Simplification:
Regular Grids, Octrees and Quadric Error Metrics

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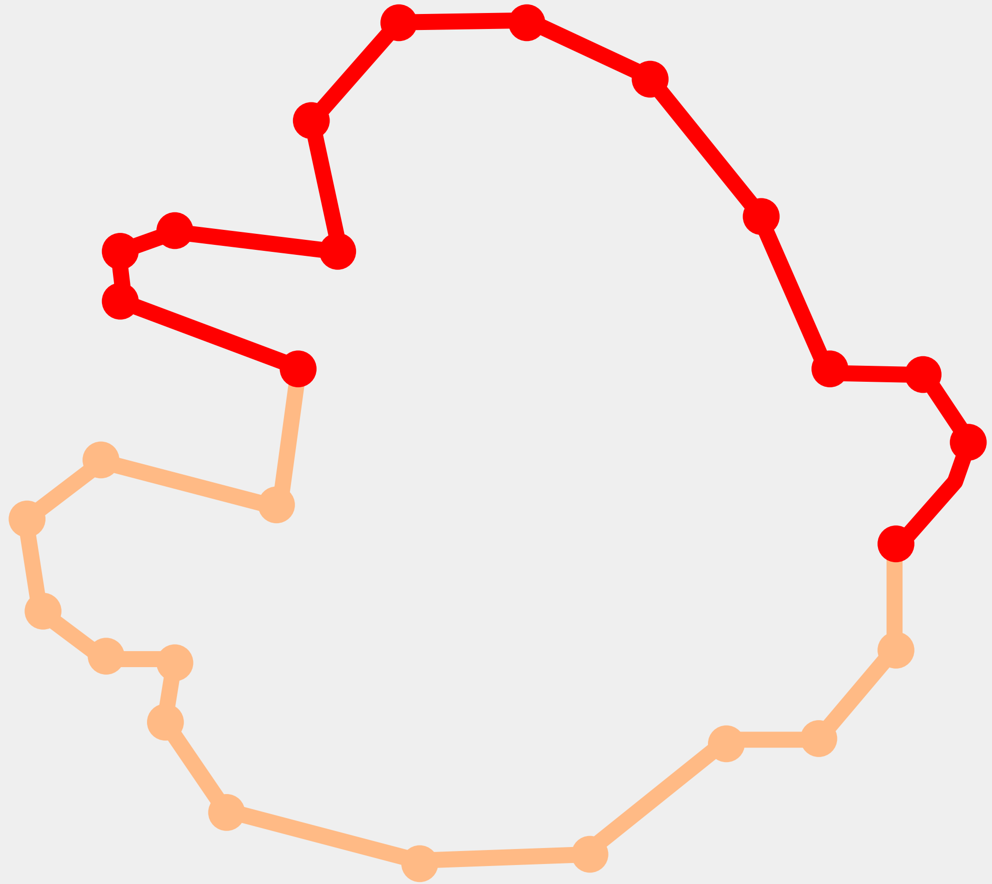
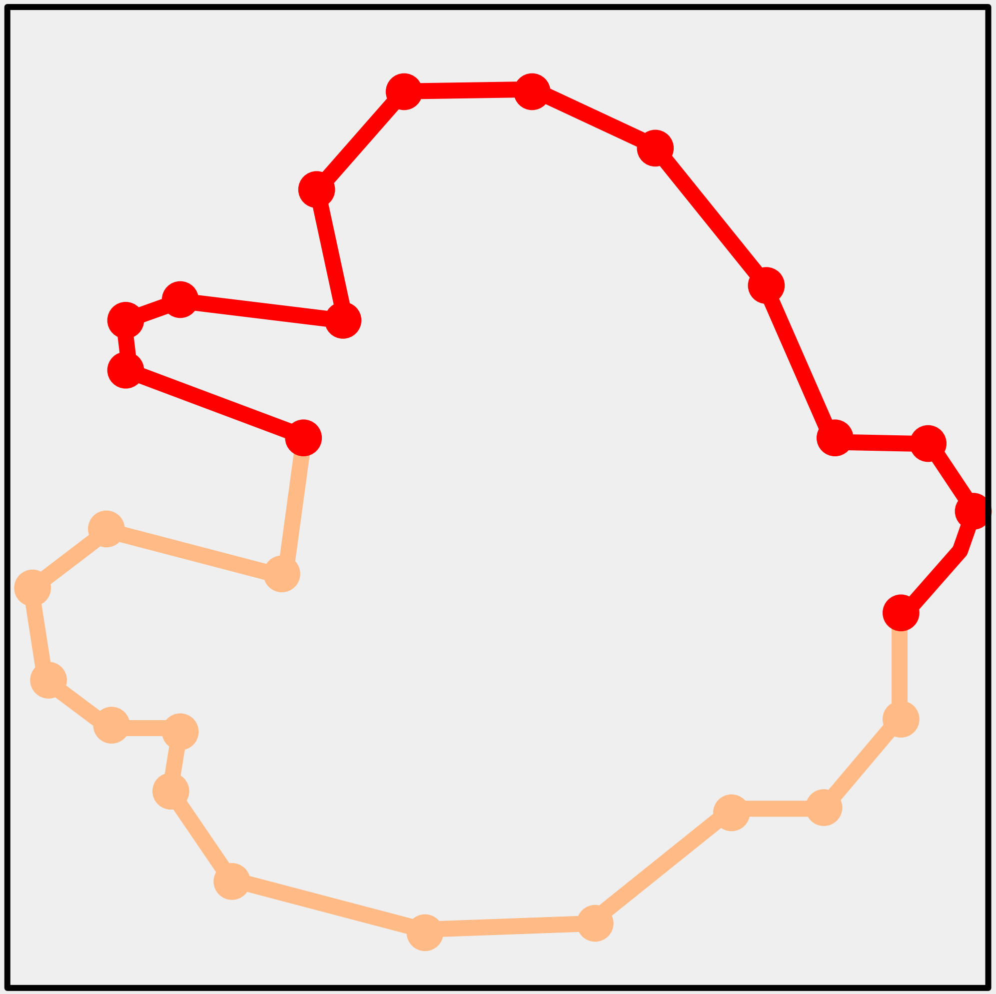
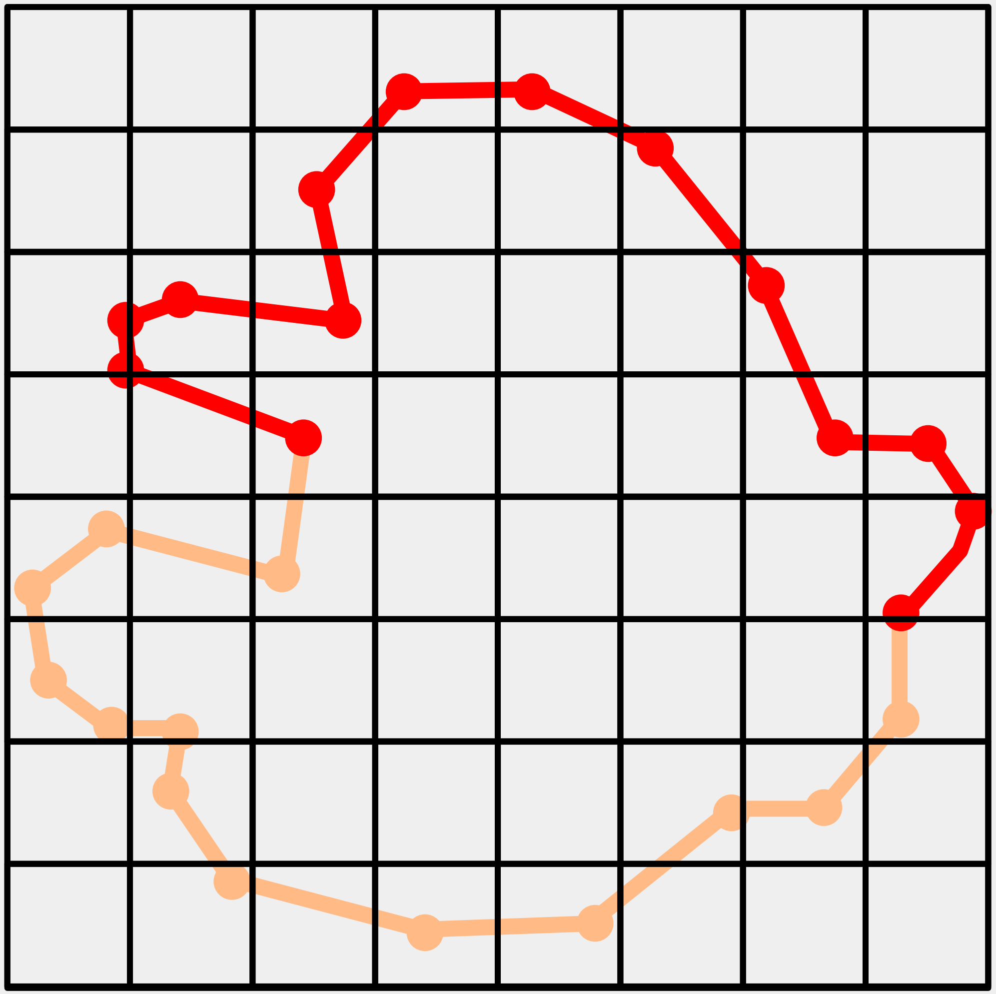
Regular Grids



