CLAIMS

What is claimed is:

1. A method for geometrical reconstruction of an internal anatomical structure using at least one processor based on a set of contours derived from the internal anatomical structure, the set of contours comprising a first subset of long-axis contours obtained based on a first set of long-axis images of the internal anatomical structure, the method comprising:

adjusting the set of contours, comprising adjusting the first subset of long-axis contours to correct for motion artefacts in the first set of long-axis images; and

deforming a template three-dimensional (3D) surface mesh preconfigured for the internal anatomical structure's type into a deformed 3D surface mesh based on the adjusted set of contours to obtain the geometrical reconstruction of the internal anatomical structure,

wherein said adjusting the set of contours further comprises:

determining, for each pair of long-axis contours in the first subset of long-axis contours, a first measure associated with the pair of long-axis contours based on a degree of superimposition between the pair of long-axis contours,

wherein said adjusting the first subset of long-axis contours is based on a first function that is dependent on the first measure respectively determined for said each pair of long-axis contours.

2. The method according to claim 1, wherein the set of contours further comprises a second subset of short-axis contours obtained based on a second set of short-axis images of the internal anatomical structure, and said adjusting the set of contours further comprises adjusting the second subset of short-axis contours to correct for motion artefacts in the second set of short-axis images.

3. The method according to claim 2, wherein said adjusting the set of contours further comprises:

determining, for each pair of long-axis contour in the first subset of long-axis contours and short-axis contour in the second subset of short-axis contours, a second measure associated with the pair of long-axis contour and short-axis contour based on a degree of superimposition between the pair of long-axis contour and short-axis contour;

wherein said adjusting the first subset of long-axis contours and said adjusting the second subset of short-axis contours are based on the first function that is further dependent on the second measure respectively determined for said each pair of long-axis contour and short-axis contour.

4. The method according to claim 3, wherein said adjusting the first subset of long-axis contours comprises translating one or more of the long-axis contours in the first subset of long-axis contours and said adjusting the second subset of short-axis contours comprises translating one or more of the short-axis contours in the second subset of short-axis contours, based on a minimization of the first function.

5. The method according to claim 4, wherein:

the first set of long-axis images and the second set of short-axis images of the internal anatomical structure are obtained over one or more cycles associated with the internal anatomical structure, each cycle comprising a plurality of phases,

said determining the first measure and said determining the second measure are performed for each of the plurality of phases, and

the minimization of the first function is performed over the cycle associated with the internal anatomical structure.

6. The method according to claim 1, wherein said deforming the template 3D surface mesh comprises:

mapping, for each of a plurality of long-axis contours of the adjusted set of contours, source control points on the template 3D surface mesh with respect to corresponding target control points on the long-axis contours, respectively.

7. The method according to claim 6, wherein said deforming the template 3D surface mesh further comprises determining a weight parameter for each of the plurality of long-axis contours, respectively; and

said mapping is performed based on a mapping function that is dependent on the weight parameter respectively determined for said each of the plurality of long-axis contours.

8. The method according to claim 7, wherein the weight parameter is determined based on a distance between the long-axis contour of the plurality of long-axis contours and a corresponding long-axis contour of the template 3D surface mesh.

9. The method according to claim 8, wherein said deforming the template 3D surface mesh comprises deforming the template 3D surface mesh iteratively, wherein for each iteration, said mapping is performed based on the mapping function that is dependent on the weight parameter respectively determined for said each of the plurality of long-axis contours, the weight parameter being determined based on said corresponding long-axis contour of the template 3D surface mesh deformed at the immediately preceding iteration.

