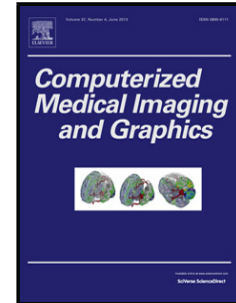


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A Novel Contour-based Registration of Lateral Cephalogram and Profile Photograph

Shumeng Wang¹, Huiqi Li^{1*}, Bingshuang Zou² and Wanjun Zhang¹

¹School of Information and Electronics, Beijing Institute of Technology, Beijing, China.

²Visiting associate professor with Department of Oral Health Sciences, Faculty of Dentistry, University of British Columbia, Vancouver, Canada

* *Corresponding author.*

E-mail address: huiqili@bit.edu.cn (Huiqi Li). Tel: (86) 010-68918239

Address: 5 South Zhongguancun Street, Haidian District, Beijing, 100081, China

Highlights

- A new contour-based registration method is proposed to register lateral cephalogram and profile photograph.
- **A hierarchical and efficient contour detection algorithm is employed to obtain contours of forehead and nose in lateral cephalogram and profile photograph.**
- **A new curve based coarse-to-fine strategy is used to align the contour pair and identically estimate the transformation from lateral radiograph to profile photograph.**
- Comparative experiment results show that the proposed method achieves higher performance in registration accuracy and robustness.

Abstract A contour-based automatic registration method of lateral cephalograms and profile photographs is proposed to facilitate the accurate measurement of anteroposterior (AP) position of maxillary central incisors relative to the forehead. There are mainly three steps in the proposed method. First, a hierarchical contour detection algorithm is employed to obtain contours of forehead and nose in lateral cephalograms and profile photographs, respectively. Curve deviation around Nasion of Soft Tissue (Ns) is further corrected using an iterative polynomial curve fitting algorithm according to the characteristics of cephalograms. Second, the coarse registration is performed based on four landmark pairs using a routine least squares method for each image pair, and then the contours are roughly matched. Finally, the coarse registration is further refined by applying the coherent point drift (CPD) algorithm to all the contour points. Using image pairs of lateral cephalograms and profile photographs from 49 Chinese patients, we show that the proposed method achieves higher performance in terms of accuracy and robustness than the existing methods.

Keywords contour detection; curve alignment; multi-modal registration; medical image analysis.

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