

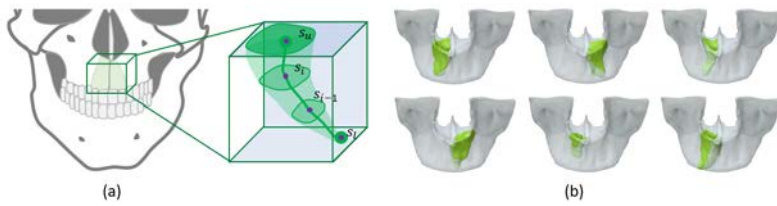
# Supplemental Material: Stochastic Anomaly Simulation for Maxilla Completion from Cone-Beam Computed Tomography

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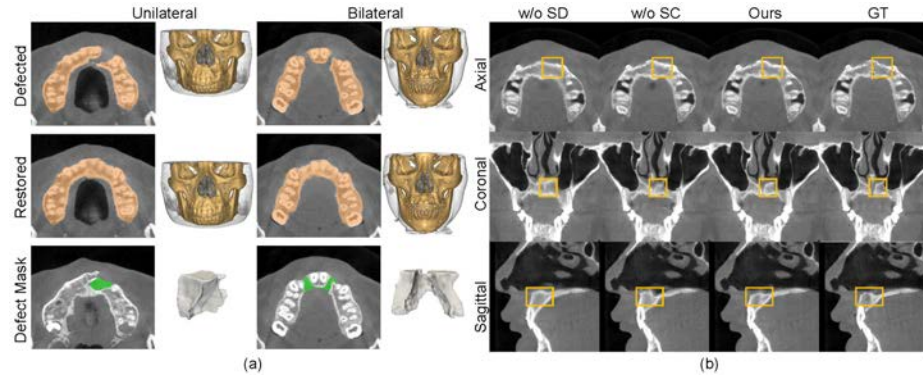
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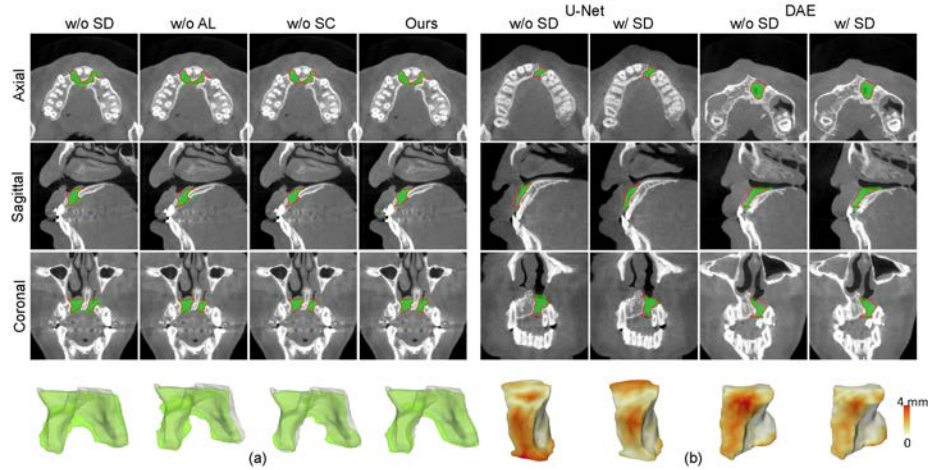
**Fig. 1.** (a) Illustration of the proposed SAS-based defected CBCT generation. Alveolar cleft defects occur in Zones 1-2 (green) in the Tessier system of orofacial clefting. The SAS algorithm relies on iterative skeleton tracing between randomly selected seed points of  $s_l$  and  $s_u$ , where the skeleton is further dilated for diversified defected CBCT generation. (b) Sampled cleft defects generated by the proposed SAS algorithm.

**Table 1.** CBCT restoration accuracies regarding the PSNR, SSIM, and the NCC by compared methods and variants of the proposed approach. (SD-simulated data, SC-symmetric constraints)

	PSNR $\uparrow$	SSIM $\uparrow$	NCC $\uparrow$
Mirror [11]	20.6 $\pm$ 1.95	0.77 $\pm$ 0.10	0.77 $\pm$ 0.11
Demons [21]	21.0 $\pm$ 2.20	0.80 $\pm$ 0.08	0.81 $\pm$ 0.08
SyN [3]	20.9 $\pm$ 1.35	0.80 $\pm$ 0.06	0.81 $\pm$ 0.06
VM [4]	20.7 $\pm$ 1.18	0.79 $\pm$ 0.04	0.80 $\pm$ 0.04
GII [23]	23.0 $\pm$ 1.33	0.87 $\pm$ 0.04	0.88 $\pm$ 0.04
w/o SD	22.4 $\pm$ 1.20	0.86 $\pm$ 0.03	0.86 $\pm$ 0.03
w/o SC	23.6 $\pm$ 1.14	0.90 $\pm$ 0.02	0.90 $\pm$ 0.02
Ours	<b>24.0<math>\pm</math>1.23</b>	<b>0.91<math>\pm</math>0.02</b>	<b>0.91<math>\pm</math>0.02</b>



**Fig. 2.** (a) Sampled slices and volume rendering of clinical unilateral and bilateral defected CBCTs before and after restoration. The estimated defect masks and surfaces are shown at the bottom. (b) Defected CBCT restoration by variants of the proposed approach, where the restored regions are blocked. (SD-simulated data, SC-symmetric constraints)



**Fig. 3.** (a) Cleft defect map prediction (green) by variants of the proposed approach without using simulated data (SD), adversarial learning using clinical data (AL), and symmetric constraints (SC). The ground truth contours are plotted in red on slices. The transparent overlapping of 3D surfaces associated with the predicted defect masks (green) and the ground truth (gray) are shown at the bottom. (b) Cleft defect map prediction (green) by the U-Net [6] and the DAE [14] with and without using simulated data (SD) on sampled axial, coronal, and sagittal slices. The cleft defect surfaces with the MSDs visualized are shown at the bottom.