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Non-rigid point cloud registration based lung motion estimation using tangent-plane distance 🔗

📖 **PLOS One**

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Working

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Data Preparation

1 Extract dense point clouds F and R from 4DCT images at different phases, and they represent the status of lung surface at different time.

2 Simplify point cloud F to point cloud F′. The scale of F′ should be around 4000.

3 Calculate the connectivity matrix M from point cloud F′.

4 Calculate the normal vector information N from point cloud R.

5 Simplify point cloud R and its normal vector information N to R′ and N′. The scale of R′ should be around 6000.

6 Bring point cloud F′, connectivity matrix M, point cloud R′ and normal vector information N′ to the non-rigid registration procedure, and let F′, R′ denote the source point cloud and target point cloud respectively.

Non-rigid Registration

7   Initial the local affine transformation parameters X.

8   Initial the weight value α and the stiffness matrix G.

9   Calculate the the derivative of the objective function to the transformation parameters and update the local affine transformation parameters using stochastic gradient descent optimization. Repeat until a convergence criteria is met.

10   Output the local affine transformation parameters and the transformed points.