CADReasoner: Iterative Program Editing for CAD Reverse Engineering

Supplementary Material

A. Multi-view visualization

Figure 4 shows the input image for the first step, where the predicted shape is absent. For subsequent steps, the predicted shape is rendered in a similar way and incorporated into the red channel of the image.

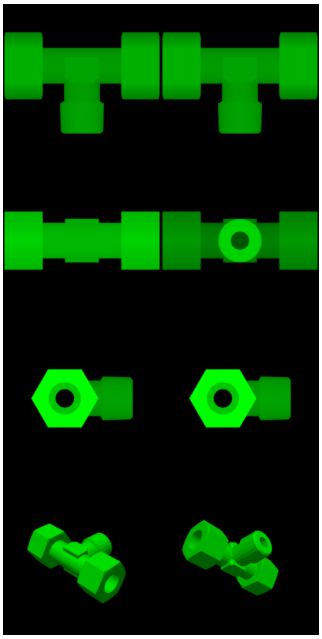

Figure 4. **Multi-view image of target shape.** We render eight fixed views—six orthographic ($\pm X, \pm Y, \pm Z$) and two isometric—using parallel projection and flat shading; intensity encodes depth. The views are arranged in a 2×4 grid with consistent axis orientation.

B. More results on scans

To probe generalization across domains, Table 6 compares four train/test combinations. Training on scans improves transfer in both directions: compared to training on clean data, it reduces CD on clean test and boosts IoU. In short, scan-simulation acts as a robust curriculum that yields models strong on scans and at least as strong on clean surfaces.

As reported in Table 7, we additionally evaluate our method on the CC3D dataset – a dataset of CAD models that includes both clean meshes and versions that have been virtually scanned using a proprietary 3D scanning pipeline, exhibiting realistic scan-like artifacts that differ from those generated by our simulation procedure. We present experimental results on the image modality because, unlike point clouds, which consist of only 256 points, images capture all scan defects and more clearly demonstrate the benefits of scan-sim training. Training with our scan simulation significantly reduces performance degradation on scanned data.

Table 6. **Train–test cross-generalization under scan-simulation (CADReasoner, greedy decoding, iteration $t = 5$, MCB subset: 1000 samples.** Selection uses scan CD when *Test: scan*; final metrics are always computed on the corresponding *clean* surface for comparability. Median CD↓ ($\times 10^3$), mean IoU↑ (%), IR↓ (%).

Train set	Test set	CD ↓	IoU ↑	IR ↓
clean	clean	1.43	41.0	0.0
clean	scan	4.42	17.8	0.1
scan	clean	**1.01**	**47.4**	0.0
scan	scan	1.14	46.4	0.0

Table 7. **Results on CC3D dataset** (sampling, N=5). Final metrics are computed against the corresponding *clean* surfaces.

	CC3D-clean			CC3D-scan			Δ %	
Method	CD	IoU	IR	CD	IoU	IR	CD	IoU
cadrille-SFT	0.88	54.9	8.4	1.15	48.4	10.2	+30.7	-11.8
cadrille-RL	0.57	65.0	0.1	0.67	60.3	0.1	+17.5	-7.2
Our (w/o scan-sim) (t=1)	0.81	58.1	0.1	0.96	53.6	0.1	+18.5	-7.7
Our (w/o scan-sim) (t=5)	0.39	64.2	0.0	0.44	60.1	0.0	+12.8	-6.4
Our (w/ scan-sim) (t=1)	0.53	62.0	0.1	0.55	61.2	0.1	**+3.8**	**-1.3**
Our (w/ scan-sim) (t=5)	0.34	66.9	0.0	0.37	66.7	0.0	**+8.8**	**-0.3**