Peeking Template Matching for Depth Extension

– Supplementary materials–

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References

[1] S. Jayanti, Y. Kalyanaraman, N. Iyer, and K. Ramani. Developing an engineering shape benchmark for cad models. *Computer-Aided Design*, 38(9), 2006. 1, 2

A. Extended Results on the Shape Reconstruction Experiment (using the SHREC [1] data-set)

A.1. Statistics on shape completions - Volume Estimation Error

Figure 1 below (which is Figure 6 from the paper) summarized the *reconstruction errors* (y–axis) for the 36 instances (6 instances for each of the 6 shapes), as a function of the % of unseen surface (x–axis). It showed that the algorithm performs well when the occluded surface area is almost up to ∼50% of the entire surface and beyond that performance degrades rather quickly.

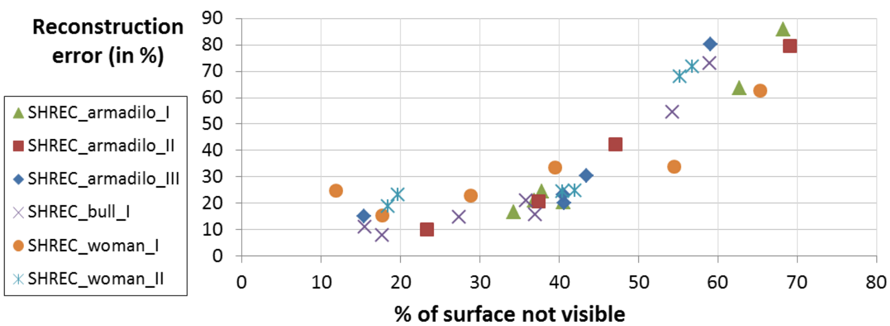


Figure 1. **Statistics on SHREC [1] shape completions - Reconstruction Error (Figure 6 from the paper)**: We randomly generated 6 completion instances of different difficulty for each of the 6 SHREC shapes (a total of 36). The x-axis shows the % of shape surface that is visible, representing the difficulty of the instance. The y-axis shows the *reconstruction error*, which is the difference in volume between the original and reconstructed shapes as a percentage of the original shape volume. Note that up to an occlusion rate of almost ∼50% the algorithm performs well (see Figure 7 in the paper and Figures 3 and 4 for many visual comparisons with the original shapes). The performance deteriorates at higher occlusion levels (see Figure 8 from the paper as well as Figure 5 for such cases).

As referred to in the paper, we provide here another look at the results through a different measure - the *volume estimation error*. We compare the volume of the predicted shape to the volume of the original shape, by taking the difference between the two as a percentage of the original shape volume. The results are shown in Figure 2. We are interested in both the sign and the magnitude of this difference. In accordance to the result of the previous figure, it is evident here too that up to an unseen percentage of almost 50%, the volume estimation resulting from our completions is of low error and is relatively unbiased. For the shapes of higher occlusion rate, the volume estimation error grows rather quickly and it is consistently biased towards underestimating the volume. This can be explained by the fact that in these cases large portions of the shape surface are occluded, and our method tends to find a solution with small surface area due to the total-variation regularization.

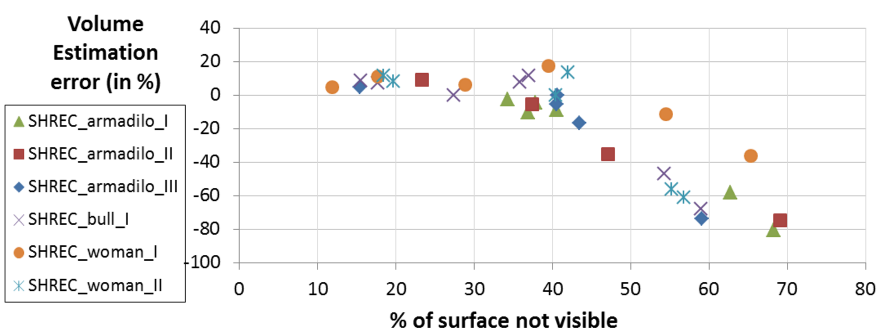


Figure 2. **Statistics on SHREC [1] shape completions - Volume Estimation Error**: See main paper and the caption of Figure 1 for experiment details. Here we measure the Volume Estimation Error, which is the difference between the reconstructed and true shape volumes, as a percent of the true volume. Notice that up to an occlusion rate of almost ∼50% the volume estimation is fairly accurate and is relatively unbiased. See Figure 7 in the paper and Figures 3 and 4 for many visual examples with such occlusion rates of up to 50%. Beyond such an occlusion rate the performance deteriorates - see Figure 8 from the paper as well as Figure 5 for such cases.

