Supplemental Material
Exploring Collections of 3D Models using Fuzzy Correspondences

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In this document we show additional evaluations for [Kim et al. 2012].

1 Evaluation

In this section we include some evaluations that were omitted from our submission to save space. Please refer to the paper for the evaluation method and the algorithm details.

Blended Intrinsic Maps We compare our approach to matching of all pairs using blended intrinsic maps [Kim et al. 2011], on different datasets from the benchmark: 71 human models (SCAPE) and 51 animals. We compute error only for the same pairs of shapes as in [Kim et al. 2011], overall testing 71 pairs in the first dataset and 51 pairs in the second. Figures 1 and 2 show that for larger tolerable geodesic error (right side of plots), mapping a point to the closest point in the embedded space (blue) performs better than blended maps (red) and almost all correspondences are accepted. This suggests that consistency gives leverage to fuzzy correspondences over blended intrinsic maps, creating maps that are correct at large scale.

The inferior performance of using best fuzzy correspondence for smaller tolerance due to the fact that the correspondences are only sampled at a coarse set of discrete points, while blended maps are defined smoothly at every point on a surface. This can be addressed by staying within the space of blended maps. The magenta curve shows a map produced by choosing a blended map that is the most consistent with fuzzy correspondence values (this is equivalent to improving edge's consistency just for a single pairwise alignment). Note that producing these higher quality maps requires alignment of all pairs that need to be compared. However, for achieving quality of the blue curve we only compute 623 out of 1275 possible maps for Animals, and 355 out of 2485 possible maps for SCAPE.

Affine Alignment We also compare our method to an automatic pairwise matching for the chair dataset. The fuzzy correspondences were computed with 602 out of possible 6105 alignments. Although our method on average does not perform much better than the naive ICP in Figure 3, it fixes issues with some unusual chairs (see Figure for an example) that do not contribute much to the global error (since there are fewer of them).

Per class results on SHREC datasets In Figures 4, 5, 6, 7 we show per class comparisons to [Nguyen et al. 2011]. Please, see the paper for more details.

2 Applications

In Figure 8 we show full automatic results for the semantic glue application described in the paper. The person was manually aligned to a single chair (top-left), and our method automatically re-aligned the person to other 110 chairs in the collection.

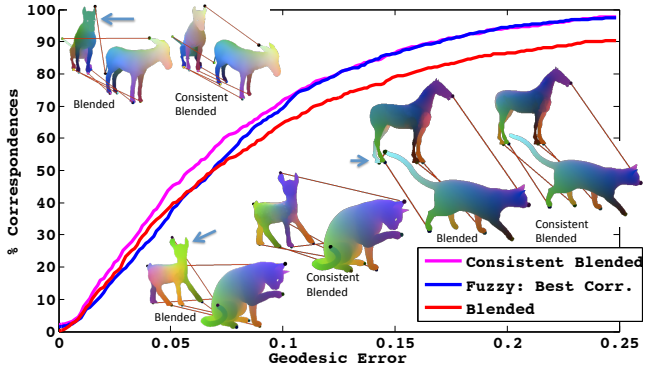

Figure 1: ***Animals dataset.*** *Comparison of the three methods: choosing blended map that is consistent with fuzzy correspondences (magenta), taking the best fuzzy correspondence (blue), and just using blended intrinsic map (red). Three examples show results obtained with the blended map, and results obtained by choosing a blended map consistent with fuzzy correspondences. The right surface is colored by mapping xyz coordinates to rgb colors and the left surface is colored by transferring color using a map. Regions misaligned by the blended map are highlighted by arrows.*

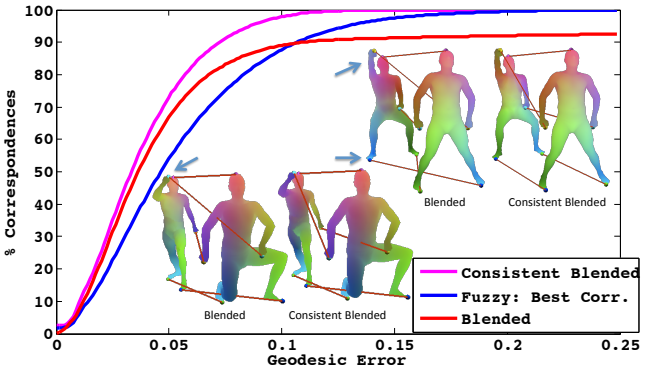

Figure 2: ***SCAPE dataset.*** *Comparison of three methods similarly to the animals dataset (Figure 1) the main improvement with out method comes due to consistency optimization. We present a few representative examples where consistent blended map provides an improvement over the blended map.*

References

KIM, V. G., LIPMAN, Y., AND FUNKHOUSER, T. 2011. Blended intrinsic maps. ACM SIGGRAPH.

