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REALISTIC 3D PHOTO-RECONSTRUCTION FROM CBCT IMAGES

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Summary: Orthognathic surgery is a surgical procedure that corrects the intermaxillary discrepancy, promoting a significant improvement in chewing and breathing, which contribute to the patient's well-being and psychological condition. During surgery planning, orthodontists often use two-dimensional imaging techniques. However, these techniques had some disadvantages compared to three-dimensional ones, namely non-detection of facial asymmetries and distortion of cephalometric points outside the medial sagittal plane. The evaluation based on CBCT images and dental cast models tries to overcome these limitations but soft tissue evaluation remains complex. Both orthodontists and maxillofacial surgeons make an effort to mentally merge the photographic and CBCT images to predict the outcome of the treatment. The objective of this work was to develop a co-registration method that would allow a realistic reconstruction from CBCT images. From the CBCT images, a three-dimensional rendering was performed followed by a segmentation of the soft tissues, allowing to obtain the cranial external surface. A co-registration between the obtained surface and a frontal photograph of the subject was then carried out. From this mapping, a photo-realistic model capable of replicating the features of the face was generated. To assess the quality of this procedure, orthodontists were asked to fill in a survey on the models obtained. The method developed was automatically applied to nine cases, and four were randomly chosen for the survey. The survey results show that orthodontists consider the three-dimensional model obtained to be of high quality and realistic. The method developed can automatically obtain a three-dimensional model from CBCT images allowing the visualization of the results of surgical-orthognathic planning.