

Claims

1. A method of identifying, within a spatial-temporal image comprising a sequence of medical images of a subject captured at a series of respective times, a portion of the spatial-temporal image which corresponds in position to an anatomical structure, the method comprising:

(a) deriving, within a first of the images, a first estimate of the region of the first image which corresponds in position to the anatomical structure;

(b) using the first estimate of the region of the first image to obtain, within at least one image of the sequence neighbouring the first image, a first estimate of the region of the at least one neighbouring image which corresponds in position to the anatomical structure; and

(c) using the first estimate of the region of the at least one neighbouring image to obtain a refined estimate of the region of the first image which corresponds in position to the anatomical structure.

2. A method according to claim 1, in which step (a) comprises:

obtaining the values of a first force function V defined over the first image which minimize an energy functional, said energy functional being defined using the first image and the first force function, and

identifying the first estimate of the region of the first image using the values of the first force function V which minimize the energy functional.

3. A method according to claim 1, in which step (b) is performed by:

using the first estimate of the region of the first image to initialise an iterative algorithm which, for each neighbouring image, obtains the values of a second force function V defined over the neighbouring image which minimize a second energy functional, said second energy functional being defined using the neighbouring image and the second force function V , and

identifying the first estimate of the region of the neighbouring image using the values of the second force function which minimize the second energy function.

4. A method according to claim 3, when dependent on claim 2, in which said step (c) is performed by generating a modified force function V^* defined over the first image, by modifying the first force function V for the first image using the second force function V for the or each neighbouring image, and

5 identifying the region of the neighbouring image using the modified force function.

5. A method according to any one of claims 1 to 4, in which step (a) comprises:

obtaining an initial estimate of the region of the first image corresponding in position to the anatomical structure by a clustering algorithm to partition pixels of the first image into clusters, by minimising a dissimilarity function which is a sum over the clusters of a respective dissimilarity measure of the clusters,

the dissimilarity measure for at least one of the clusters employing a term which takes a relatively lower value for a pixel of the cluster within a circular region and a relatively higher value for a pixel of the cluster outside the circular region.

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6. A method according to claim 5, further including improving the initial estimate iteratively to obtain the first estimate of the region of the first image.

7. A method according to any one of claims 1 to 6, in which step (a) comprises:

20 defining a circular region within the first image defined by a plurality of parameters including a centre location of the circular region;

defining a plurality of clusters;

apportioning pixels of the first image between the clusters, and varying the parameters defining the circular region, to minimise a dissimilarity function which is a sum over the clusters of a respective dissimilarity measure of the cluster,

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wherein the dissimilarity measure includes, for at least one of the clusters, a term which takes a relatively lower value for a pixel of the cluster within the circular region and a relatively higher value for a pixel of the cluster outside the circular region.

30 8. A method according to any one of claims 5 to 7, in which the anatomical structure is a left ventricle (LV).

9. A method according to any one of claims 1 to 8, in which the medical images are cardiac magnetic resonance (CMR) images.

10. A computer system comprising a computer processor and a data storage device storing computer program instructions operative to cause the computer processor to perform a method according to any one claims 1 to 9.

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11. A computer program product, such as a tangible data storage device, storing computer program instructions operative to cause a computer processor to perform a method according to any one of claims 1 to 9.