixels of the pair adjacent of input images.

19. The system according to claim 18, wherein said generate the guidance vector field further comprises adjusting the guidance vector field based on a plurality of correction parameters determined for the plurality of input images, respectively.

20. A computer program product, embodied in one or more non-transitory computer-readable storage mediums, comprising instructions executable by at least one processor to perform a method of image stitching, the method comprising:

generating a first stitched image based on a plurality of input images and based on an image domain stitching process;

generating a guidance vector field based on a plurality of gradient fields of the plurality of input images and based on a gradient domain stitching process; and

generating a second stitched image based on solving a first optimization problem based on the first stitched image and the guidance vector field,

wherein the first optimization problem is configured as a cost function comprising an image domain function and a gradient domain function, and wherein the gradient domain function dominates the cost function.