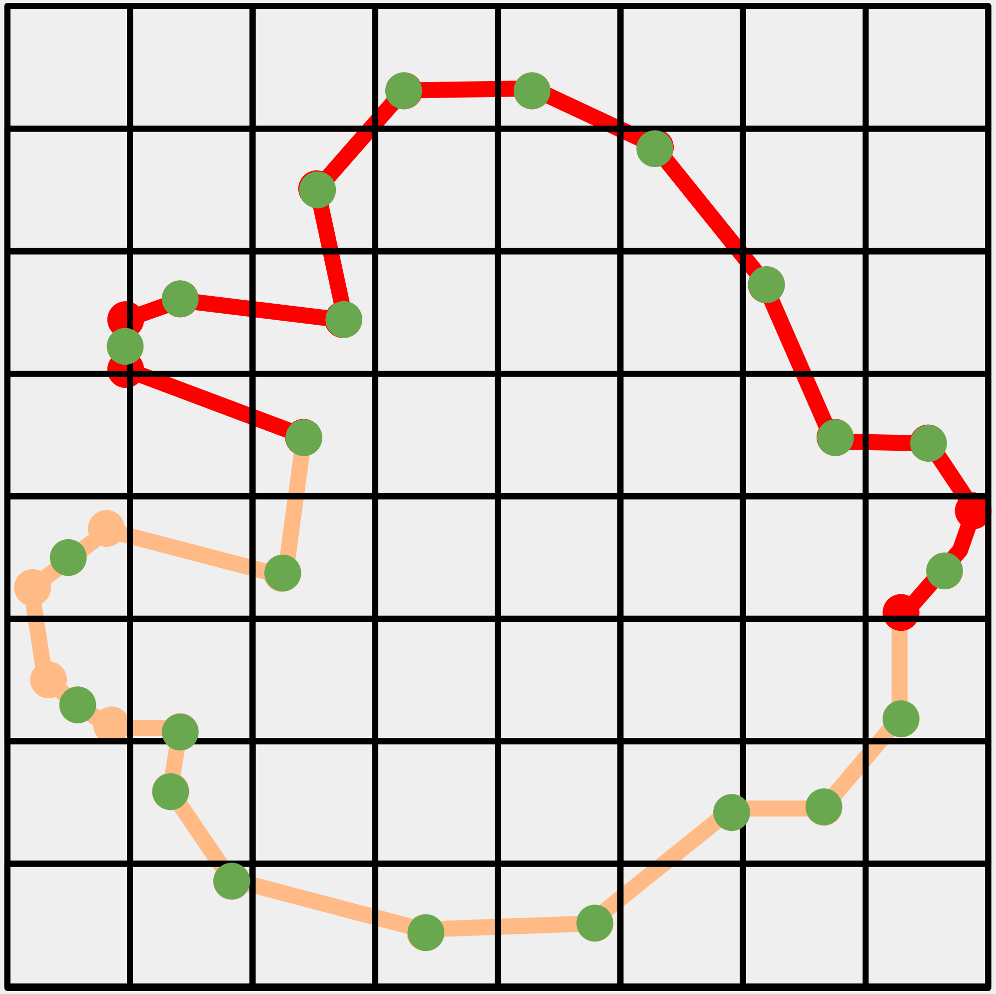
Regular Grids - Bounding Box



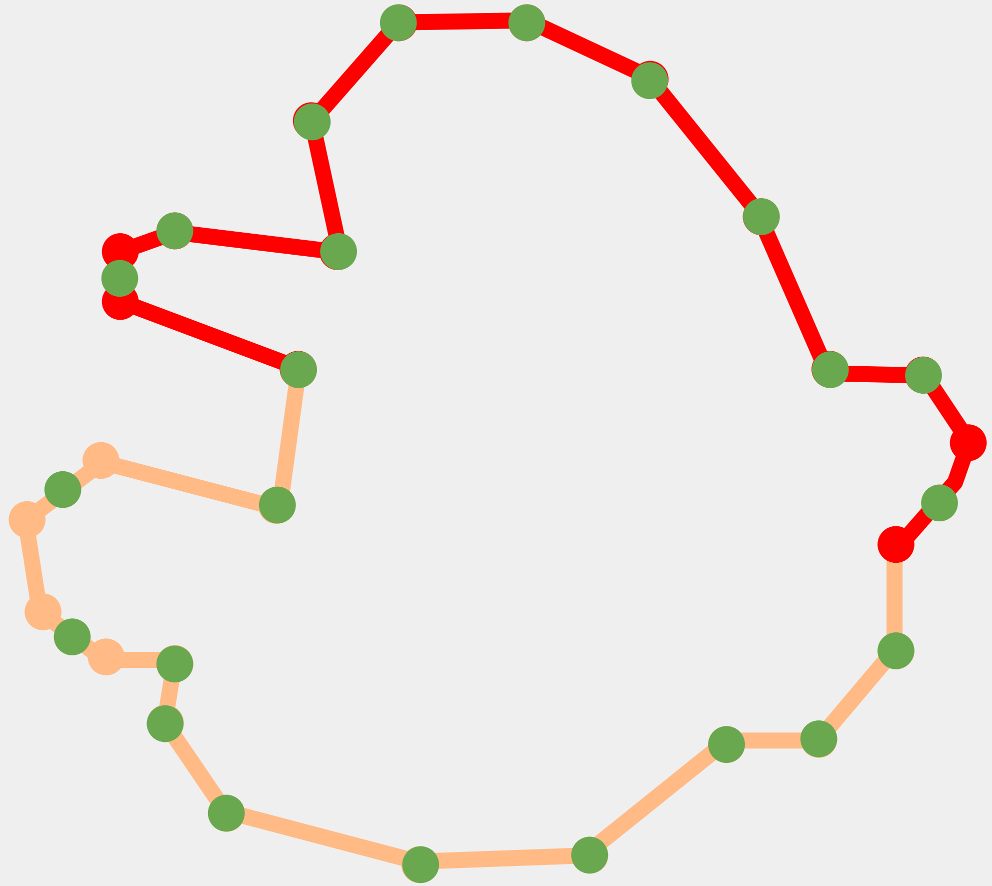
Regular Grids - Division



