Robust Reconstruction of Watertight 3D Models from Non-uniformly Sampled Point Clouds Without Normal Information

AYUSHI SINHA

OUTLINE

- Surface Confidence Estimation (Φ)
- Graph-Based Surface Extraction
- Hierarchical Hole Filling and Detail Preservation
- Mesh Extraction

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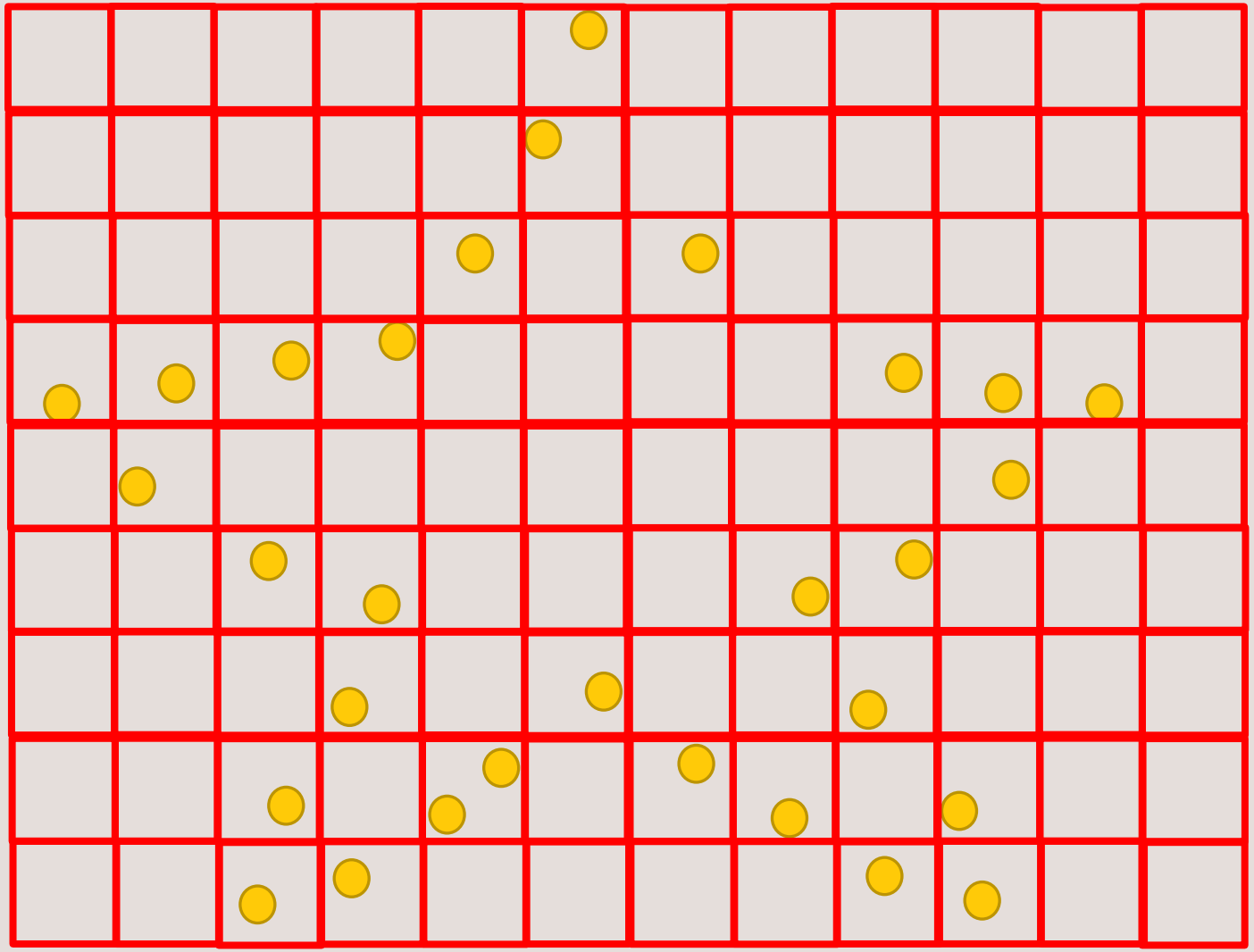

