

Automated 3D cephalometric landmark identification and morphometric analysis using CT

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ABSTRACT

Identification of 3D cephalometric landmarks (73 landmarks), which serve as proxy to a human skull, is the fundamental step in cephalometric analysis as they are used for diagnosis, surgical planning and treatment evaluation. Morphology of human skull follow certain patterns and consequently positions of landmarks are interdependently related. Hence, a concatenated vector of landmarks can be represented by low dimensional semantic latent variables associated with craniofacial morphometric factors. This paper presents a fully automated method for detecting landmarks from 3D computerized tomography(CT) images and providing low dimensional semantic latent representation of the skull. The contribution of this paper is twofold; first, we develop a fully automatic 3D landmark tracing method (for identifying more than 70 landmarks) with the accuracy required for clinical practice. Second, we provide a low dimensional semantic latent representation with each latent variable corresponding to a distinct morphological characteristic. The proposed method for landmark detection achieves an average 3D point-to-point error of 1.63 mm for 73 cephalometric landmarks with a small number of training CT datasets.