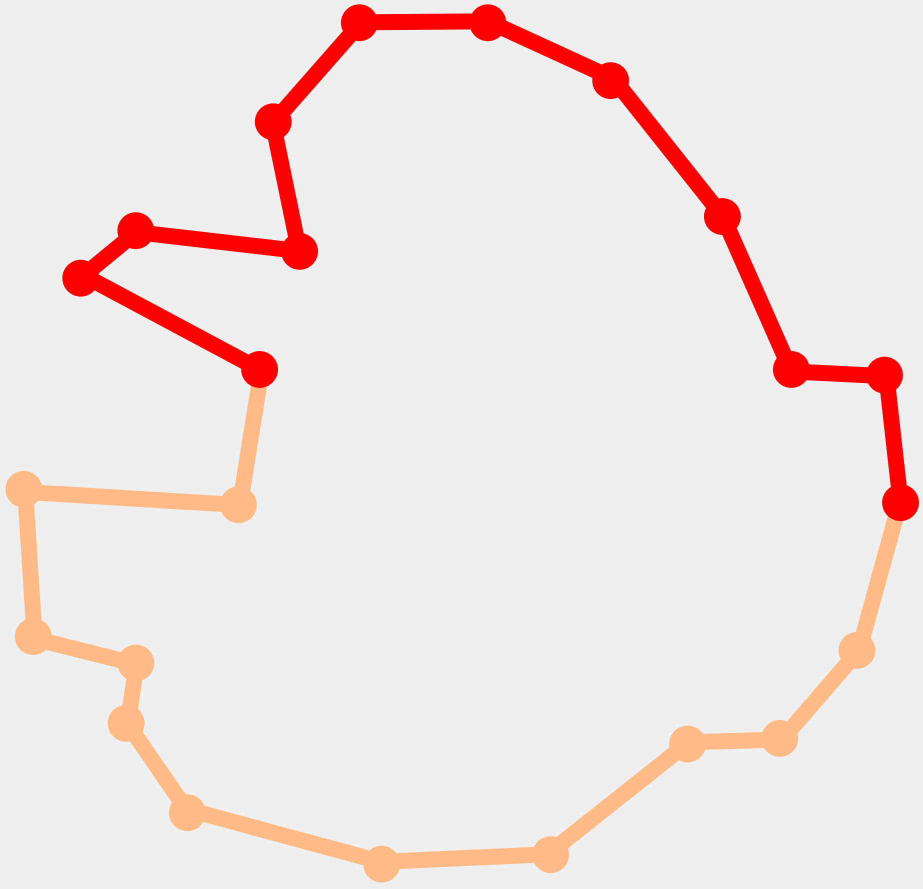
Regular Grids - New Vertices



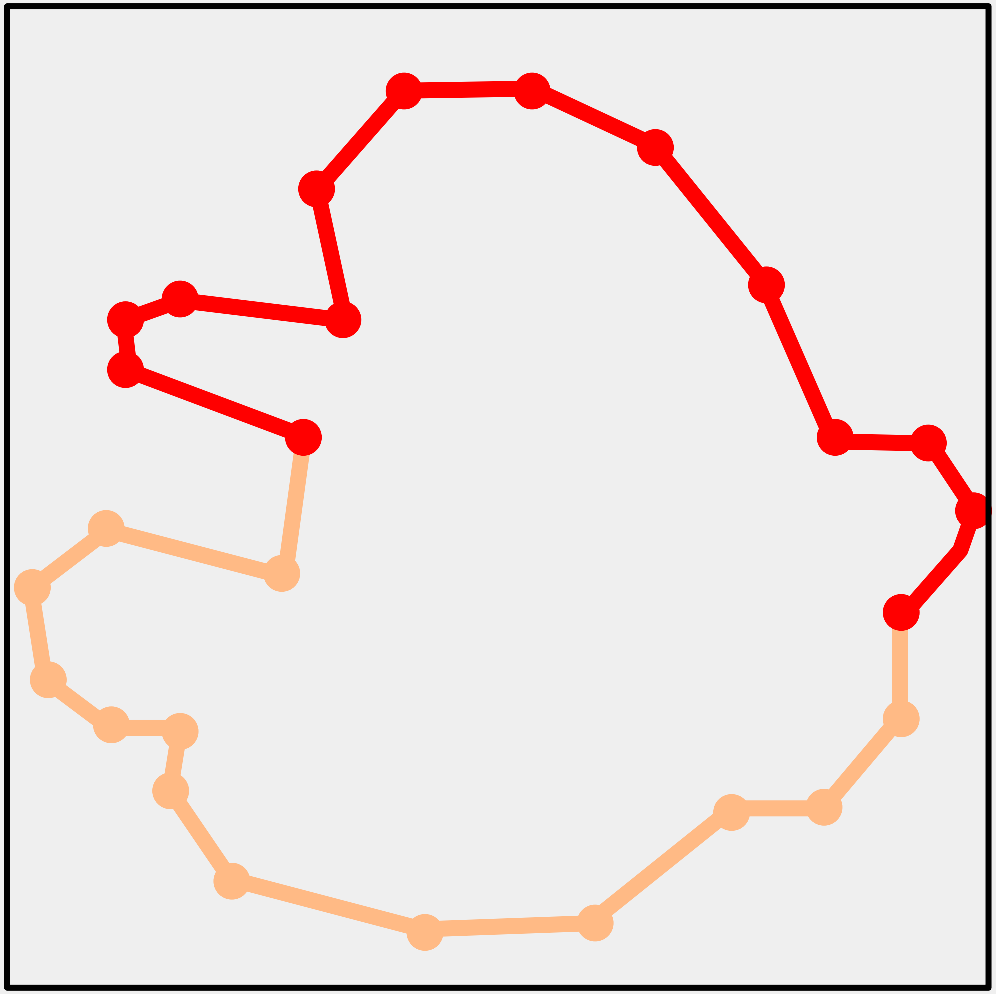
Regular Grids - New Vertices



