

# **Fully-automated Lung Inspiration and Expiration registration from Chest CT scans using Level-set deformable registration method.**

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## **Purpose**

To improve a fully-automated lung inspiration and expiration registration method from chest CT scans.

## **Data**

We used 30 cases of chest CT scans from a public open dataset (available at <http://empire10.isi.uu.nl/>). Each data had sequential CT scans at breath-held inspiration and expiration states.

## **Method**

The proposed method consisted of three steps: lung segmentation, preprocessing, transformation scheme and a level-set based non-rigid registration method. In the first part of the scheme, whole lung regions were segmented from dataset using EMPIRE10 lung mask.

Subsequently, an affine transform was used to align the inspiration CT scans to expiration CT scans using lung mask. Then a non-rigid B-spline transformation was implemented using the initial affine transformation. An affine transformation and a B-spline transformation have been performed Elastix tool box [1].

A level-set motion based registration tool has been implemented

B-spline as an interpolation to model deformation. Gradients of the expiration were calculated on a smoothed image while intensity difference was measured on the inspiration.

### **Computing time**

On Intel i7 CPU (3.4GHZ), the average computation time of one registration is about 50 minutes on the EMPIRE10 dataset

### **Reference**

[1] S. Klein, M. Staring, K. Murphy, M.A. Viergever, J.P.W. Pluim : elastix: a toolbox for intensity based medical image registration. IEEE Transactions on Medical Imaging, vol. 29, no. 1, pp. 196 - 205, January 2010.