Supplementary for '*Fantastic Breaks:* A Dataset of Paired 3D Scans of Real-World Broken Objects and Their Complete Counterparts'

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1. Implementation Details for Shape Repair

We provide implementation details for the shape repair approaches MendNet [4], DeepMend [3], and DeepJoin [2]. We train each shape repair approach for 2,000 epochs. When training on the Geometric Breaks dataset provided by Lamb et al [3], we use 5,086 train and 45 test objects. When training on the Breaking Bad dataset [5], we use 2,575 train and 45 test objects. For each shape repair approach we use the hyperparameters recommended by the authors. For MendNet, DeepMend, and DeepJoin, we use a learning rate of 5e-4 for the network parameters and 1e-3 for the latent codes. For MendNet and DeepMend we use a regularization loss weight of 1e-4. For DeepJoin we use a regularization loss weight of 1e-4, a signed distance function loss weight of 10.0 and a normal field loss weight of 1e-1. For MendNet we use a latent code size of 265. For DeeMend and DeepJoin we use a latent code size of 128 and 64 for the complete and break codes respectively.

When re-training on *Fantastic Breaks*, we train each shape repair approach for an additional 1,000 epochs, for a total of 3,000 epochs. For re-training, we generate new randomly initialized codes for objects from *Fantastic Breaks* and set the learning rate of the codes to 1e-3. MendNet and DeepJoin are trained with the Geometric Breaks dataset on a server with a 40-core Intel Xeon CPU and one NVIDIA RTX 4090, and take 211 and 130 hours respectively to train. DeepMend is trained with the Geometric Breaks dataset on a server with a 40-core Intel Xeon CPU and two NVIDIA RTX 3090s, which takes 160 hours. MendNet, DeepMend, and DeepJoin are trained with the Breaking Bad dataset on the same server with a 40-core Intel Xeon CPU and two NVIDIA RTX 3090s, and take 148, 75, and 70 hours respectively to train. Re-training on *Fantastic Breaks* takes between 1 and 2 hours for MendNet, DeepMend, and DeepJoin on the same server with a 40-core Intel Xeon CPU and two NVIDIA RTX 3090s.

2. Paired Objects from Fantastic Breaks

In figure 1 we show complete, broken, and restoration meshes in gray, gray, and red respectively for a subset of 78 paired object in our dataset. We generate repair meshes using the approach of Lamb et al. [1].

References

[1] N. Lamb, S. Banerjee, and N. K. Banerjee. Automated reconstruction of smoothly joining 3d printed restorations to fix broken objects. In *Proceedings of the ACM Symposium on Computational Fabrication*, pages 1–12, 2019. 1

[2] N. Lamb, S. Banerjee, and N. K. Banerjee. Deepjoin: Learning a joint occupancy, signed distance, and normal field function for shape repair. *ACM Trans. Graph. (Proc. SIGGRAPH Asia)*, jul 2022. 1

[3] N. Lamb, S. Banerjee, and N. K. Banerjee. Deepmend: Learning occupancy functions to represent shape for repair. In *European Conference on Computer Vision (ECCV)*, 2022. 1

[4] N. Lamb, S. Banerjee, and N. K. Banerjee. Mendnet: Restoration of fractured shapes using learned occupancy functions. *Computer Graphics Forum*, 41(5):65–78, 2022. 1

[5] S. Sellán et al. Breaking bad. In *NeurIPS*, 2022. 1

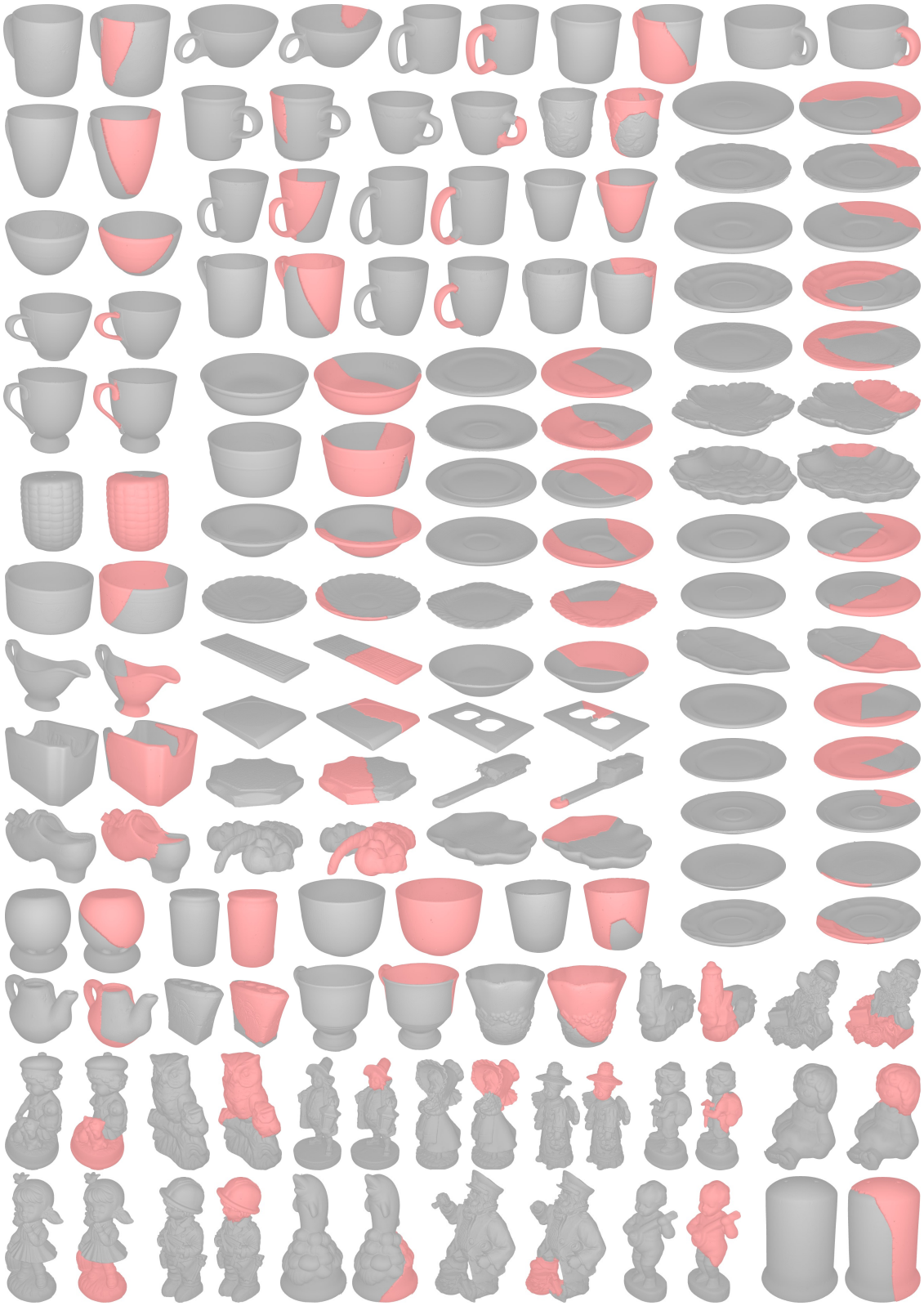

Figure 1. Complete, broken, and repair meshes for a subset of 78 paired object in our dataset. For each paired object, complete meshes are shown in gray on the left. Broken meshes, in gray, are shown with repair meshes, in red, on the right.