# Mandoline Supplement

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## 1 INTRODUCTION

This supplement contains performance measurements of Mandoline on the Thingi10K dataset as well as some extra visual results from meshes found in Thingi10K.

### 1.1 Performance Measurements with Thingi10K

We ran performance tests to evaluate the scalability of our method using the Thingi10K dataset's [Zhou and Jacobson 2016] closed and solid meshes. We found that the algorithm scales roughly linearly with respect to input element count. We show run-times with respect to the number of vertices and use a log-log scale to make the entire dataset visible (see Figure 3). We also used this data to evaluate performance with respect to grid resolution in Figure 2, which is also roughly linear.

Finally, we ran a performance comparison between Mandoline and Mesh Arrangements [Zhou et al. 2016], where we coerced Mesh Arrangements to run in "resolve" mode on non-manifold inputs by removing its topological piecewise-constant winding number check (the faces of the regular grid itself is a non-manifold mesh). In some visual checks on the output Mesh Arrangements seemed to be reasonable, though it lost its ability to discern closed regions in the mesh. We preprocessed Thingi10K for self-intersections and then timed Mandoline and our modified Mesh Arrangements on the same $5^3$ grid for the entire Thingi10K dataset (Figure 1).

### 1.2 Thingi10K Renders

In Figure 4 we show various slices through several different meshes from Thingi10K. In each case the cut input mesh is shown on the left, followed by several slices through the outside of that mesh on the right.

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In Figure 5 we show the results of our method on several additional meshes from Thingi10K with interesting features like thin tubes, sheets, or holes.

## REFERENCES

Qingnan Zhou, Eitan Grinspun, Denis Zorin, and Alec Jacobson. 2016. Mesh Arrangements for Solid Geometry. *ACM Transactions on Graphics (TOG)* 35, 4 (2016).
Qingnan Zhou and Alec Jacobson. 2016. Thingi10K: A Dataset of 10,000 3D-Printing Models. *arXiv preprint arXiv:1605.04797* (2016).