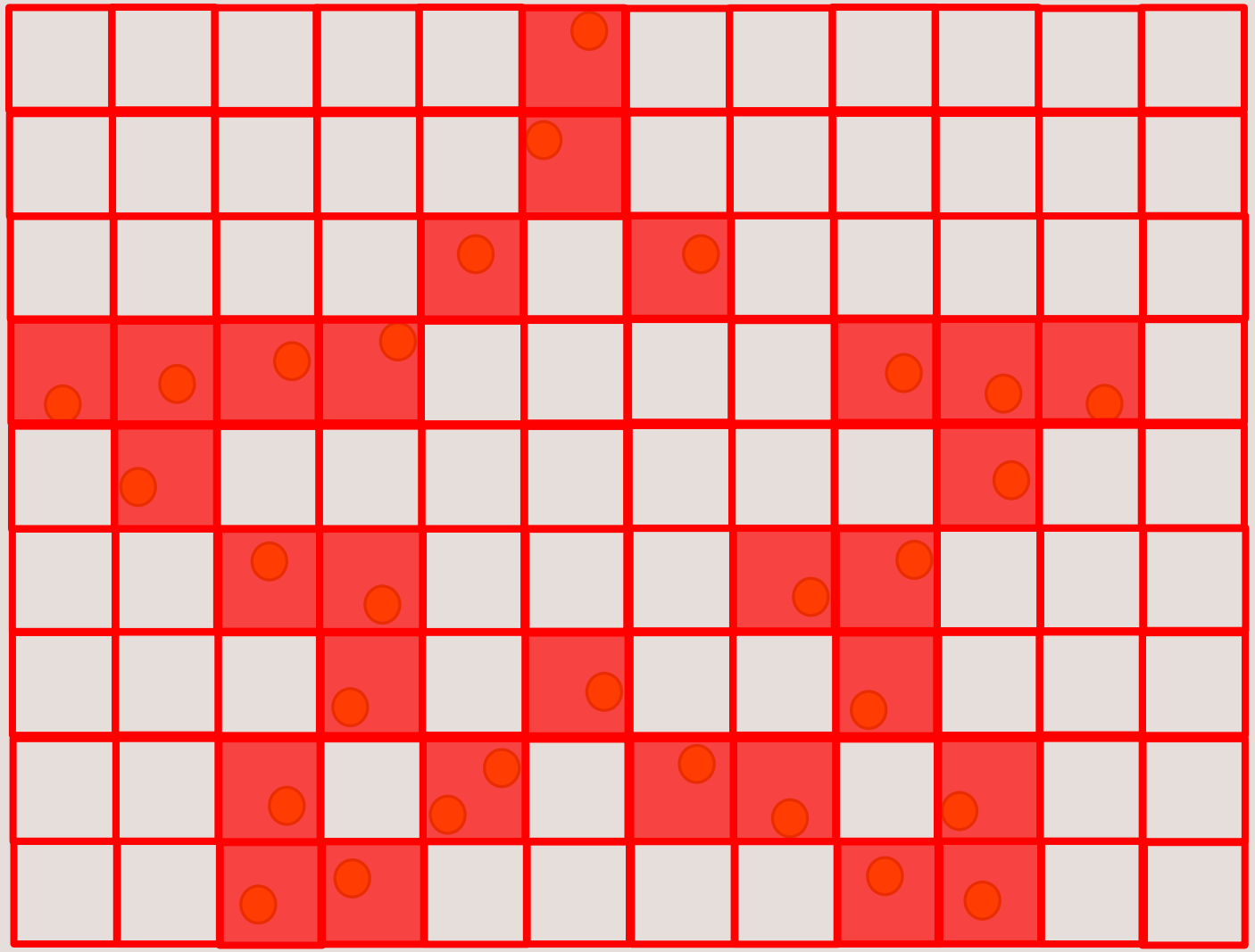

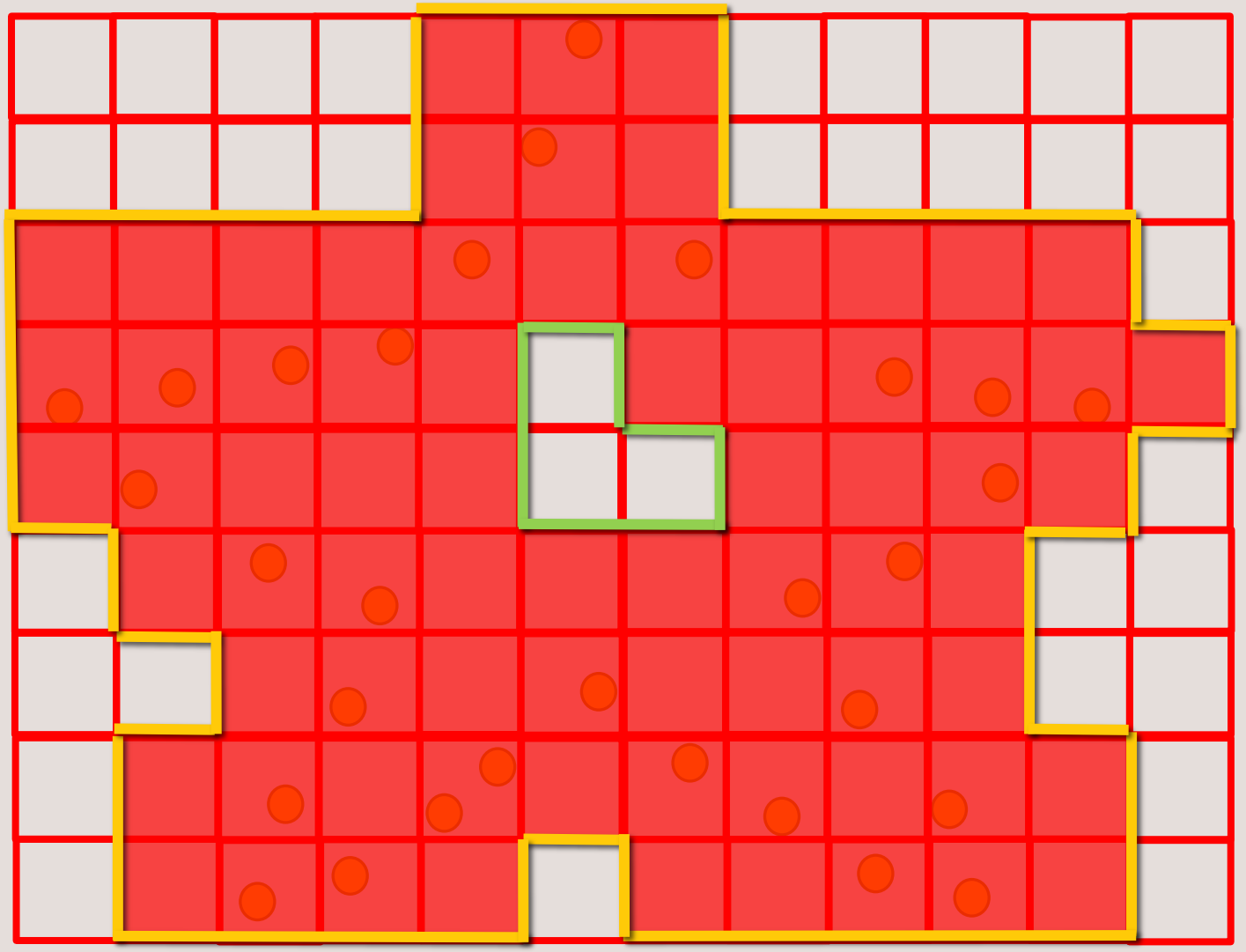

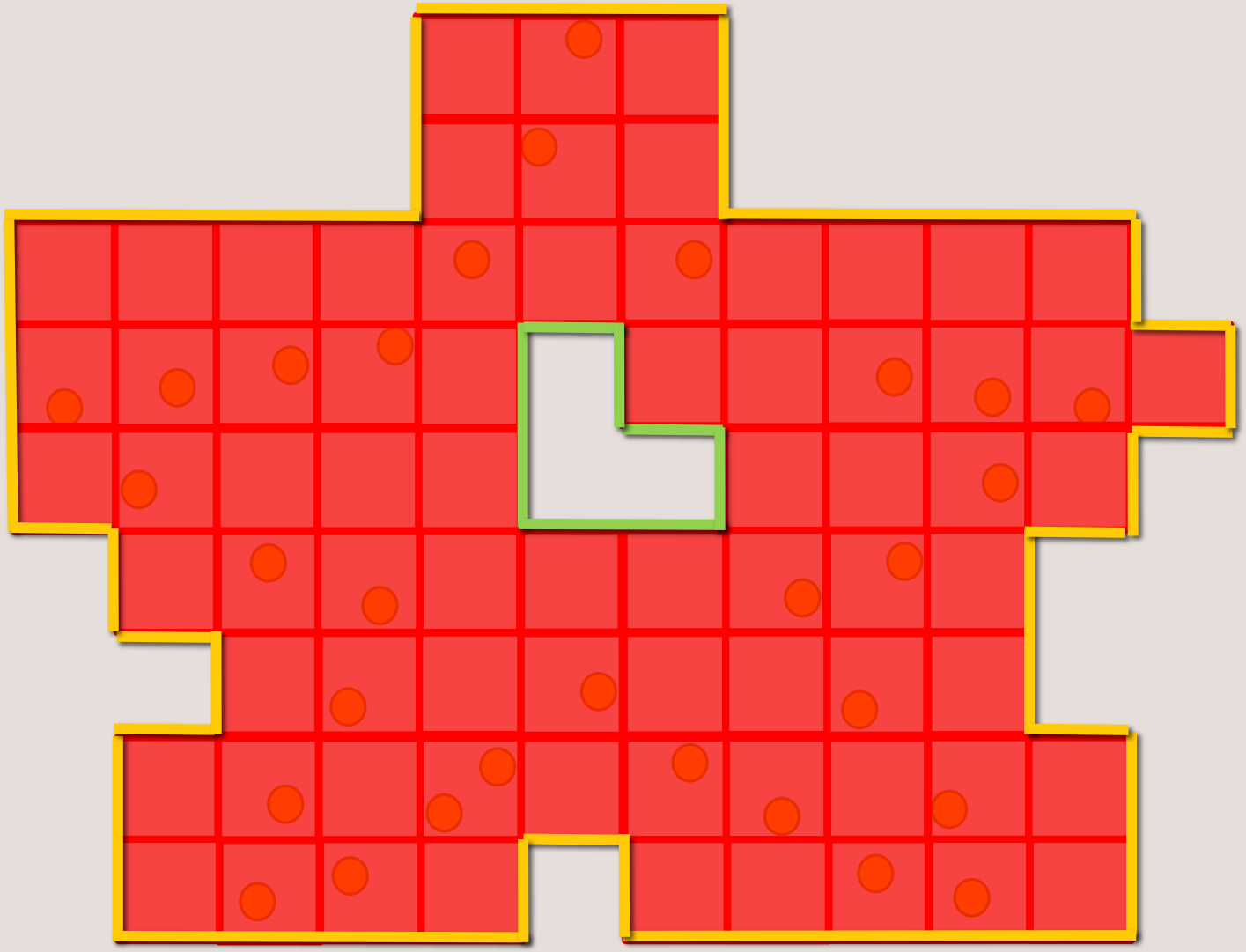