A.2. Additional completion examples with unseen area $< 50\%$

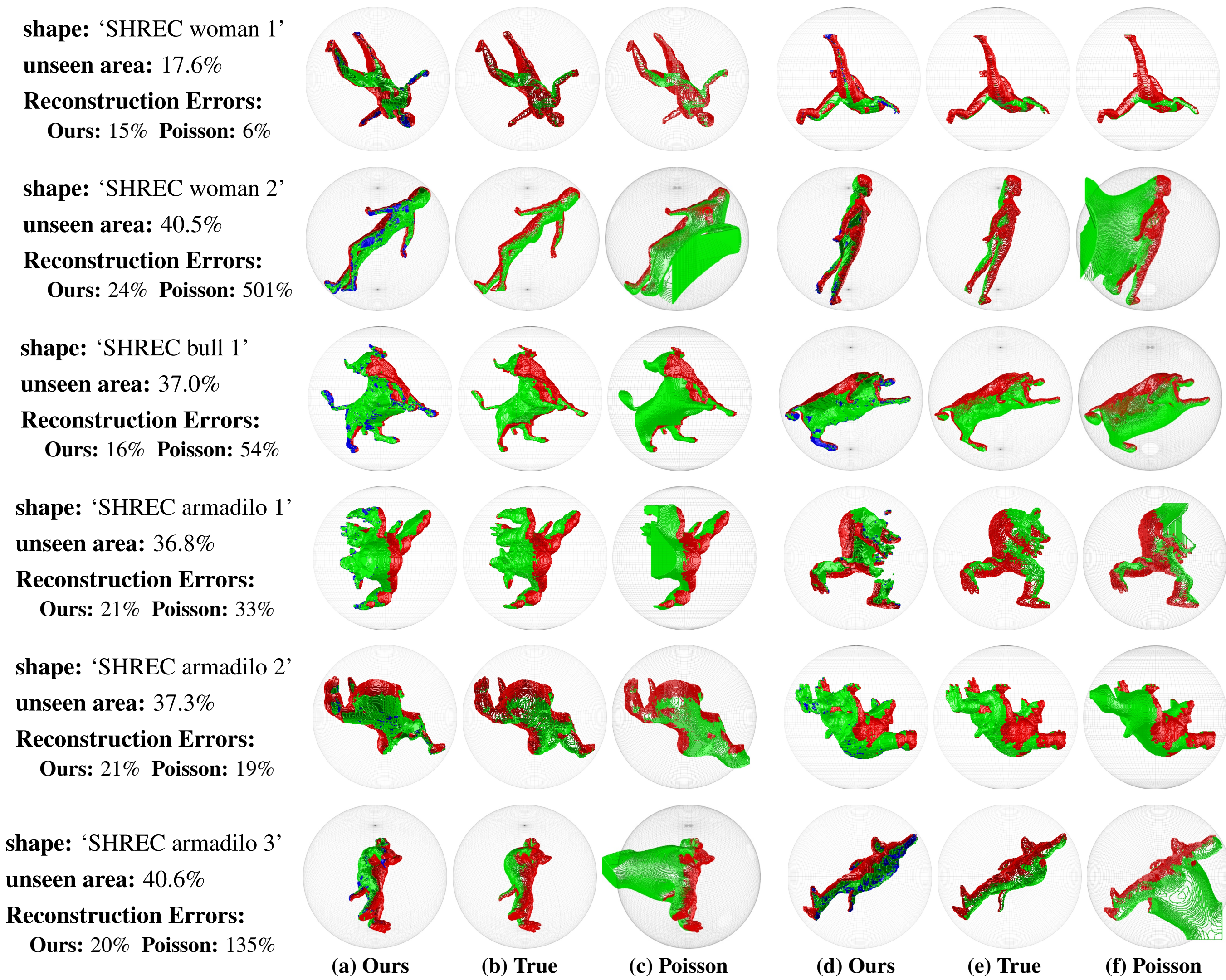


Figure 3. **Shape completion examples** (with unseen area $< 50\%$): These examples extend Figure 7 from the paper (see its caption for further details). We show here an additional instance for each of the 6 used shapes.

