

Supplemental Material: Mesh Arrangements for Solid Geometry

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1 Thingiverse Dataset

We tested our self-union algorithm on 10,000 meshes crawled from Thingiverse.com, a popular 3D model repository. We provide information about the entire data set in “supplementary_data/input_summary.csv”. The following fields are included:

- “thing_id”: Id used by Thingiverse.com for index each “thing”. Information about each individual thing can be retrieved from http://www.thingiverse.com/thing:{thing_id}.
- “file_id”: A unique id for each file.
- “license”: The license associated with each file.
- “link”: Direct link to download each model.
- “no_duplicated_faces”: If the mesh contain any duplicated faces.
- “closed”: If the mesh is combinatorially closed.
- “edge_manifold”: If every edge is adjacent to exact 2 faces (or 1 face for boundary edge).
- “no_degenerated_faces”: If there exists a triangle with three vertices *exactly* collinear.
- “vertex_manifold”: If local neighborhood of every vertex is a topological disc.
- “single_component”: If the mesh contains just a single connected component.
- “is_pwn”: If the mesh induces a piece-wise constant winding field.

2 Data set from [Barki et al. 2015]

Beside the Thingiverse dataset, we also conduct exhaustive tests on the data set from [Barki et al. 2015]. This data set contains 26 models widely used by the computer graphics community. We conduct pair-wise union, intersection and difference for all 351 pairs. 1404 results are generated. The union and self intersection results are shown in Figure 1. The difference results are shown in Figure 2.

In addition to pair-wise boolean tests, We also compute the consecutive union of each model with a rotated copy of itself for 10 times.

All 1404 + 26 mesh files can be found inside “barki_test.zip” in the supplemental materials.

References

BARKI, H., GUENNEBAUD, G., AND FOUFOU, S. 2015. Exact, robust, and efficient regularized booleans on general 3d meshes. *Computers and Mathematics with Applications*.