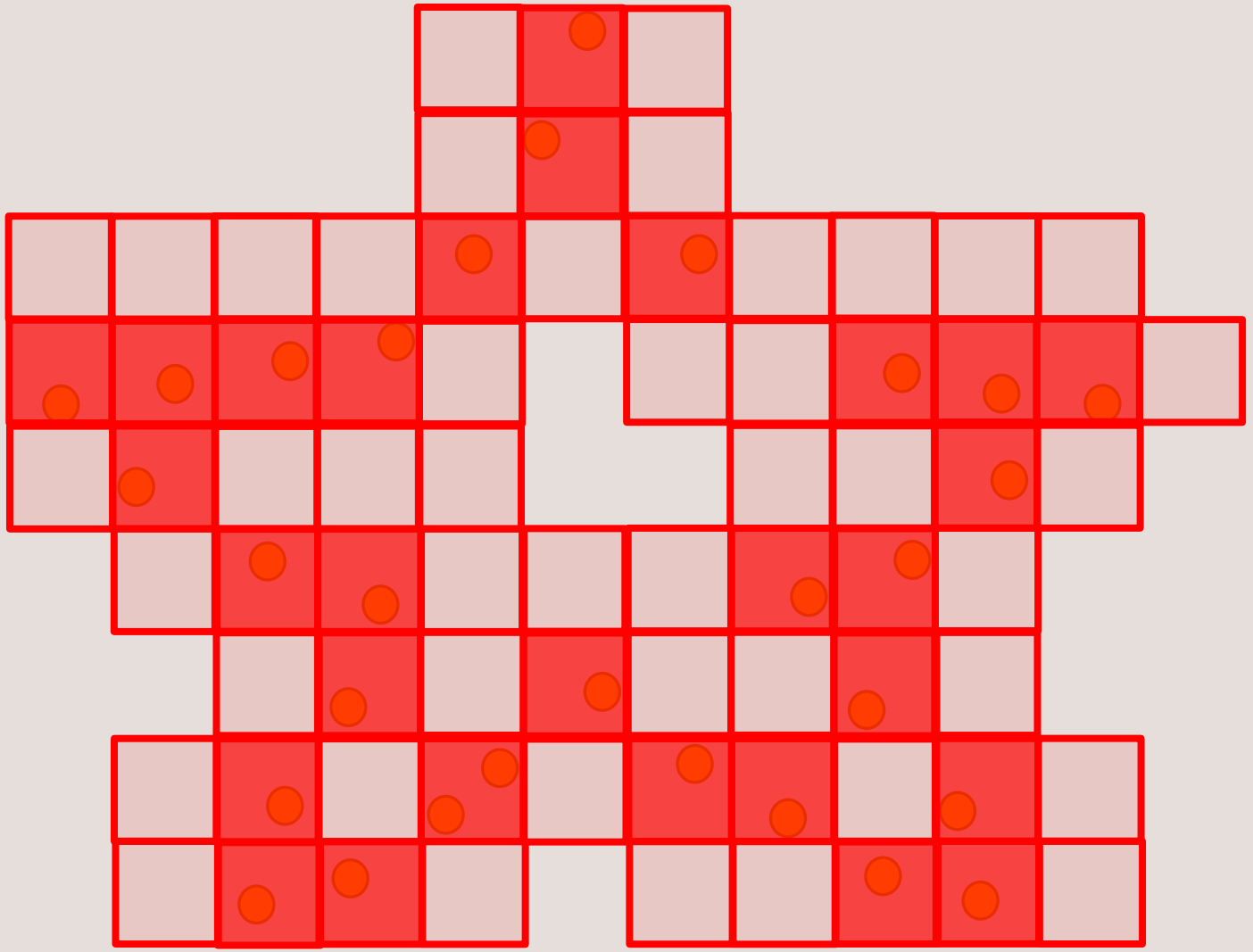

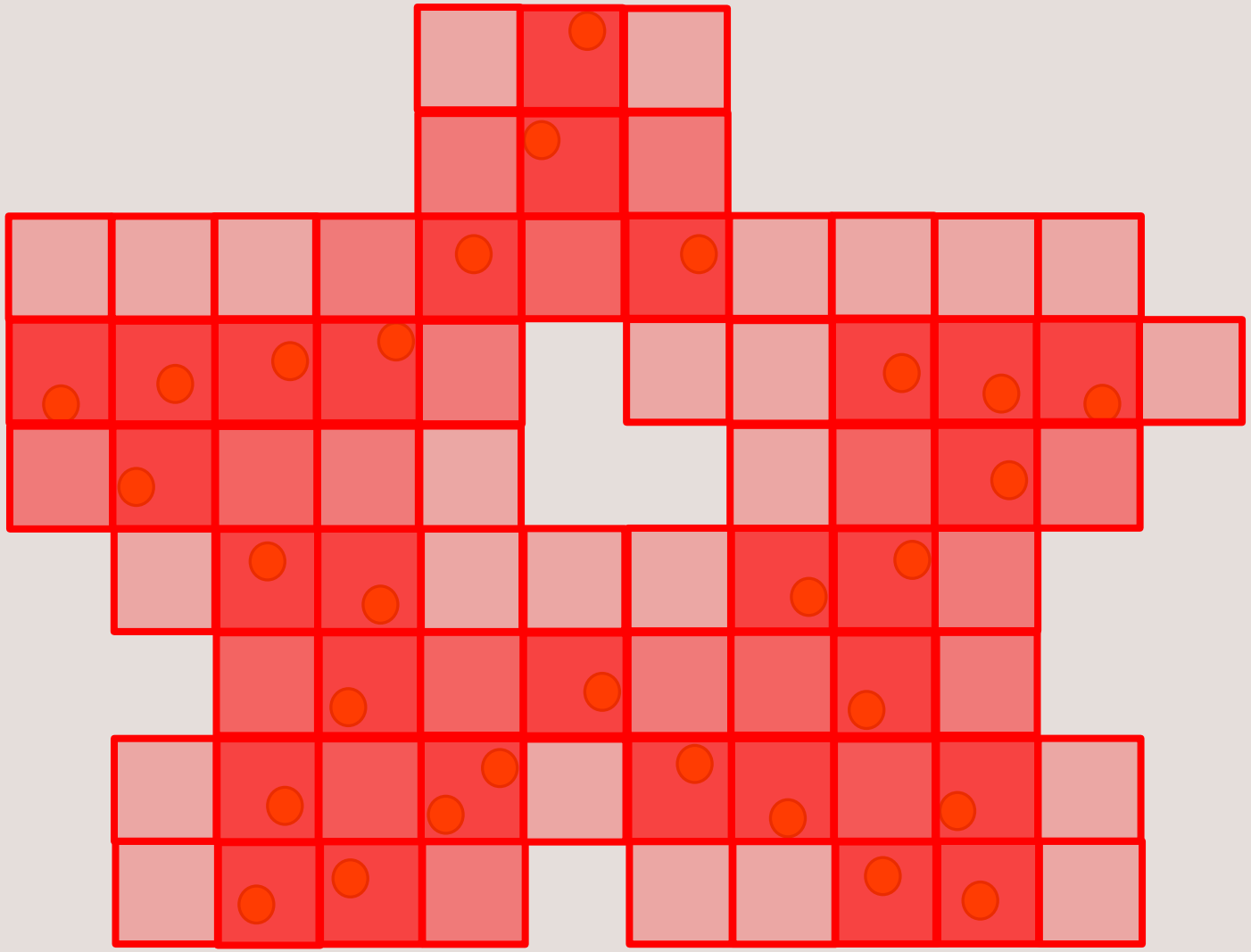

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