A.3. Additional completion examples with unseen area $< 50\%$

shape: 'SHREC woman 1'
unseen area: 39.5%
Reconstruction Errors:
Ours: 33% **Poisson:** 39%

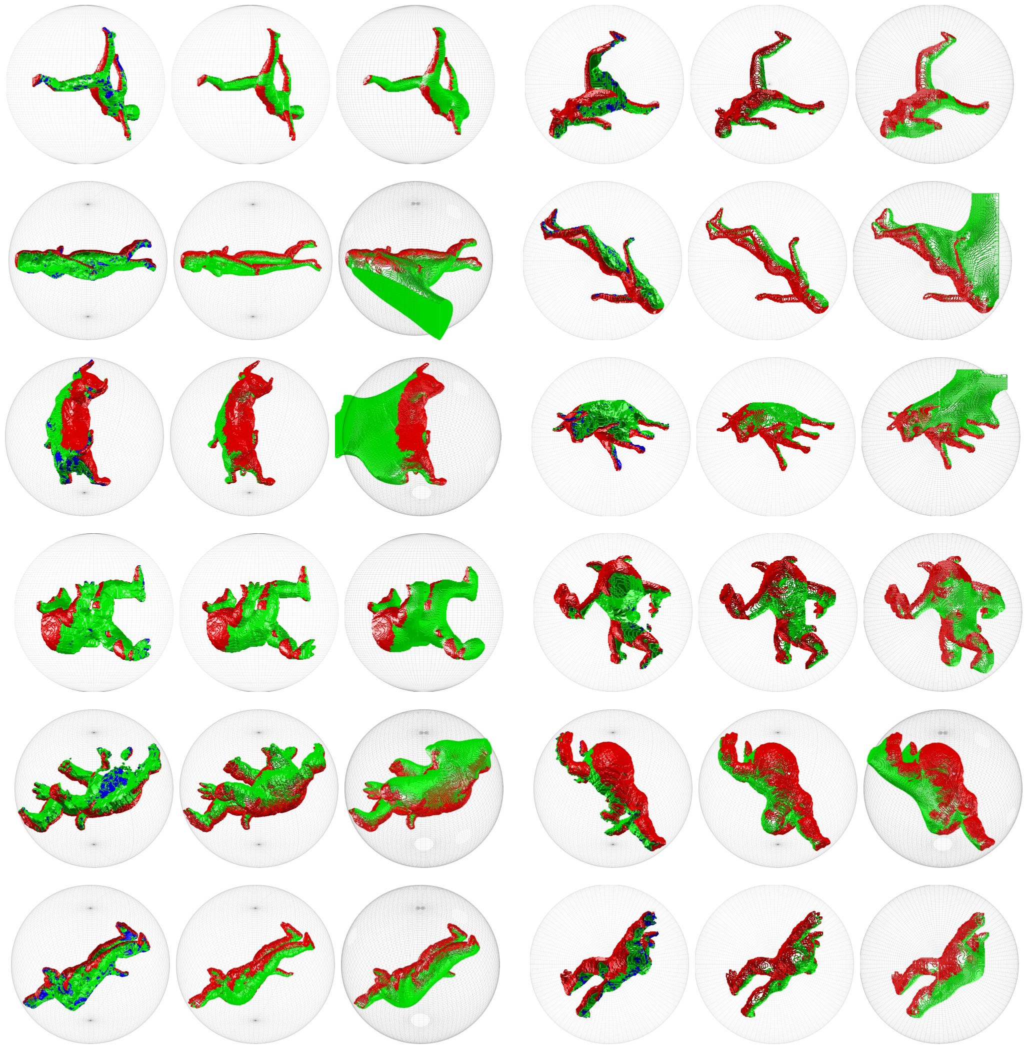
shape: 'SHREC woman 2'
unseen area: 41.9%
Reconstruction Errors:
Ours: 25% **Poisson:** 316%

shape: 'SHREC bull 1'
unseen area: 35.9%
Reconstruction Errors:
Ours: 21% **Poisson:** 135%

shape: 'SHREC armadilo 1'
unseen area: 40.5%
Reconstruction Errors:
Ours: 20% **Poisson:** 21%

shape: 'SHREC armadilo 2'
unseen area: 47.1%
Reconstruction Errors:
Ours: 42% **Poisson:** 42%

shape: 'SHREC armadilo 3'
unseen area: 40.5%
Reconstruction Errors:
Ours: 23% **Poisson:** 35%



(a) Ours **(b) True** **(c) Poisson** **(d) Ours** **(e) True** **(f) Poisson**

Figure 4. **Shape completion examples** (with unseen area $< 50\%$): These examples extend Figure 7 from the paper (see its caption for further details). We show here an additional instance for each of the 6 used shapes.