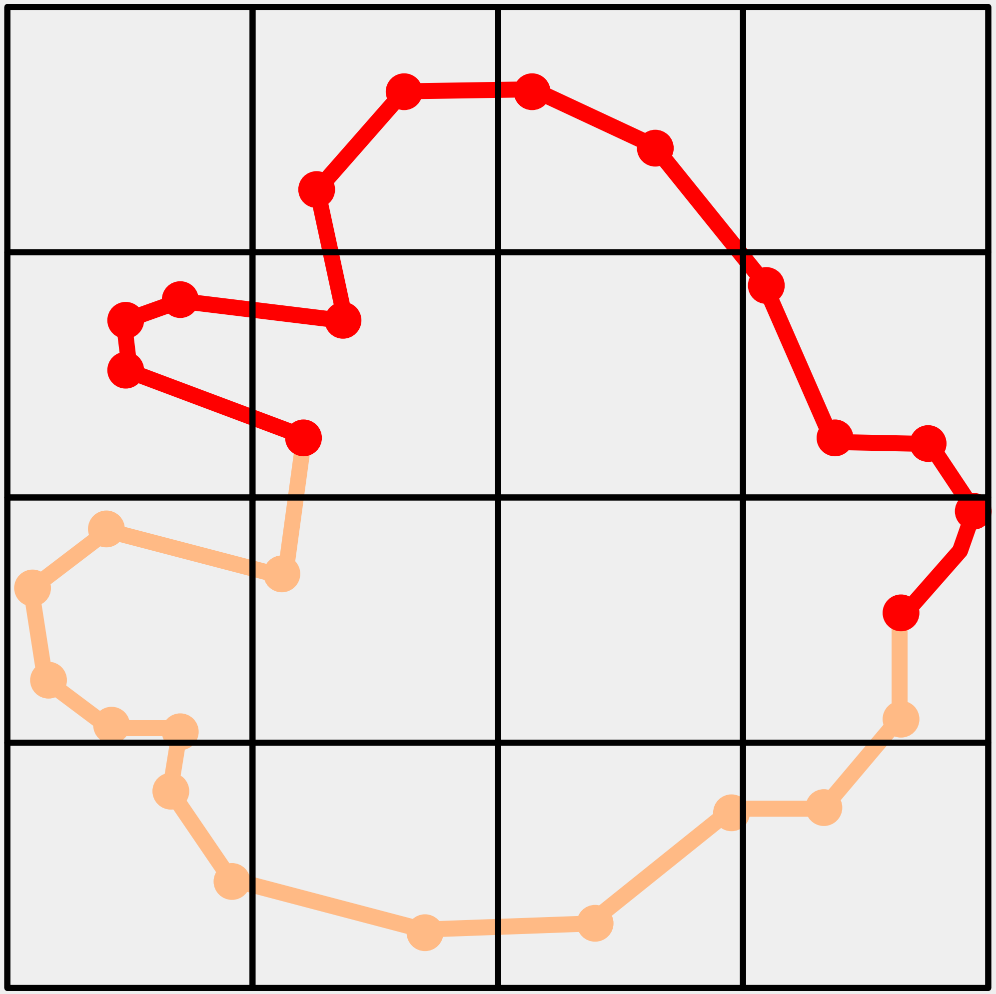
Regular Grids - Simplified



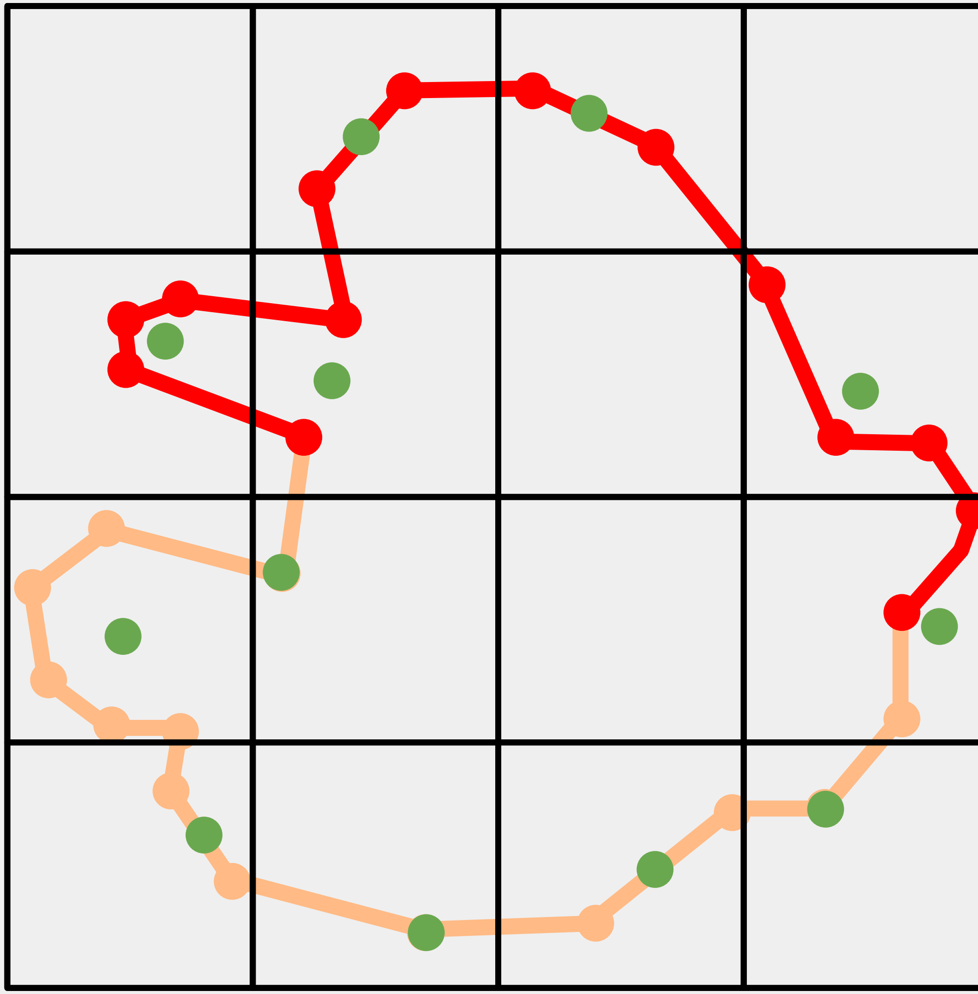
Regular Grids - Bounding Box