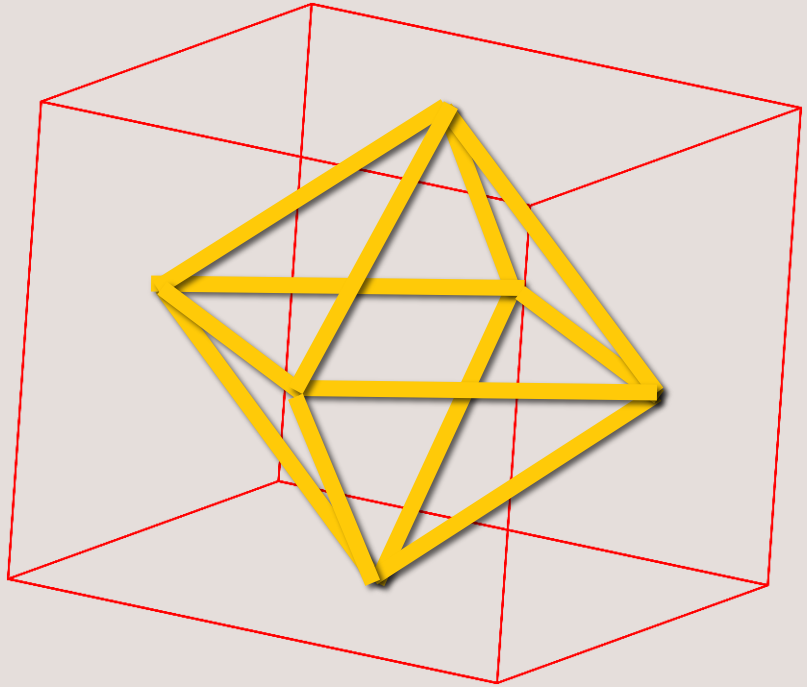
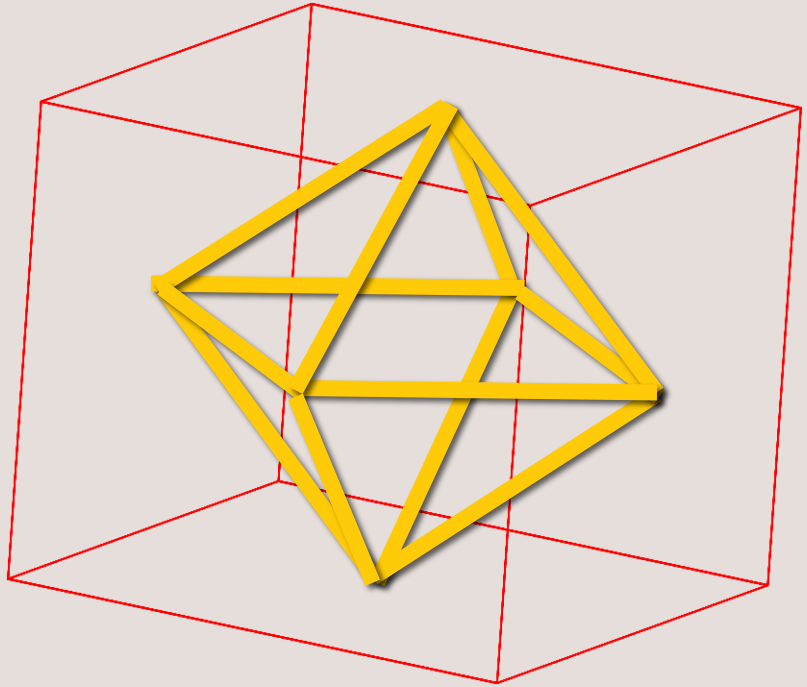
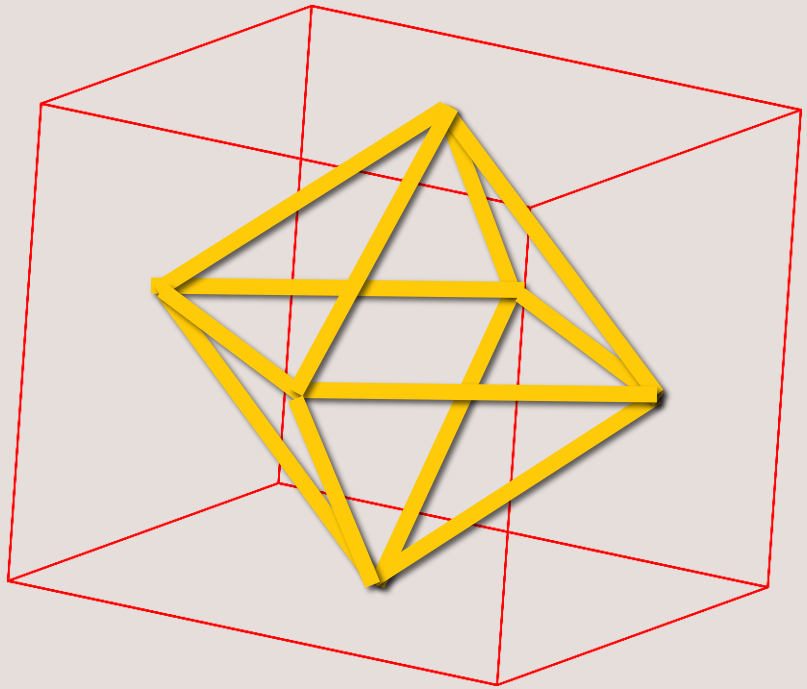