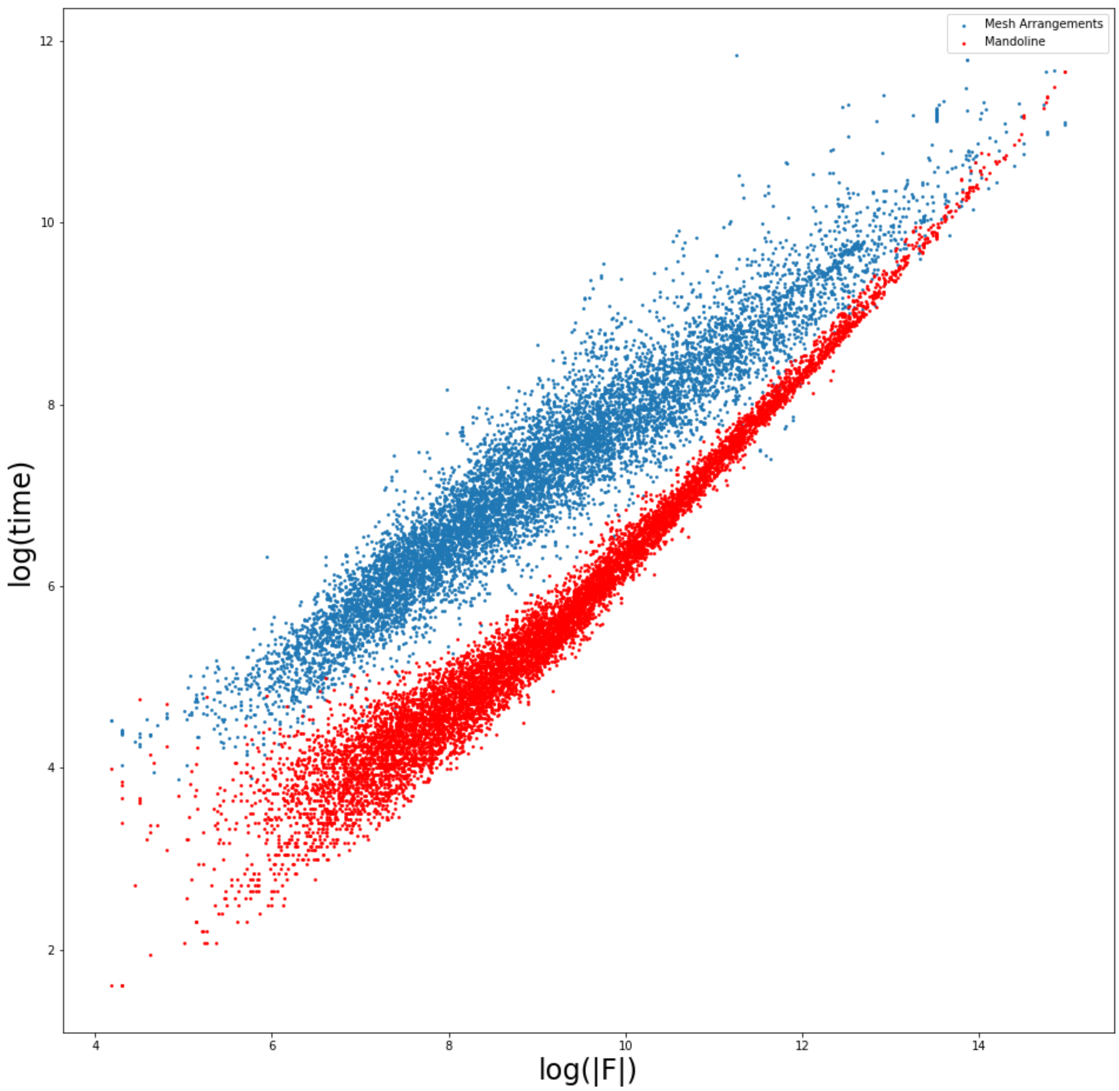



Fig. 1. Log-log plot of timings for Mesh Arrangements (blue) vs. Mandoline (red) to compute cut-cell meshes on a $5^3$ grid. (Time is measured in milliseconds.)

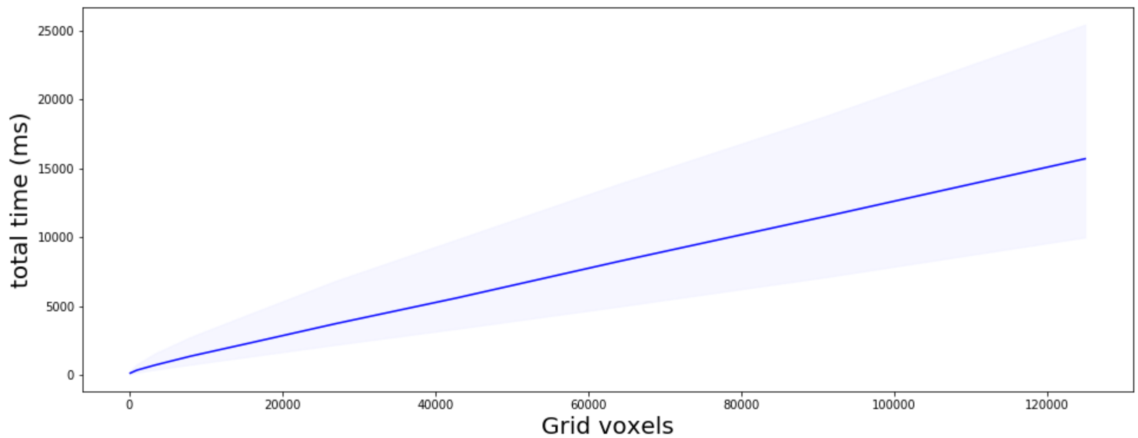
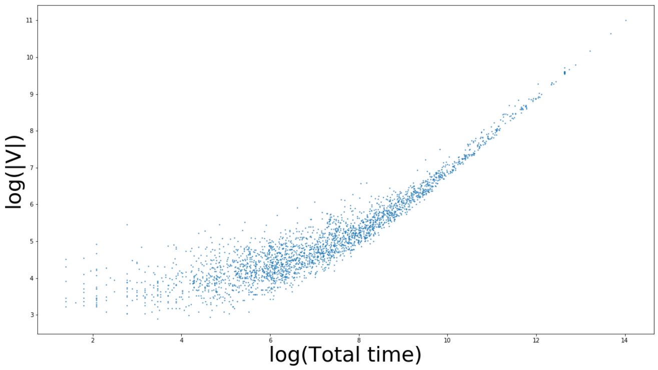
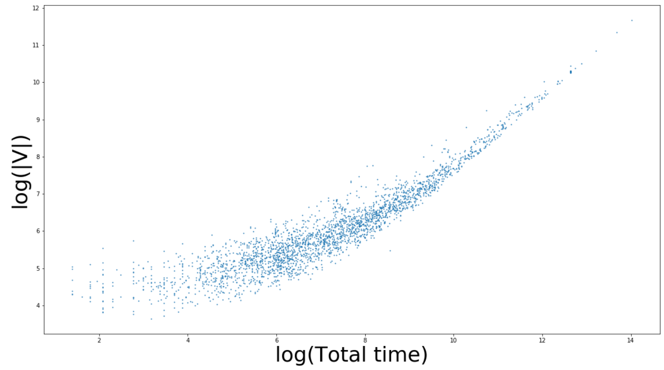