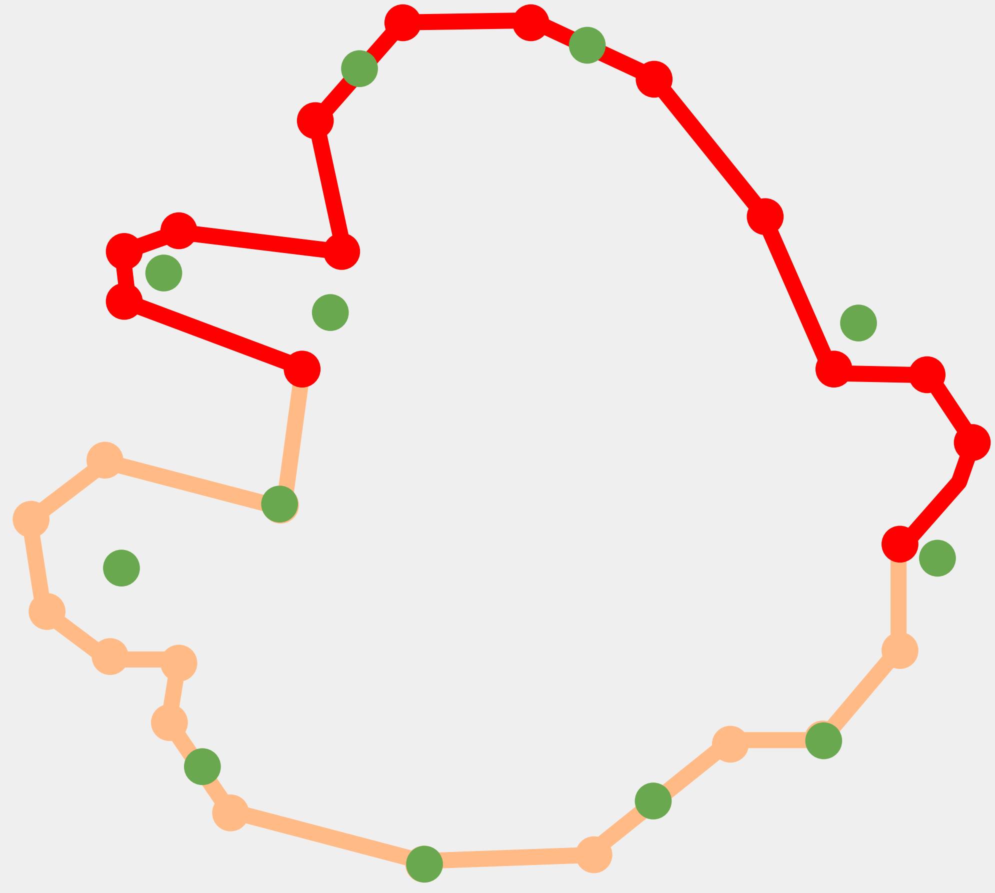
Regular Grids - Division



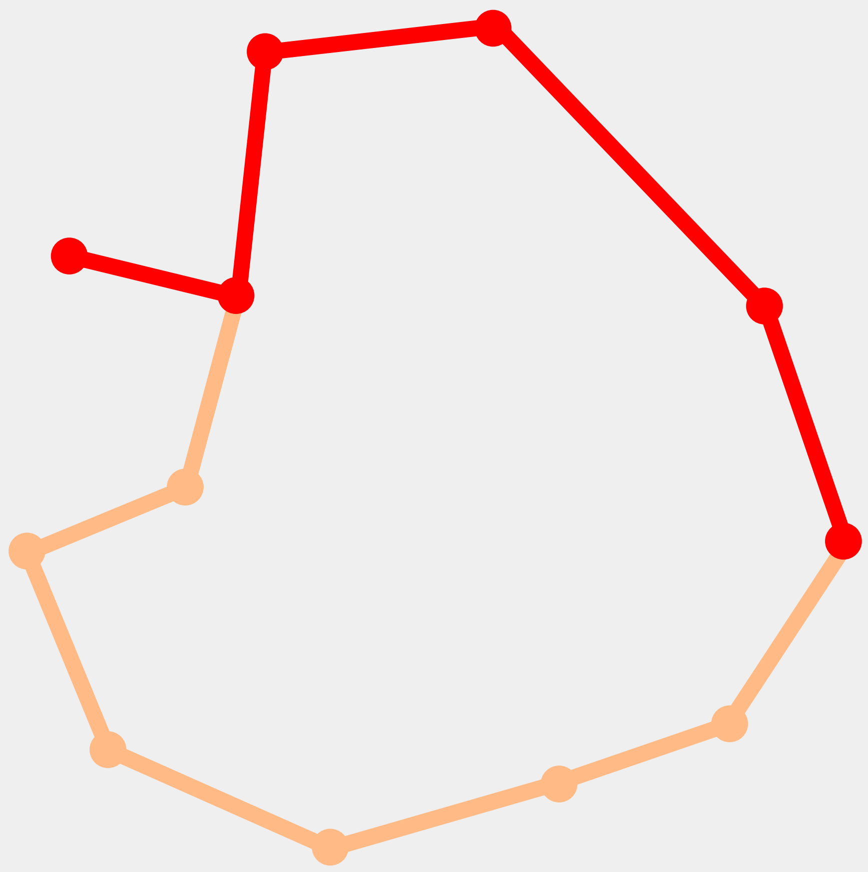
Regular Grids - New Vertices



