Co-Hierarchical Analysis of Shape Structures: Supplementary Material

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1 Additional results

Power of large set. In Figure 1, we confirm on two sets the hypothesis that the co-analysis benefits from analyzing larger sets of shapes, since then the similarity among the shapes becomes more evident and can be directly inferred. For this experiment, we defined a ground-truth correspondence between the parts of the shapes in each set, in the form of a semantic labeling of the shape parts. We measure for each level of the co-hierarchy how well it reflects the correspondence. Specifically, given a pair of shapes $M_i$ and $M_j$ and a node $N_k$ of the co-hierarchy, we count how many of the parts in $N_k$ that come from $M_i$ also have a corresponding part of $M_j$ in the same node $N_k$. We then divide this sum by the total number of parts in $M_i \cap N_k$, which gives a part hit rate. We compute the average hit rate for all the pairs of shapes in a set and all the nodes in the requested level, which we show in the graph. In these specific examples, we observe an improvement of 10–20% when the full sets are used in the co-analysis. Moreover, we notice that higher levels have higher hit rates, as then the correspondence is more coarse.

Mixed set. In Figure 2, we show that the cluster-and-select also has the potential of handling mixed sets composed of more than one category of shapes (chairs + lamps + airplanes + goblets in the example), which is beyond the capability of existing co-segmentation algorithms. We see that chairs and airplanes are well-separated in the embedding and form two different clusters, but there is confusion between lamps and goblets since these two sets are more structurally similar.

Results for all the sets. In Figures 3–8, we show the complete results of the co-hierarchical analysis for all the sets, in the form of hierarchical segmentations. Note that a few shapes with a small number of parts have a shallower hierarchy than the other shapes in the set, and so their hierarchies for lower levels can be identical to one of the hierarchies at a higher level.

Figure 1: Power of larger set: when the size of the analyzed set increases (x axis) the part hit rate (y axis) also increases, especially for higher levels of the co-hierarchy.

Figure 2: Embedding and clustering of a set with mixed categories of objects obtained with the select-and-cluster scheme. Note how shapes that are structurally similar tend to be in the same cluster.
Figure 3: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of chairs.
Figure 4: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of airplanes.

Figure 5: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of candles.
Figure 6: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of lamps.

Figure 7: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of vehicles.
Figure 8: Consistent hierarchical segmentation results corresponding to structural co-hierarchies obtained for the set of velocipedes.