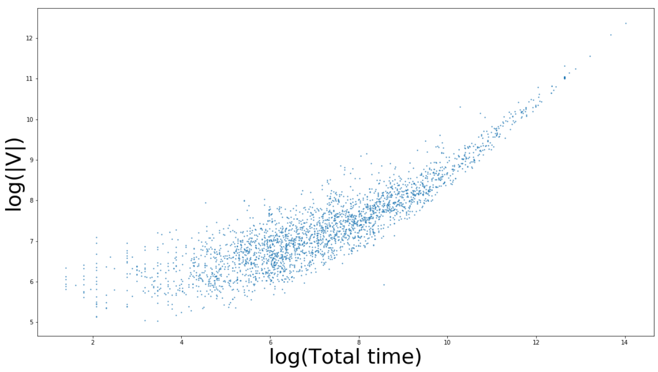

Fig. 2. Mandoline's run-time is roughly linear with respect to total grid voxel counts. For visualization, graph shows the performance distribution of Mandoline for each resolution in linear-log space, and is computed for the solid closed Thingi10K meshes, for various voxel counts and looks logarithmic. (Time is measured in milliseconds.)



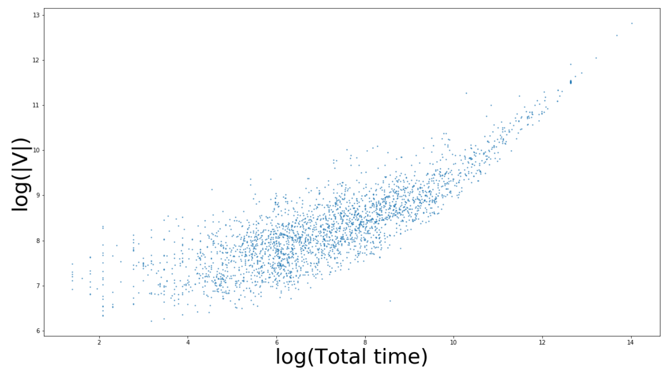

$5^3$



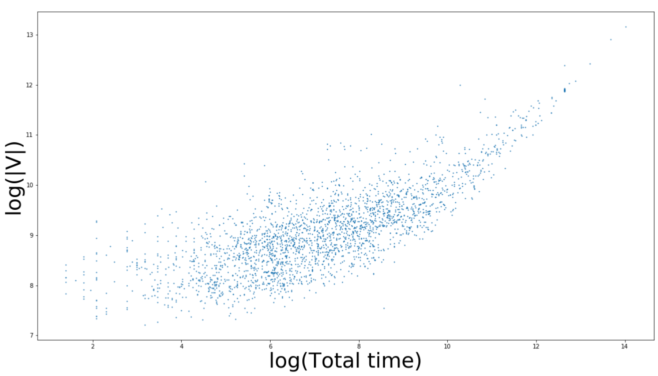

$10^3$



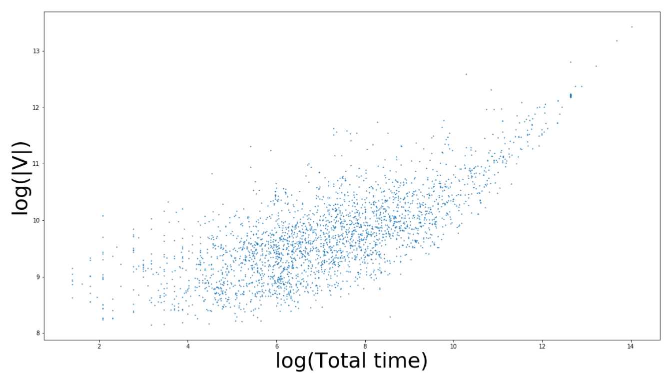

$20^3$




$30^3$




$40^3$




$50^3$

Fig. 3. These log-log graphs show that the performance of Mandoline is roughly linear with respect to number of input vertices among the solid closed Thingi10K meshes, for grid resolutions from $5^3$ to $50^3$. (Time is measured in milliseconds.)