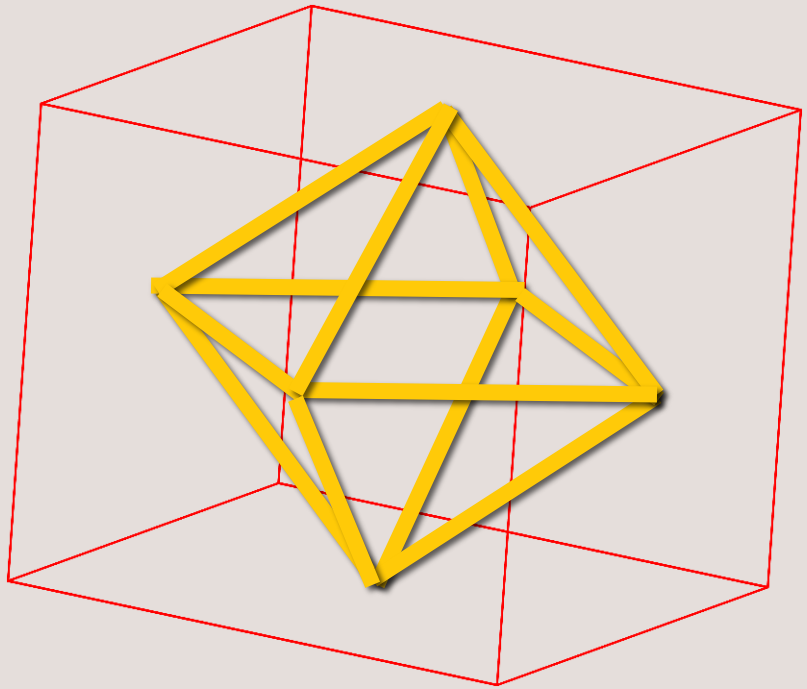


There is a Φ(v) associated with each voxel v



There is a $\Phi(v)$ associated with each voxel v

Each graph edge within a voxel v is assigned weight $w(v) = \Phi(v)^s + a$



Edges within voxels with smaller Φ value get a smaller weight

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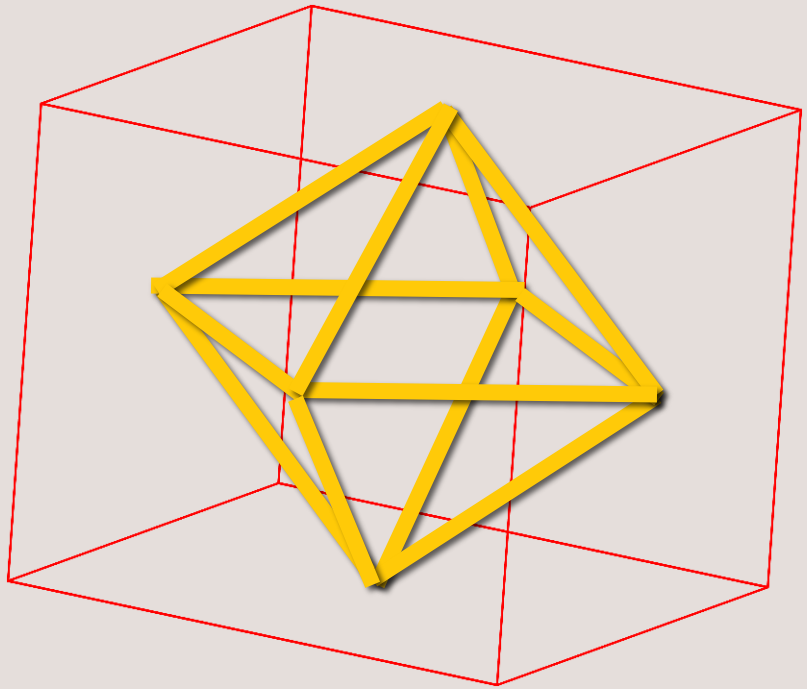

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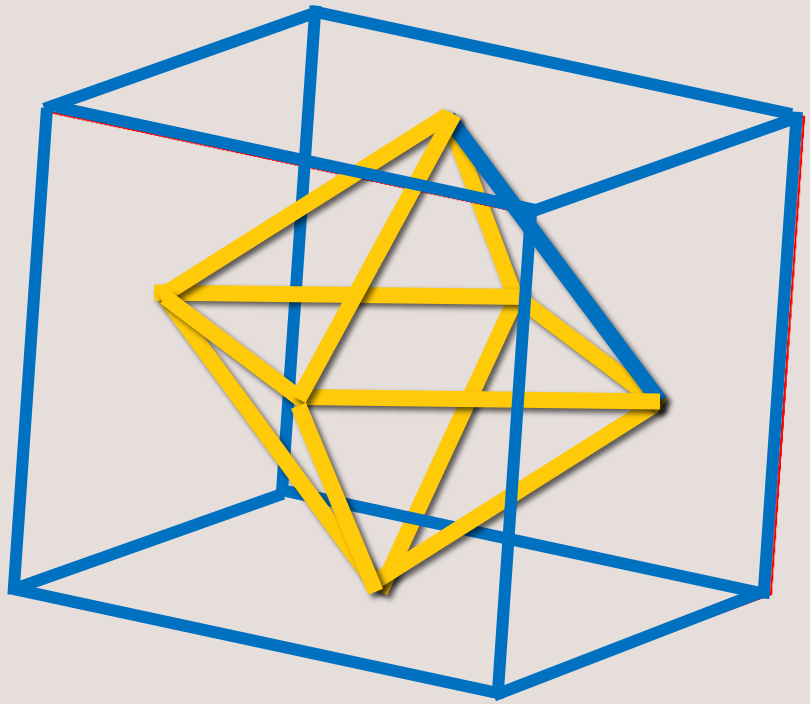
Regularizing parameter which enforces smallest surface area

The minimum cut of this graph over all the voxels in V_{crust} gives us a set of cut-edges and S_{opt}, set of voxels containing at least one cut-edge.