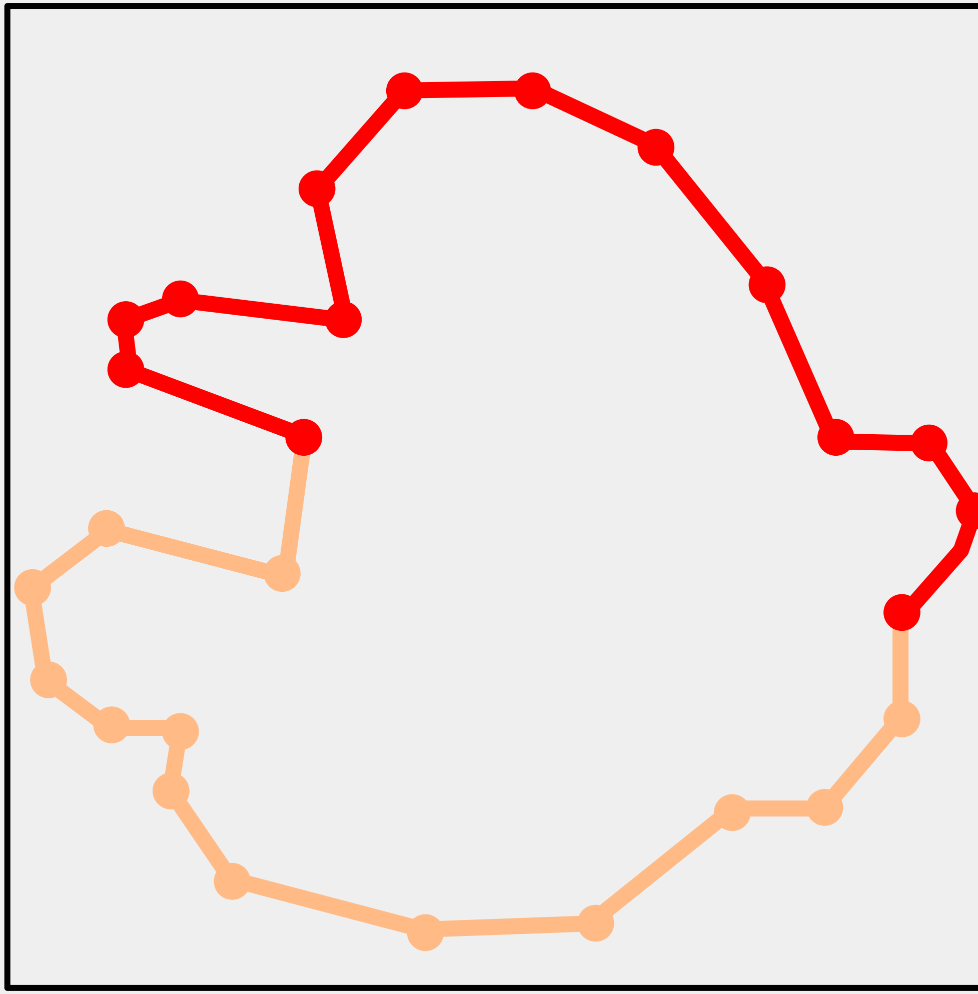
Regular Grids - New Vertices



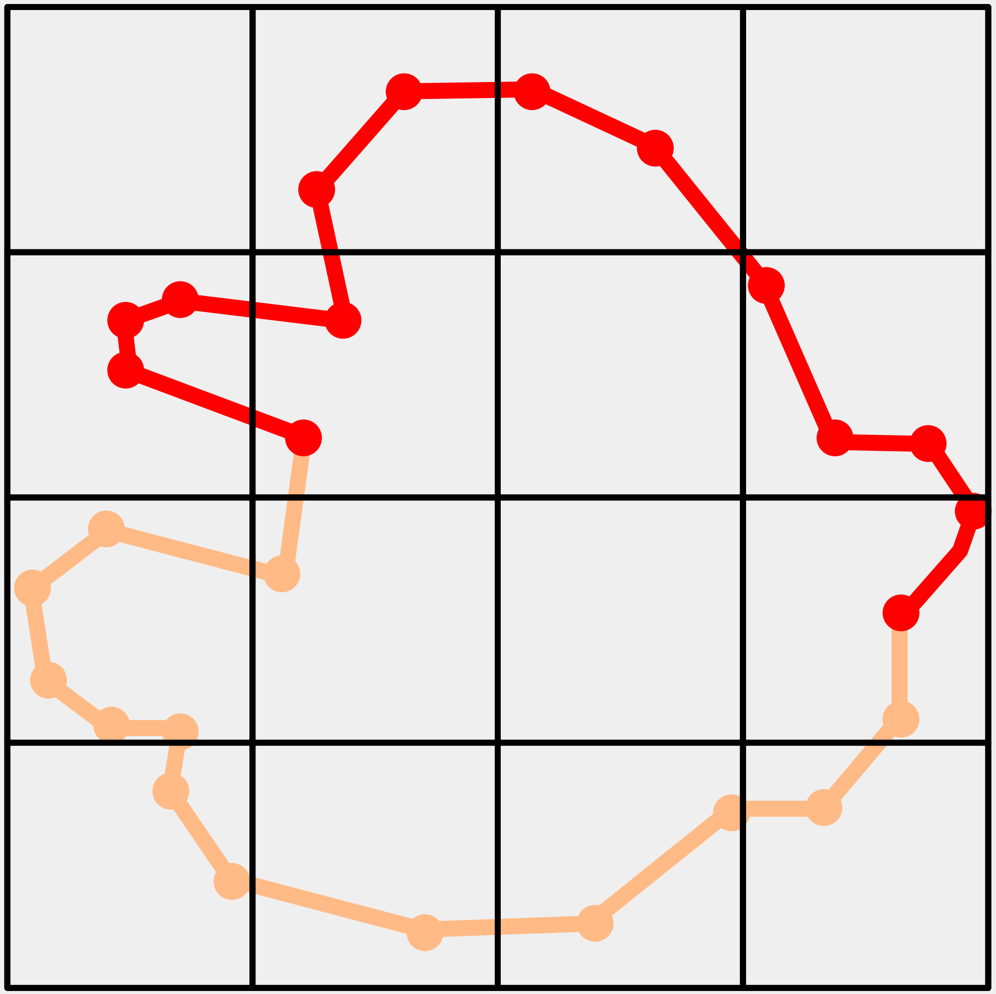
Regular Grids - Simplified