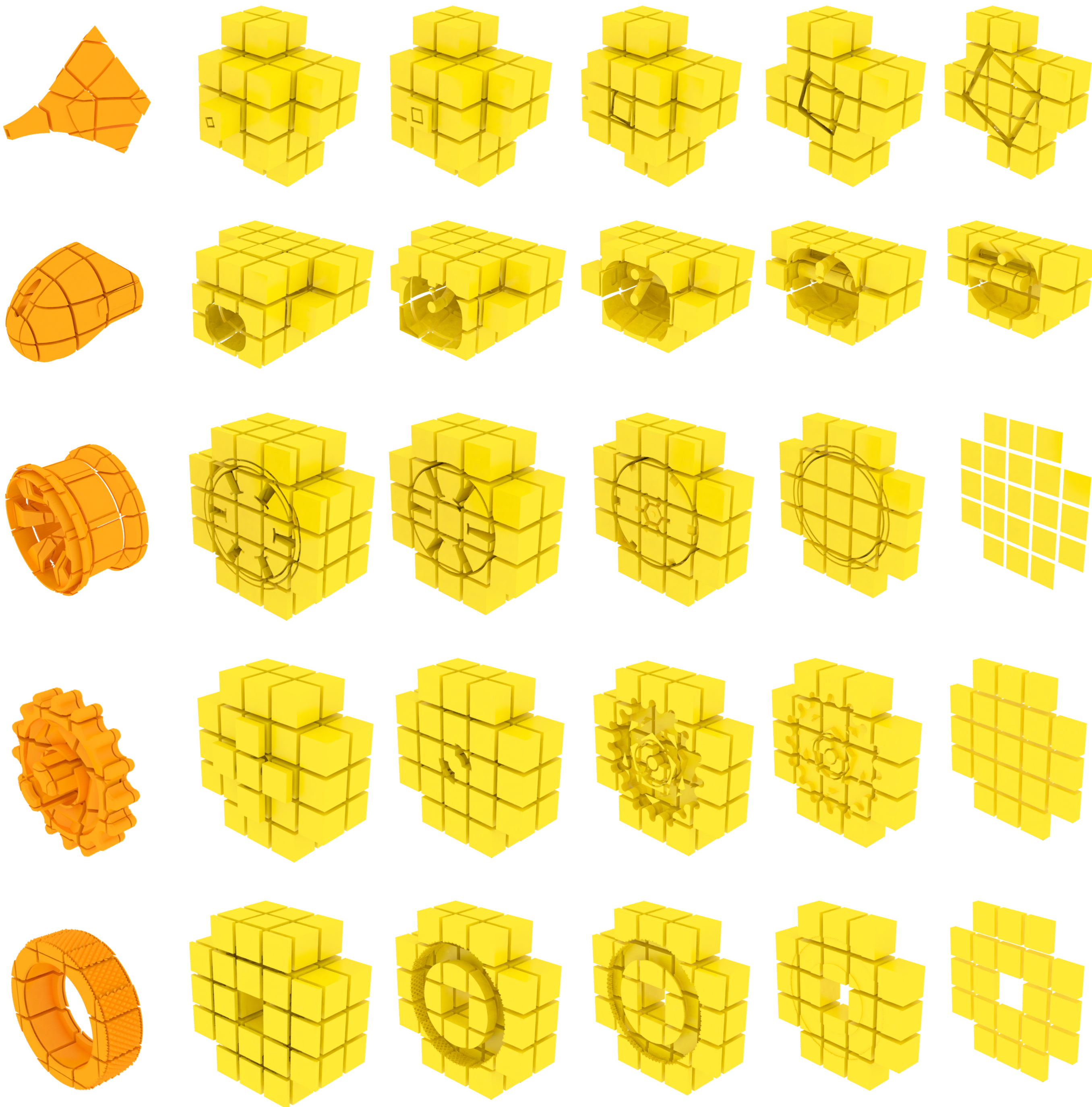


Fig. 4. Several cut-meshes (orange), with the exterior cells (yellow) visualized using cutting planes at various depths.

