

# **A fully automated method for 3D individual tooth identification and segmentation in dental CBCT**

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## **ABSTRACT**

Accurate and automatic segmentation of three-dimensional (3D) individual teeth from cone-beam computerized tomography (CBCT) images is a challenging problem because of the difficulty in separating an individual tooth from adjacent teeth and its surrounding alveolar bone. Thus, this paper proposes a fully automated method of identifying and segmenting 3D individual teeth from dental CBCT images. The proposed method addresses the aforementioned difficulty by developing a deep learning-based hierarchical multi-step model. First, it automatically generates upper and lower jaws panoramic images to overcome the computational complexity caused by high-dimensional data and the curse of dimensionality associated with limited training dataset. The obtained 2D panoramic images are then used to identify 2D individual teeth and capture loose- and tight- regions of interest (ROIs) of 3D individual teeth. Finally, accurate 3D individual tooth segmentation is achieved using both loose and tight ROIs. Experimental results showed that the proposed method achieved an F1 score of 94.19% for tooth identification and a Dice score of 94.55% for individual 3D tooth segmentation. The results demonstrate that the proposed method provides an effective clinical and practical framework for digital dentistry.