Cut-edge

Voxel belongs to S_{opt}

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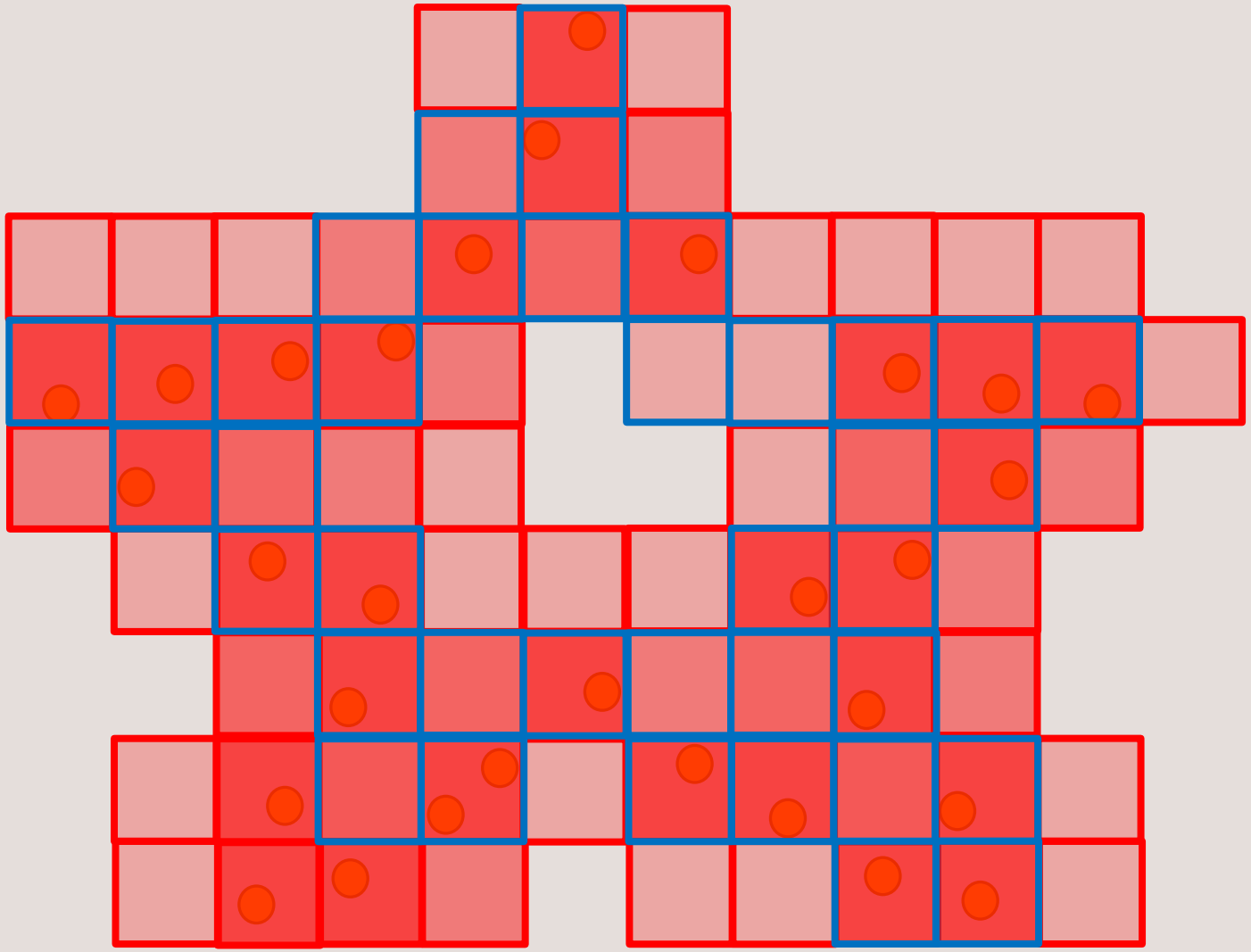
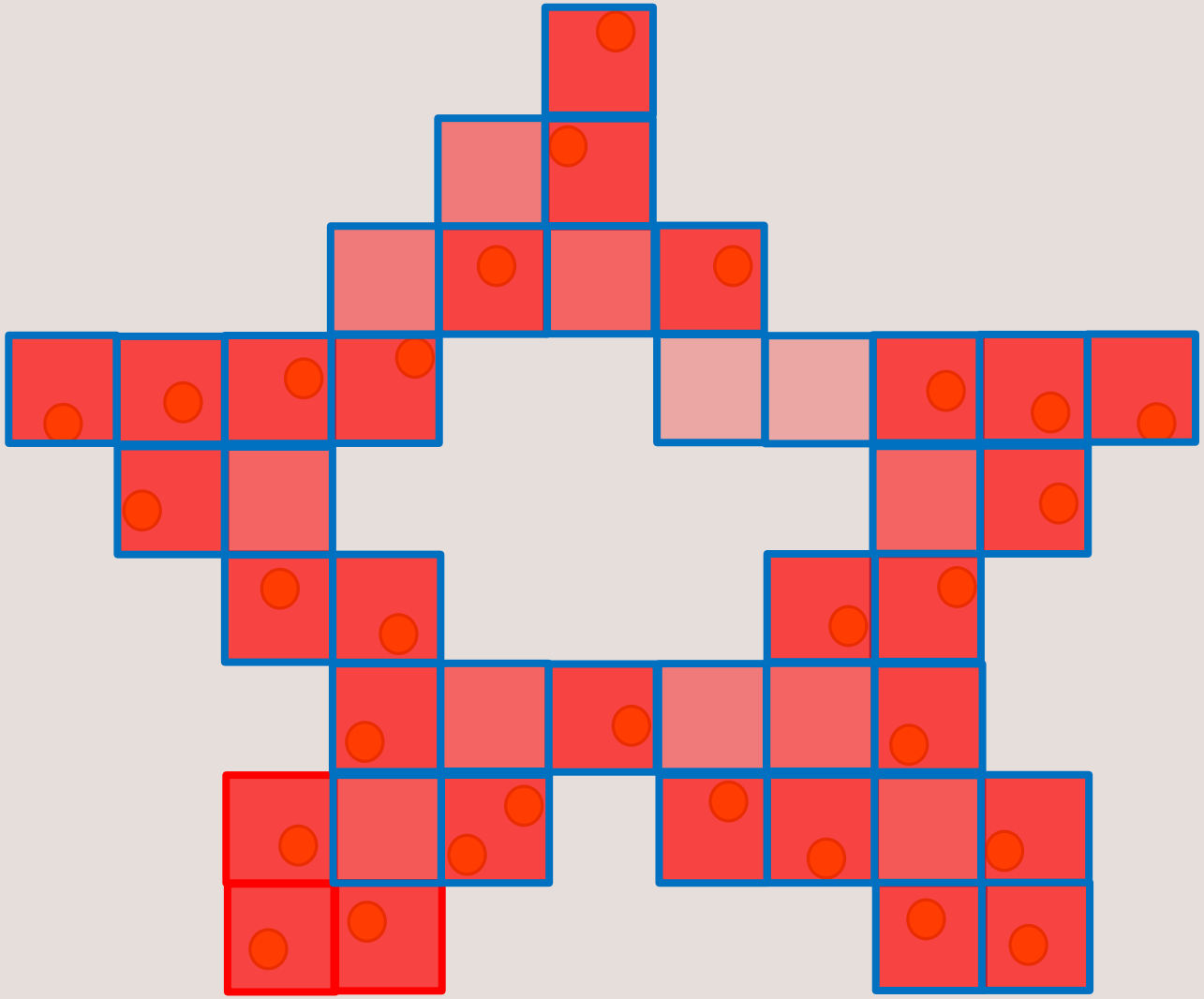
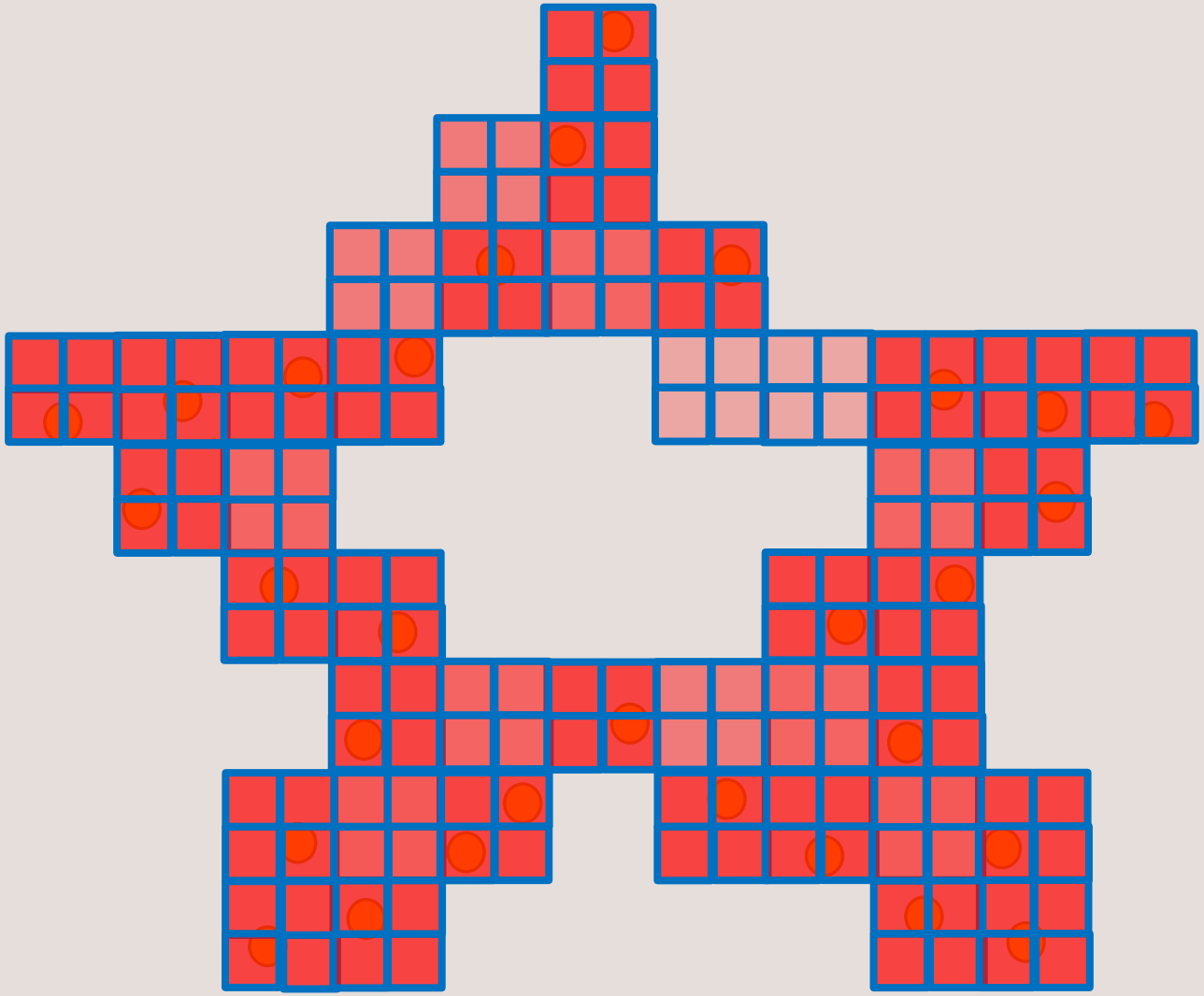
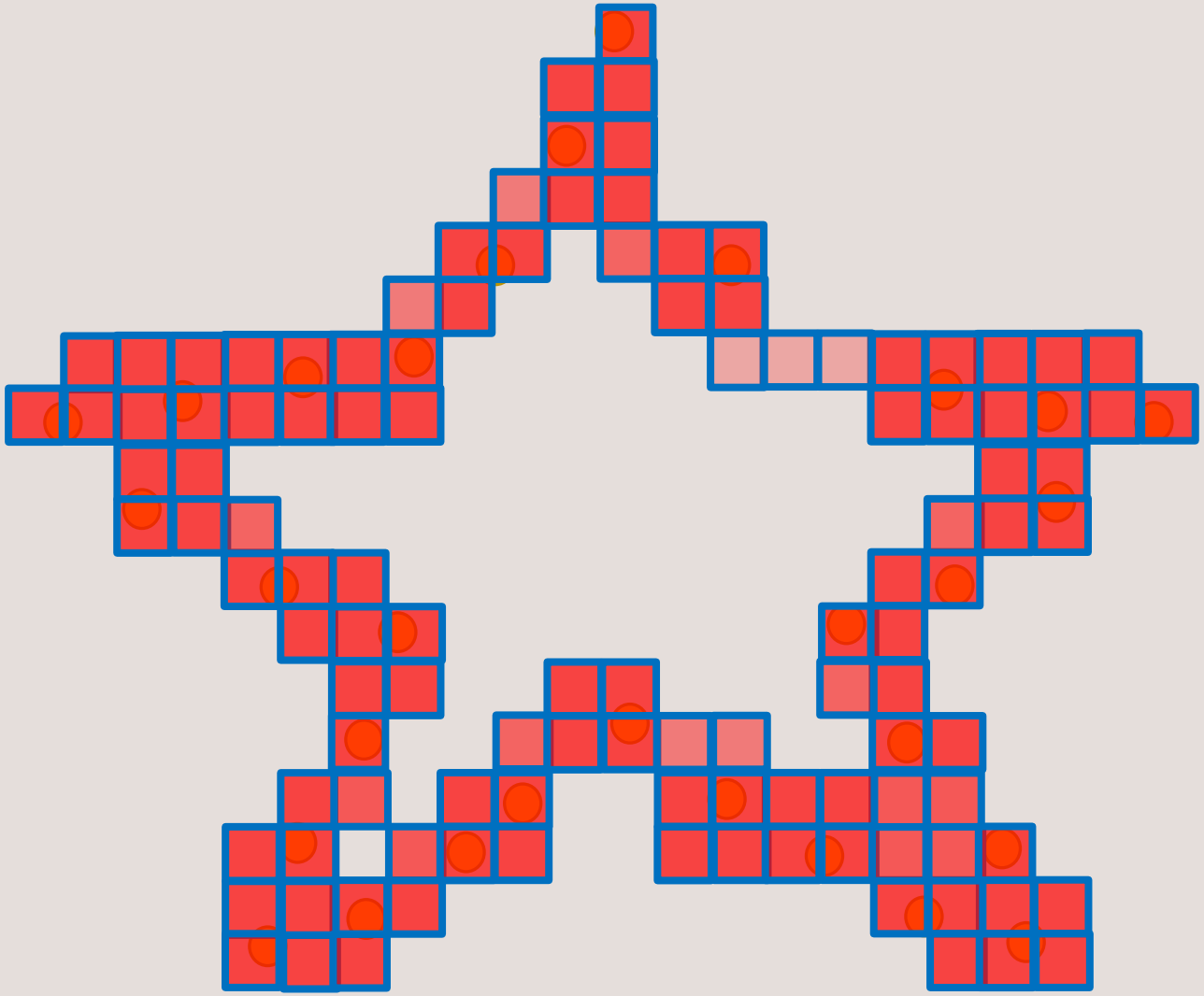




