Completing 3D Object Shape from One Depth Image Supplementary

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1. Symmetry Detection Pruning

As part of the symmetry detection we find significant symmetries in the retrieved mesh using [**?**]. Define a candidate symmetry as the points a and b, and their normals n_a and n_b. Define p, the point which minimizes the distance to the vectors defined by a, n_a and b, n_b. We eliminate any candidates with a point to vector distance greater than .01. Define m as the average of a and b. We further eliminate any candidates with $abs(cos(ang(b-a, p-m))) \geq .05$, that is we reject candidates when the angle between the lines a, b and p, m is too far from a right angle.

2. Dataset

Our dataset is separated into two training sets, train one and train two; a validation set; and a test set. We provide "subset" versions of Train 2, Validation, and Test, because running a model on such a large dataset is prohibitively expensive. Test is 25k images, while test subset is a more manageable 1.8k images. Our presented experiments are on the subset versions of our dataset. See table 1.

In our experiments, we train model parameters on Train 2 Subset. We include Train 2 as part of our query set when we test on Validation Subset and Test Subset. We do not ever include Validation in the training set.

Train 1

Experiment Type	#Classes	#Models	#Views
	30	10	40

Train 2 Subset

Experiment Type	#Classes	#Models	#Views
Novel Class	10	15	40
Novel Model	30	3	40
Novel View	30	10	3

Train 2

#Classes	#Models	#Views
10	5	2
10	2	5
10	5	2

Validation

Experiment Type	#Classes	#Models	#Views
Novel Class	5	15	40
Novel Model	30	2	40
Novel View	30	10	2

Validation Subset

#Classes	#Models	#Views
5	10	2
10	2	5
10	5	2

Test

Experiment Type	#Classes	#Models	#Views
Novel Class	15	20	40
Novel Model	40	5	50
Novel View	40	15	5

Test Subset

#Classes	#Models	#Views
15	20	2
24	5	5
24	5	5

Table 1: We provide "subset" versions of Train 2, Validation, and Test, because running a sufficiently complex model on such a large dataset is prohibitively expensive. Test is 25k images, while test subset is a more manageable 1.8k images.

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3. Additional Results

We present additional selected results. For comparison we attempt to pick results of varying quality based on the voxel I/U error metric. We select 9 examples from “novel class”, “novel model”, and “novel view” test sets. Our method is unaware of which set a query comes from, and we break out these classes only to demonstrate the range of reconstructions our system produces. See Figures 1 2 3.

Figure 1: Examples from the “Novel Class” test set. The deformation is often extreme to create an object that looks like the depthmap. However, the reconstruction technique is often robust enough to produce a reasonable mesh in many cases.

Figure 2: Examples from the "Novel Model" test set. Failure cases are generally caused by a bad match which the deformation and reconstruction are unable to compensate for.

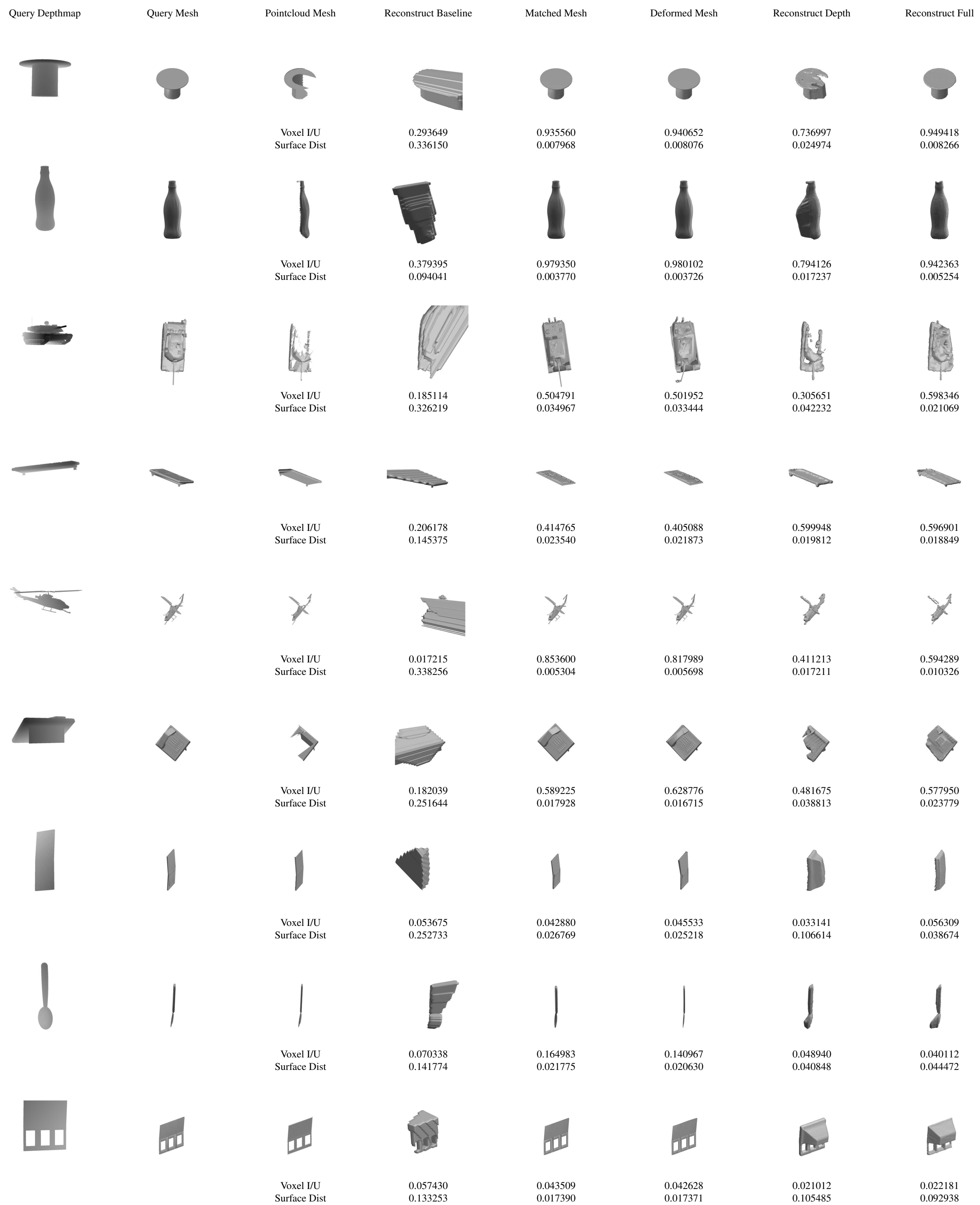

Figure 3: Examples from the “Novel View” test set. Here we see examples where final reconstruction hurts the result that the matcher and deformation produce.