KIM, V. G., LI, W., MITRA, N., DIVERDI, S., AND FUNKHOUSER, T. 2012. Exploring collections of 3d models using fuzzy correspondences. Trans. on Graphis (Proc. of SIGGRAPH).

NGUYEN, A., BEN-CHEN, M., WELNICKA, K., YE, Y., AND GUIBAS, L. 2011. An optimization approach to improving collections of shape maps. Symp. on Geometry Proc..

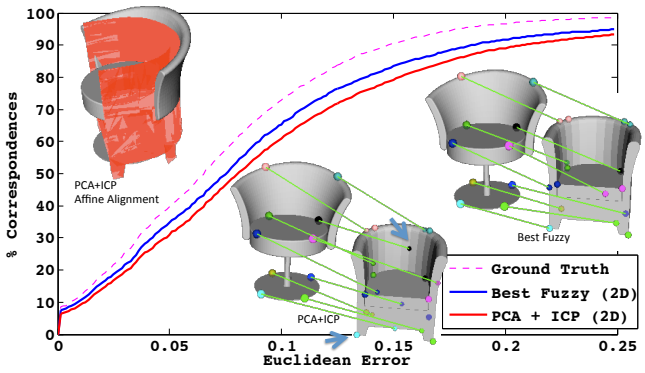

Figure 3: ***Chairs dataset****. In this dataset we are comparing taking best fuzzy correspondence to pairwise alignment of all pairs.*

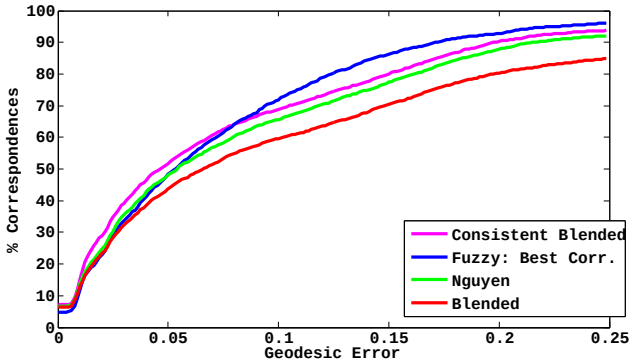

Figure 4: ***SHREC Hands dataset (20 models)****. Comparison of the four methods: choosing blended map that is consistent with fuzzy correspondences (magenta), taking the best fuzzy correspondence (blue), optimized blended maps computed by Nguyen et al. [2011], and original blended intrinsic map (red). See the paper for the discussion*

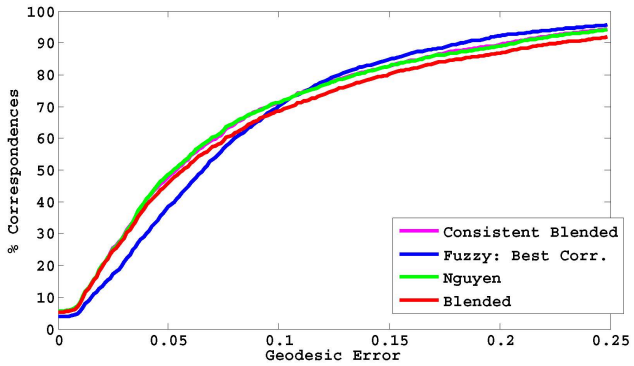

Figure 5: ***SHREC Animals dataset (20 models)****. Comparison of four methods (as in Figure 4).*

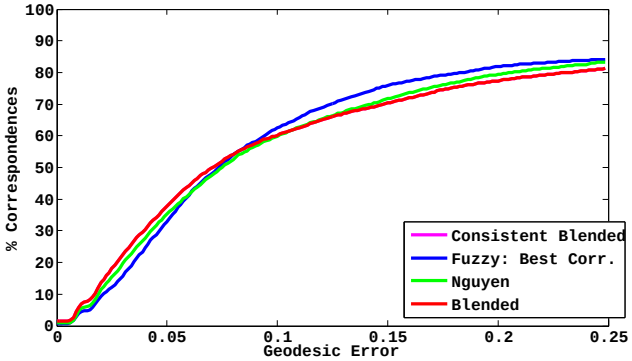

Figure 6: ***SHREC Teddies dataset (20 models)****. Comparison of four methods (as in Figure 4).*