S_{opt}





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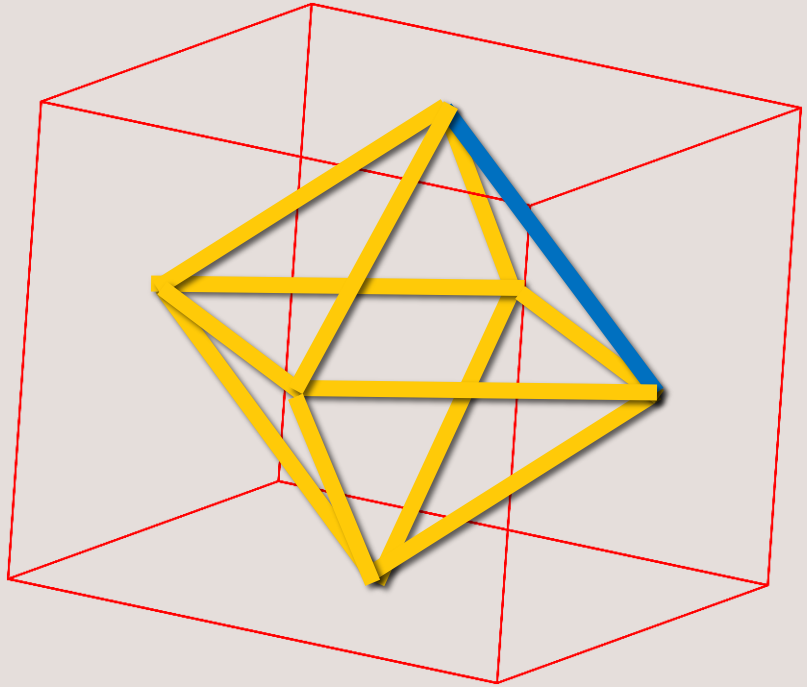
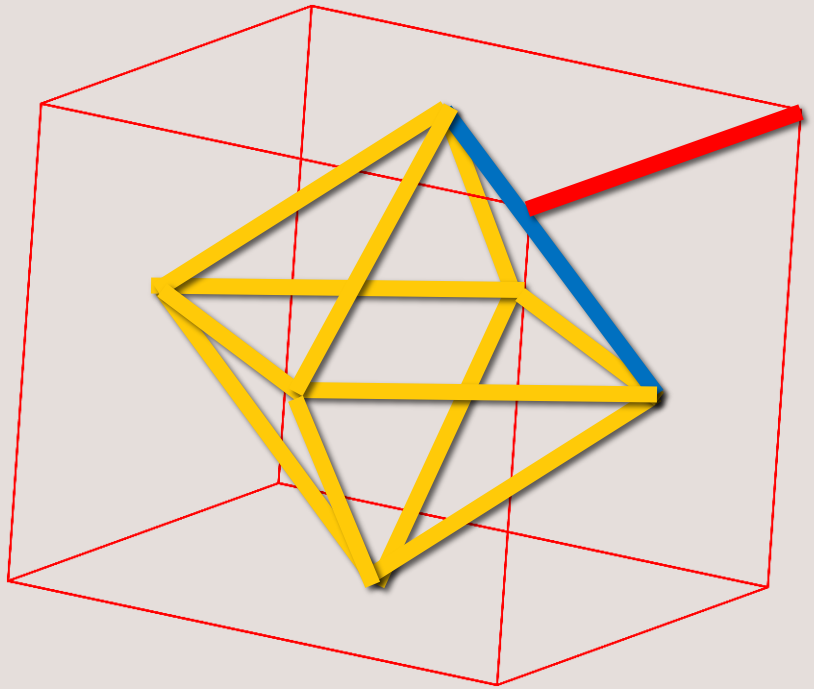
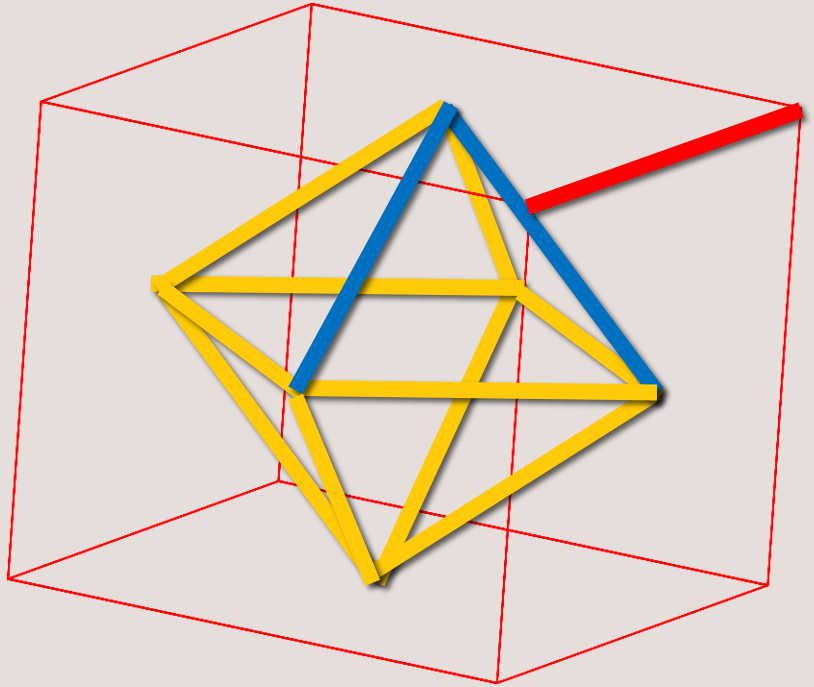