A.4. Additional completion examples with unseen area $> 50\%$

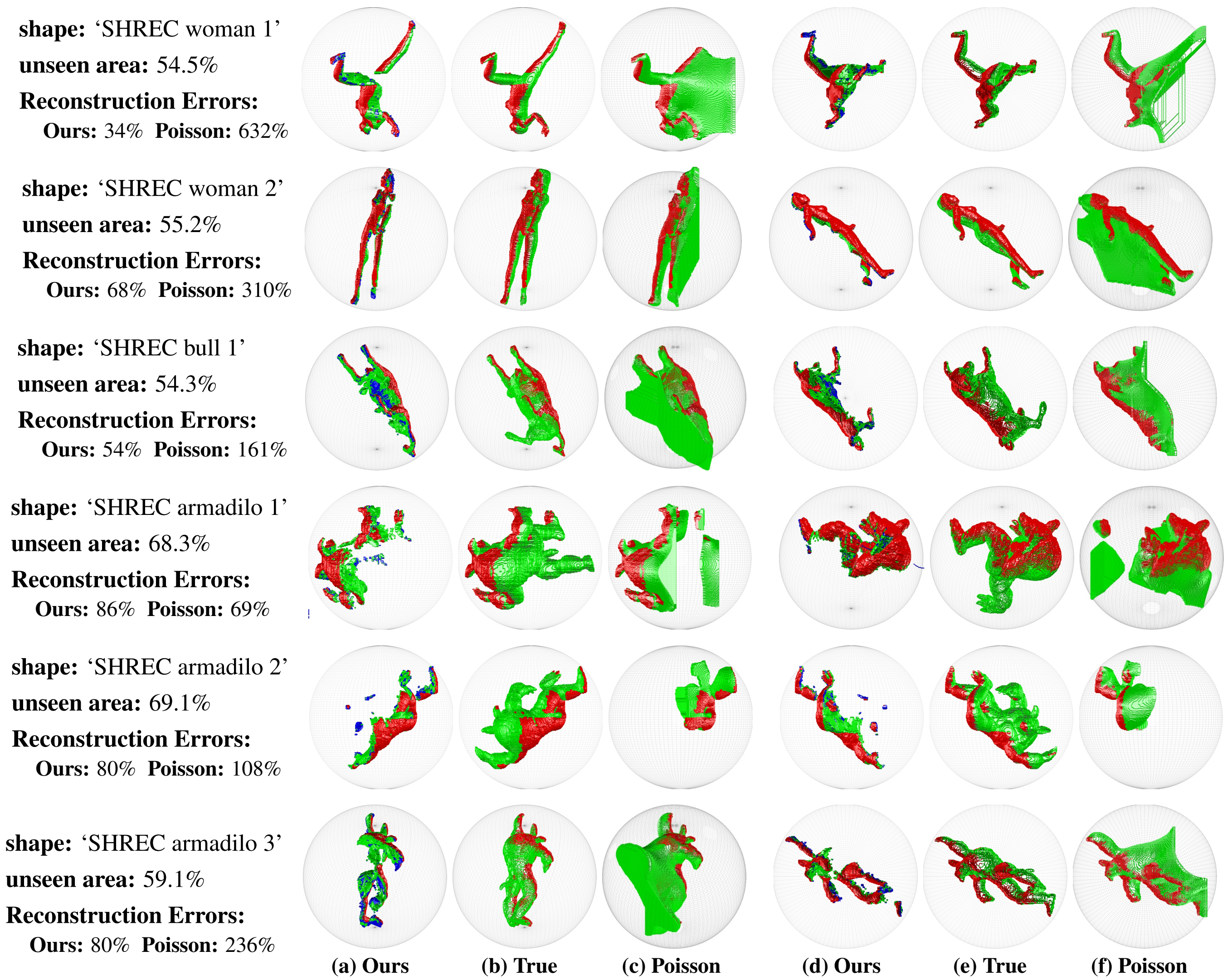


Figure 5. **Shape completion examples** (with unseen area $> 50\%$): These examples extend Figure 8 from the paper (see its caption for further details). We show here an additional instance for each of the 6 used shapes.