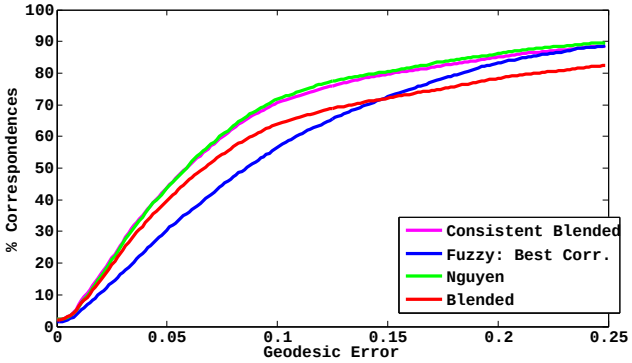

Figure 7: ***SHREC Humans dataset (20 models)****. Comparison of four methods (as in Figure 4).*

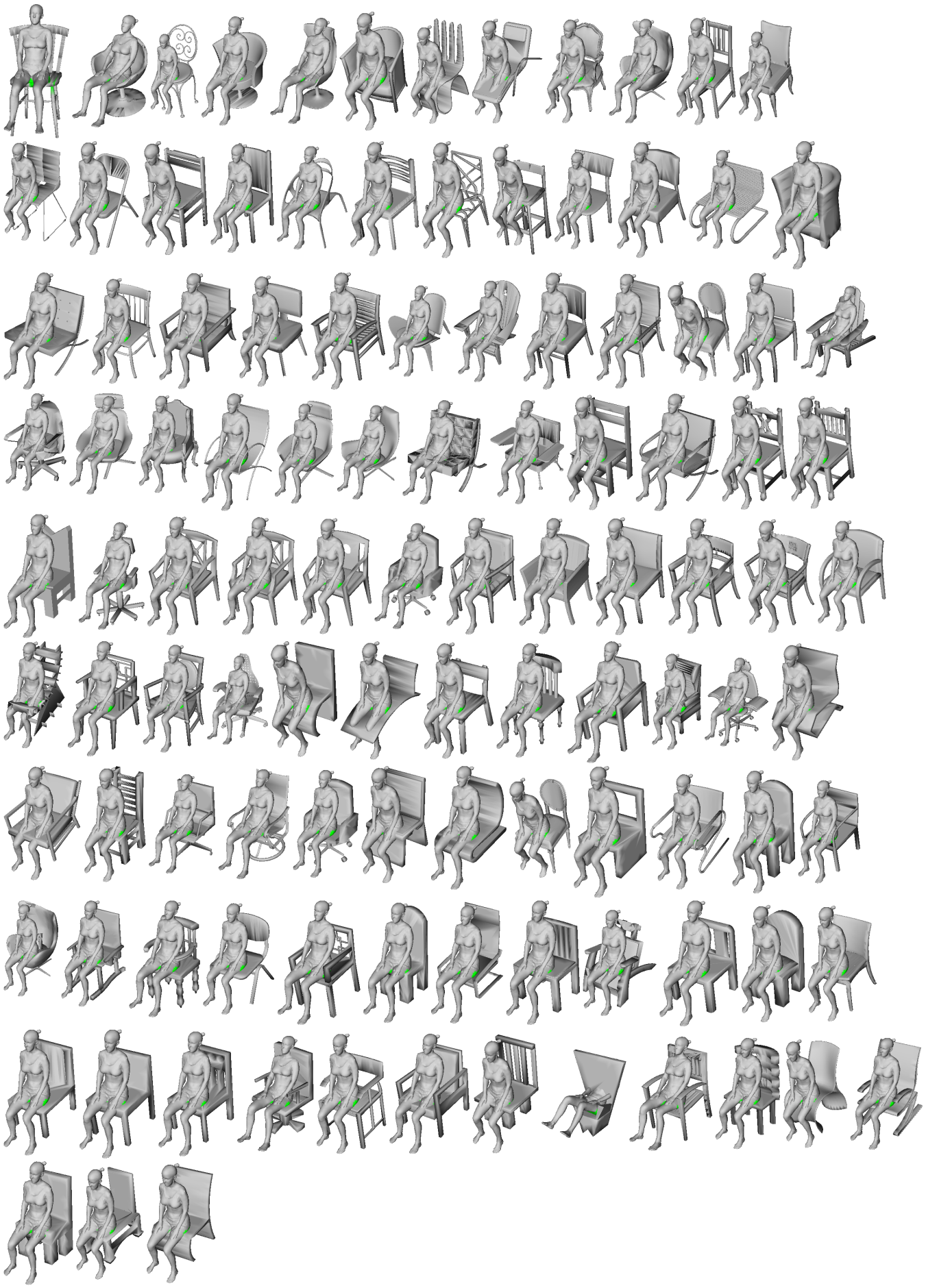

Figure 8: *Given an example human to a chair alignment, our system automatically aligned the human to all other chairs in the database. This is the full result.*