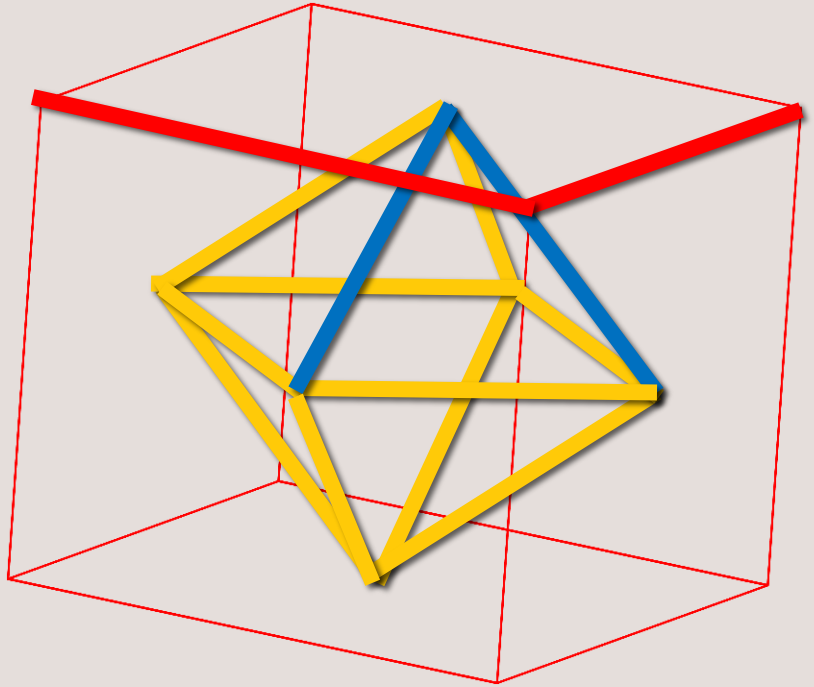
Cut edge

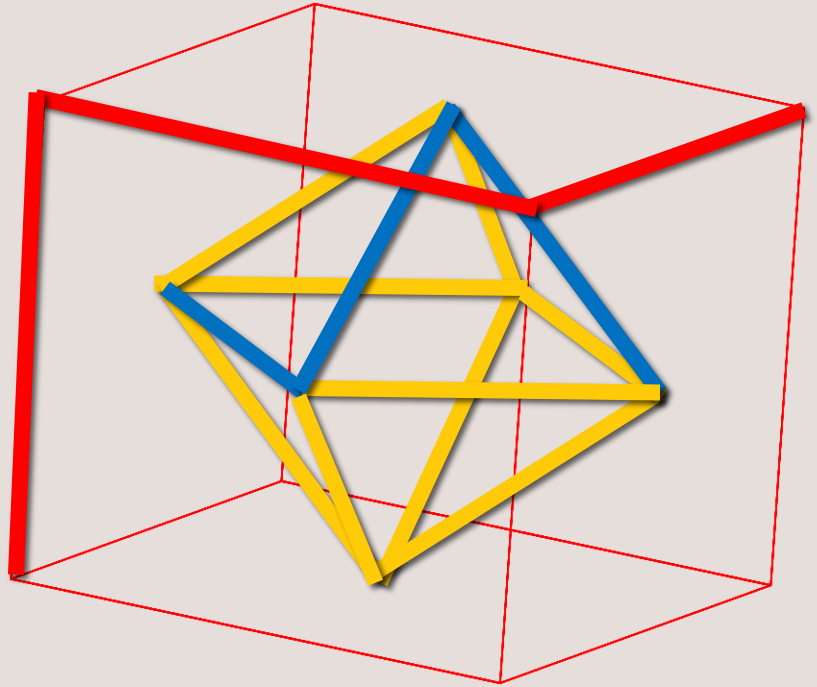


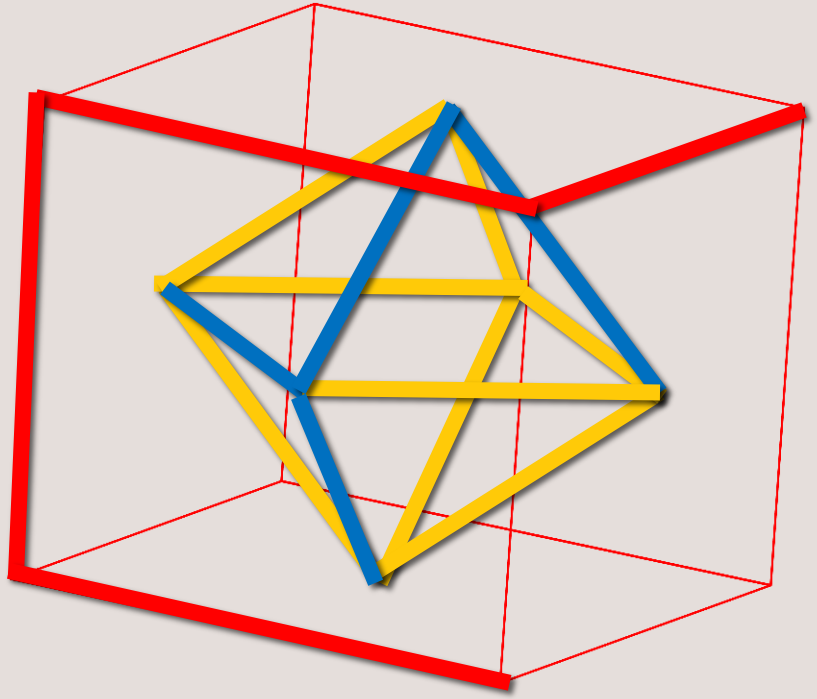
Split-edge dual
to the cut-edge

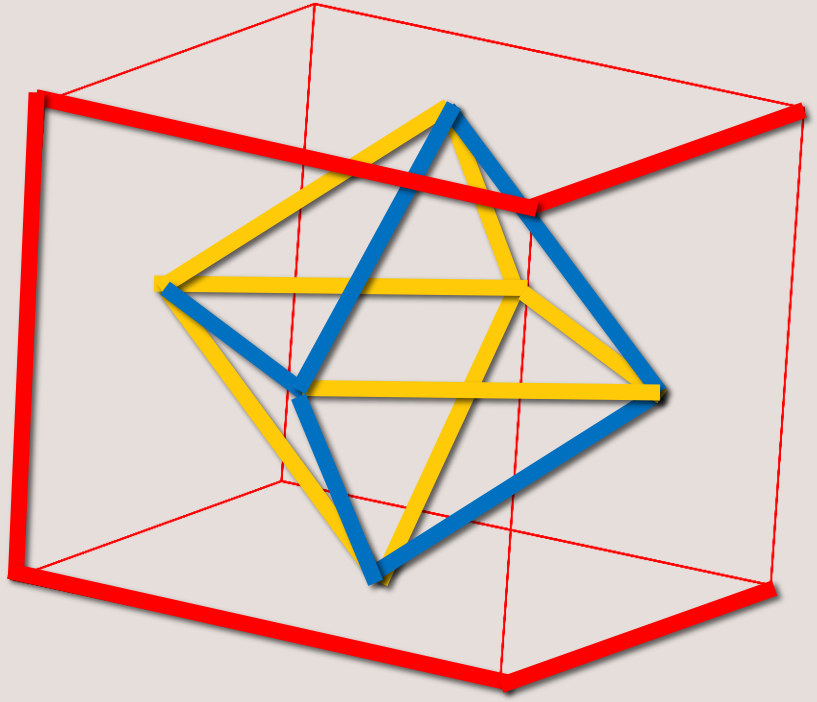
Cut-edge

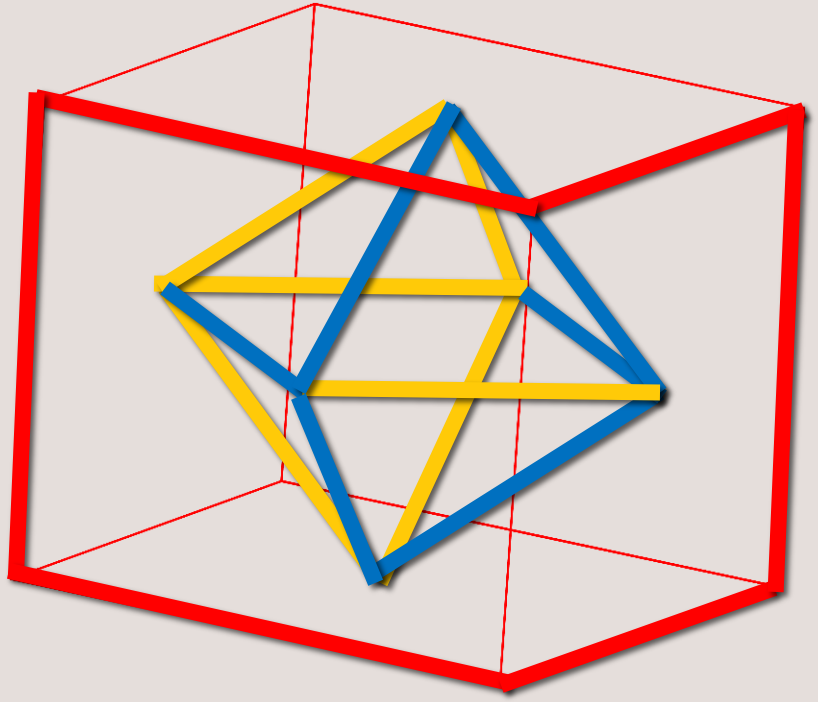


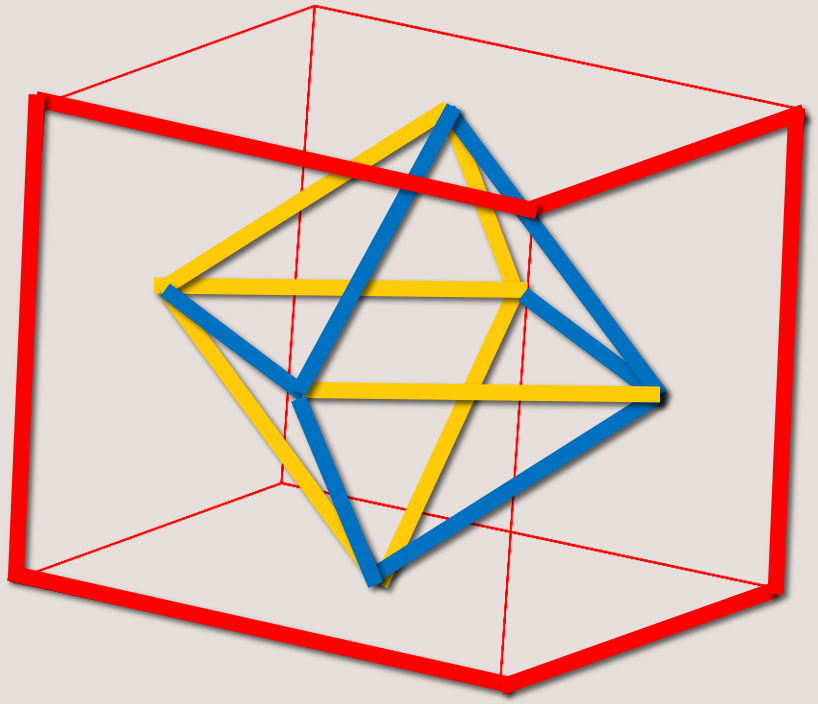




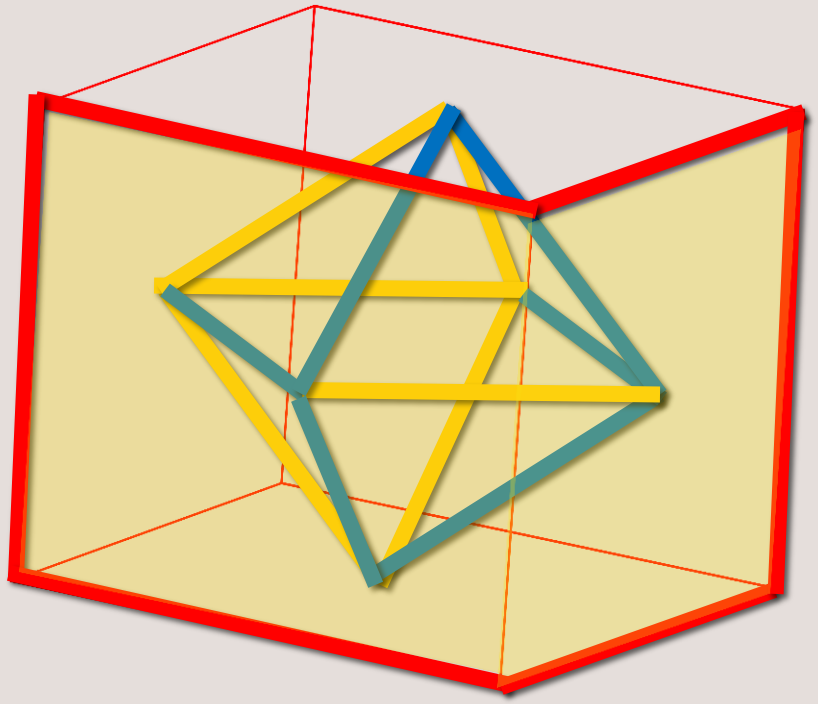






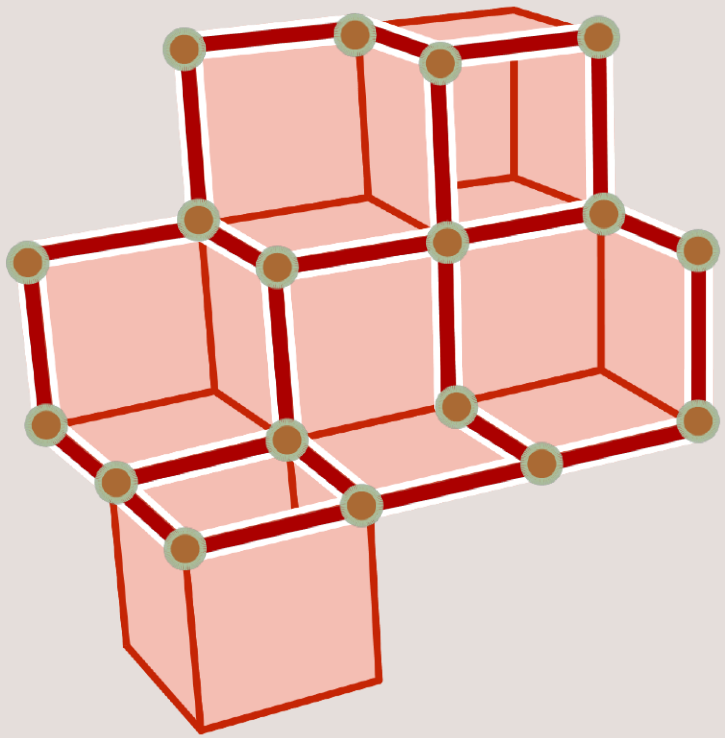


Loop of split-edges



Non-planar polygonal face

Loop of split-edges



Once the polygonal mesh $\mathcal{M}$ is found, it can be triangulated so obtain a triangle mesh.