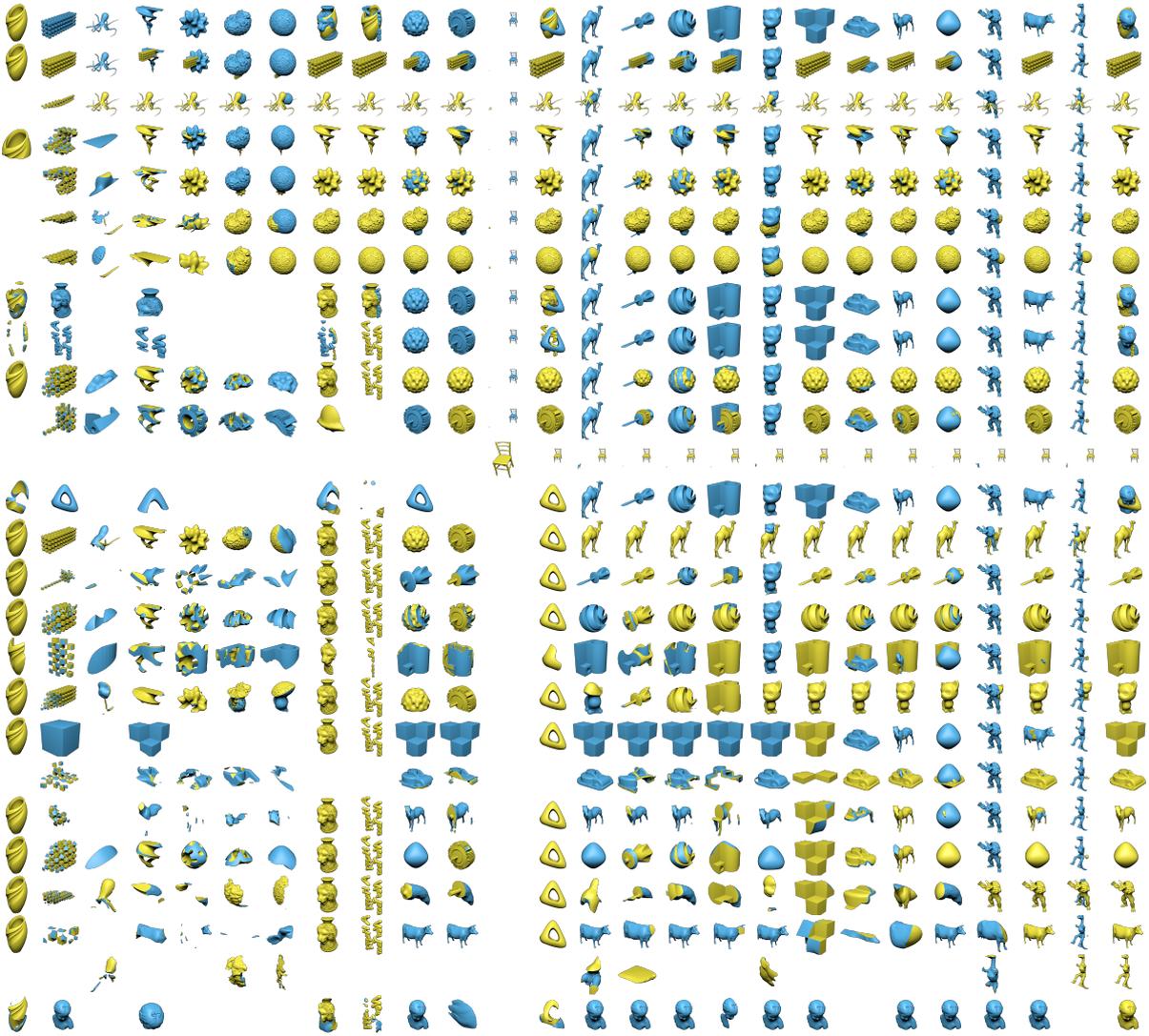


Figure 1: Result matrix showing union and intersection results of all mesh pairs. Union results are shown above the diagonal of the result matrix. Intersection results are shown below the diagonal. The diagonal shows the self-union outputs. Empty spot in the intersection region indicate the input mesh does not intersect.

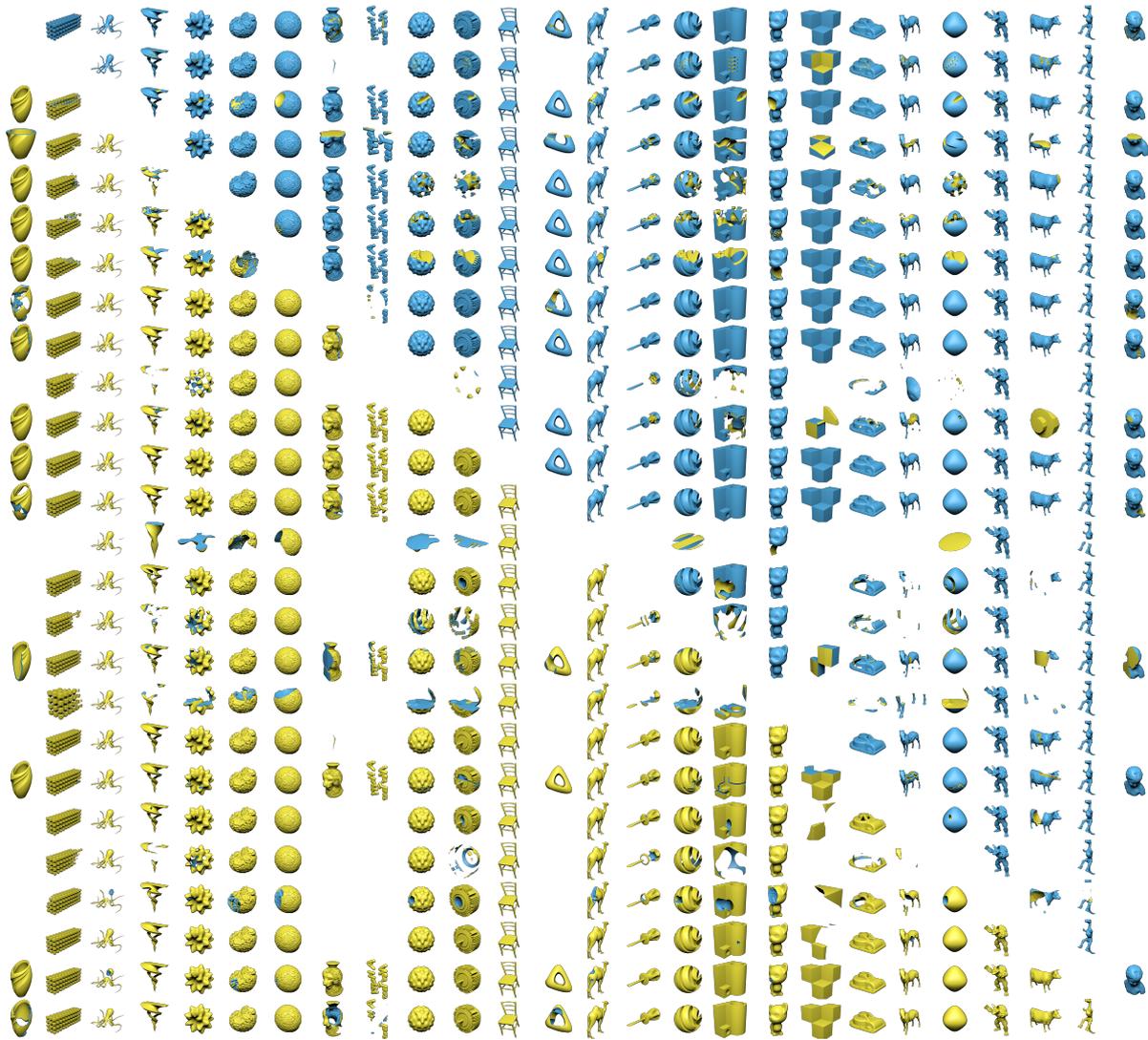


Figure 2: Result matrix showing $P \setminus Q$ (above diagonal) and $Q \setminus P$ below diagonal.