10. A system for geometrical reconstruction of an internal anatomical structure based on a set of contours derived from the internal anatomical structure, the set of contours comprising a first subset of long-axis contours obtained based on a first set of long-axis images of the internal anatomical structure, the system comprising:

a memory; and

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

adjust the set of contours, comprising adjusting the first subset of long-axis contours to correct for motion artefacts in the first set of long-axis images; and

deform a template three-dimensional (3D) surface mesh preconfigured for the internal anatomical structure’s type into a deformed 3D surface mesh based on

the adjusted set of contours to obtain the geometrical reconstruction of the internal anatomical structure,

wherein said adjust the set of contours further comprises:

determining, for each pair of long-axis contours in the first subset of long-axis contours, a first measure associated with the pair of long-axis contours based on a degree of superimposition between the pair of long-axis contours,

wherein said adjusting the first subset of long-axis contours is based on a first function that is dependent on the first measure respectively determined for said each pair of long-axis contours.

11. The system according to claim 10, wherein the set of contours further comprises a second subset of short-axis contours obtained based on a second set of short-axis images of the internal anatomical structure, and said adjust the set of contours further comprises adjusting the second subset of short-axis contours to correct for motion artefacts in the second set of short-axis images.

12. The system according to claim 11, wherein said adjust the set of contours further comprises:

determining, for each pair of long-axis contour in the first subset of long-axis contours and short-axis contour in the second subset of short-axis contours, a second measure associated with the pair of long-axis contour and short-axis contour based on a degree of superimposition between the pair of long-axis contour and short-axis contour;

wherein said adjusting the first subset of long-axis contours and said adjusting the second subset of short-axis contours are based on the first function that is further dependent on the second measure respectively determined for said each pair of long-axis contour and short-axis contour.

13. The system according to claim 12, wherein said adjusting the first subset of long-axis contours comprises translating one or more of the long-axis contours in the first subset of long-axis contours and said adjusting the second subset of short-axis contours

comprises translating one or more of the short-axis contours in the second subset of short-axis contours, based on a minimization of the first function.

14. The system according to claim 13, wherein:

the first set of long-axis images and the second set of short-axis images of the internal anatomical structure are obtained over one or more cycles associated with the internal anatomical structure, each cycle comprising a plurality of phases,

said determining the first measure and said determining the second measure are performed for each of the plurality of phases, and

the minimization of the first function is performed over the cycle associated with the internal anatomical structure.

15. The system according to claim 10, wherein said deform the template 3D surface mesh comprises:

mapping, for each of a plurality of long-axis contours of the adjusted set of contours, source control points on the template 3D surface mesh with respect to corresponding target control points on the long-axis contours, respectively.

16. The system according to claim 15, wherein said deforming the template 3D surface mesh further comprises determining a weight parameter for each of the plurality of long-axis contours, respectively; and

said mapping is performed based on a mapping function that is dependent on the weight parameter respectively determined for said each of the plurality of long-axis contours.

17. The system according to claim 16, wherein:

the weight parameter is determined based on a distance between the long-axis contour of the plurality of long-axis contours and a corresponding long-axis contour of the template 3D surface mesh, and

said deform the template 3D surface mesh comprises deforming the template 3D surface mesh iteratively, wherein for each iteration, said mapping is performed based on

the mapping function that is dependent on the weight parameter respectively determined for said each of the plurality of long-axis contours, the weight parameter being determined based on said corresponding long-axis contour of the template 3D surface mesh deformed at the immediately preceding iteration.

18. 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 for geometrical reconstruction of an internal anatomical structure based on a set of contours derived from the internal anatomical structure, the set of contours comprising a first subset of long-axis contours obtained based on a first set of long-axis images of the internal anatomical structure, the method comprising:

adjusting the set of contours, comprising adjusting the first subset of long-axis contours to correct for motion artefacts in the first set of long-axis images; and

deforming a template three-dimensional (3D) surface mesh preconfigured for the internal anatomical structure's type into a deformed 3D surface mesh based on the adjusted set of contours to obtain the geometrical reconstruction of the internal anatomical structure,

wherein said adjusting the set of contours further comprises:

determining, for each pair of long-axis contours in the first subset of long-axis contours, a first measure associated with the pair of long-axis contours based on a degree of superimposition between the pair of long-axis contours,

wherein said adjusting the first subset of long-axis contours is based on a first function that is dependent on the first measure respectively determined for said each pair of long-axis contours.