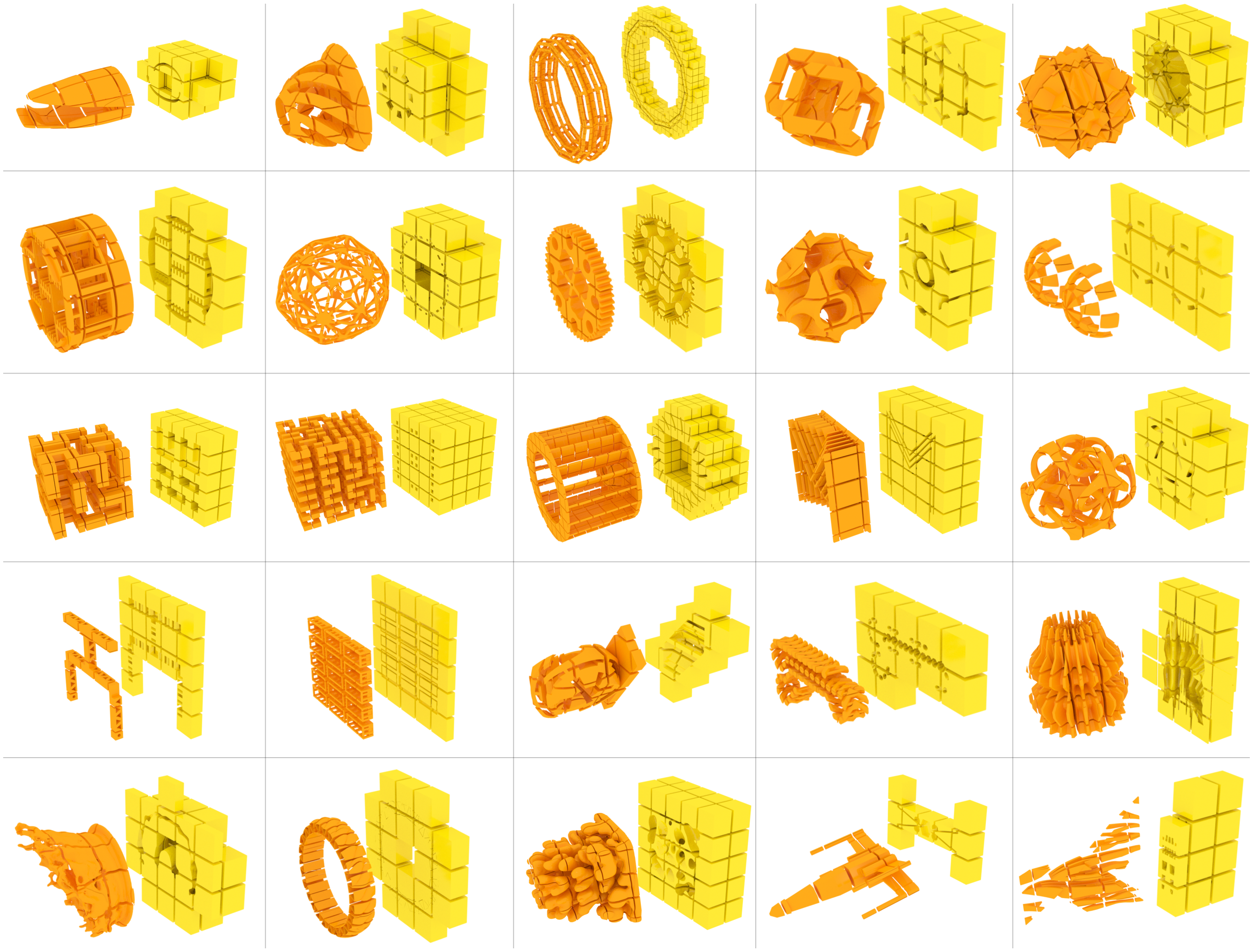


Fig. 5. More results of our method.