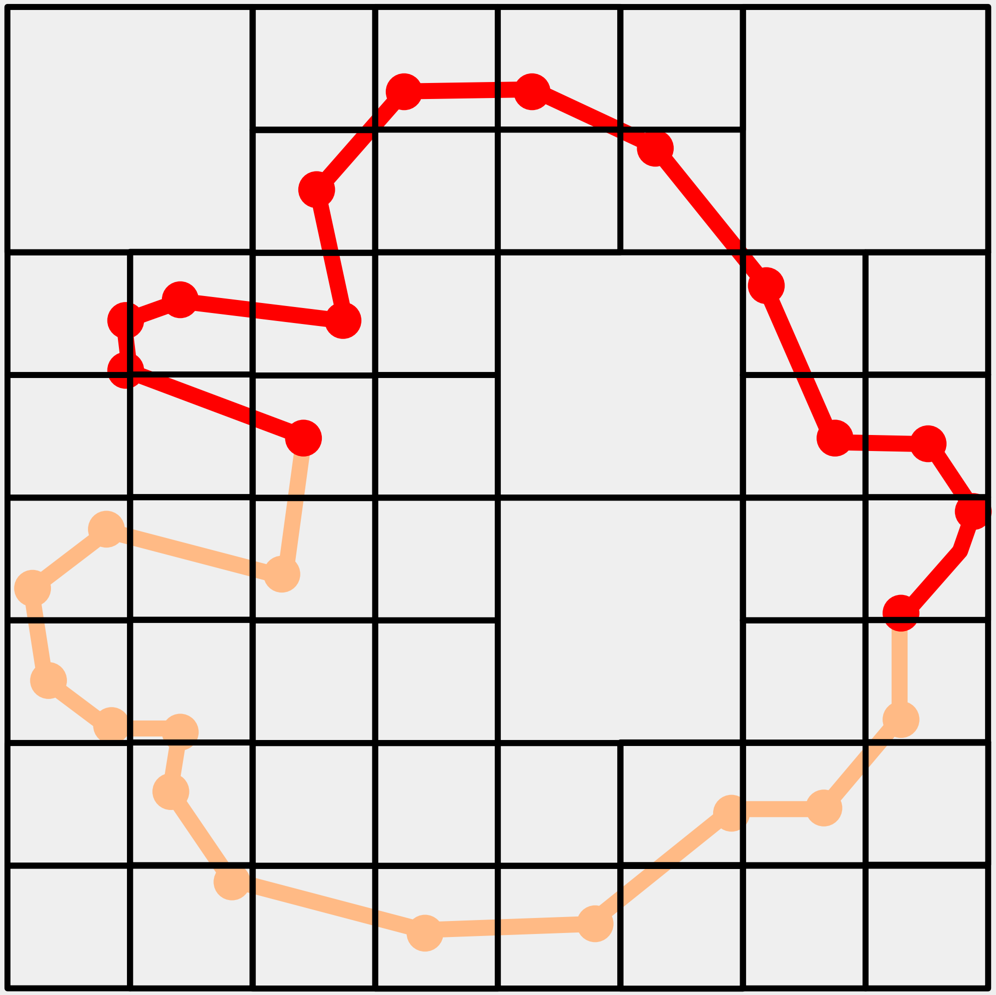
Octrees - Bounding Box



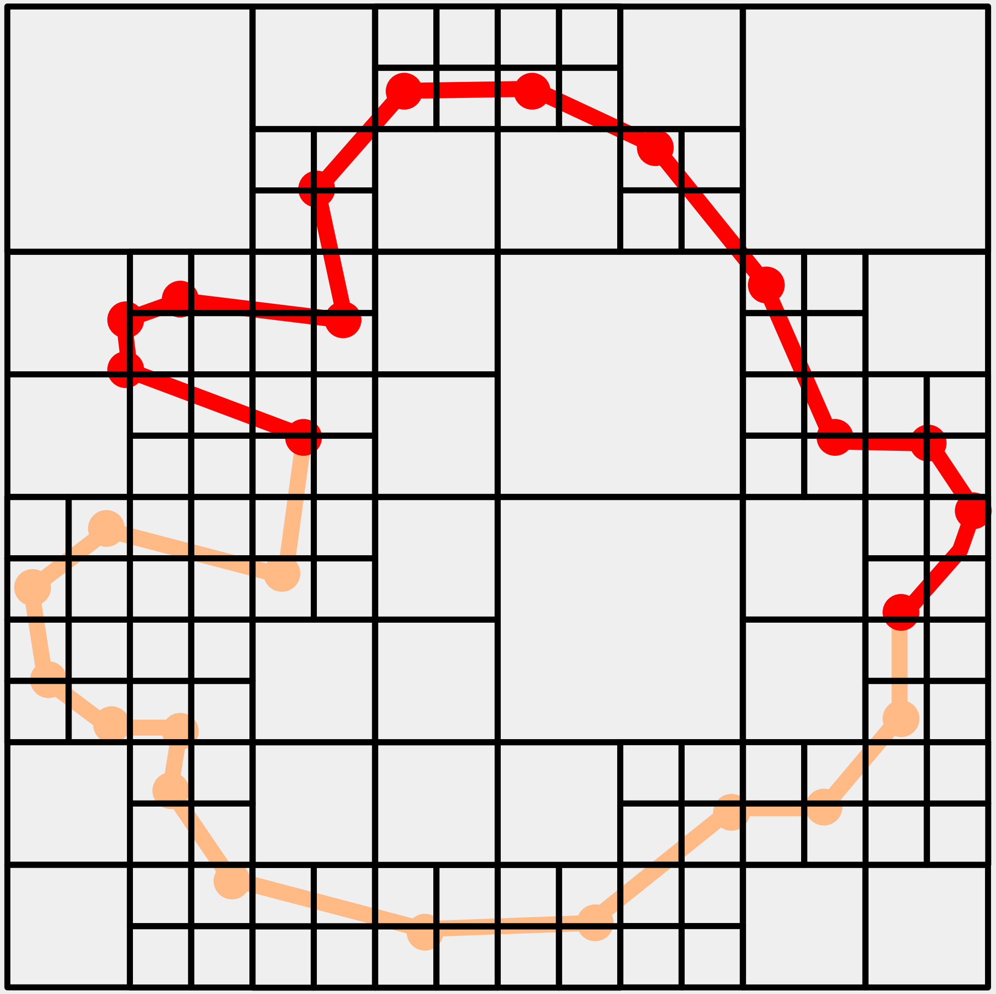
Octrees - Division



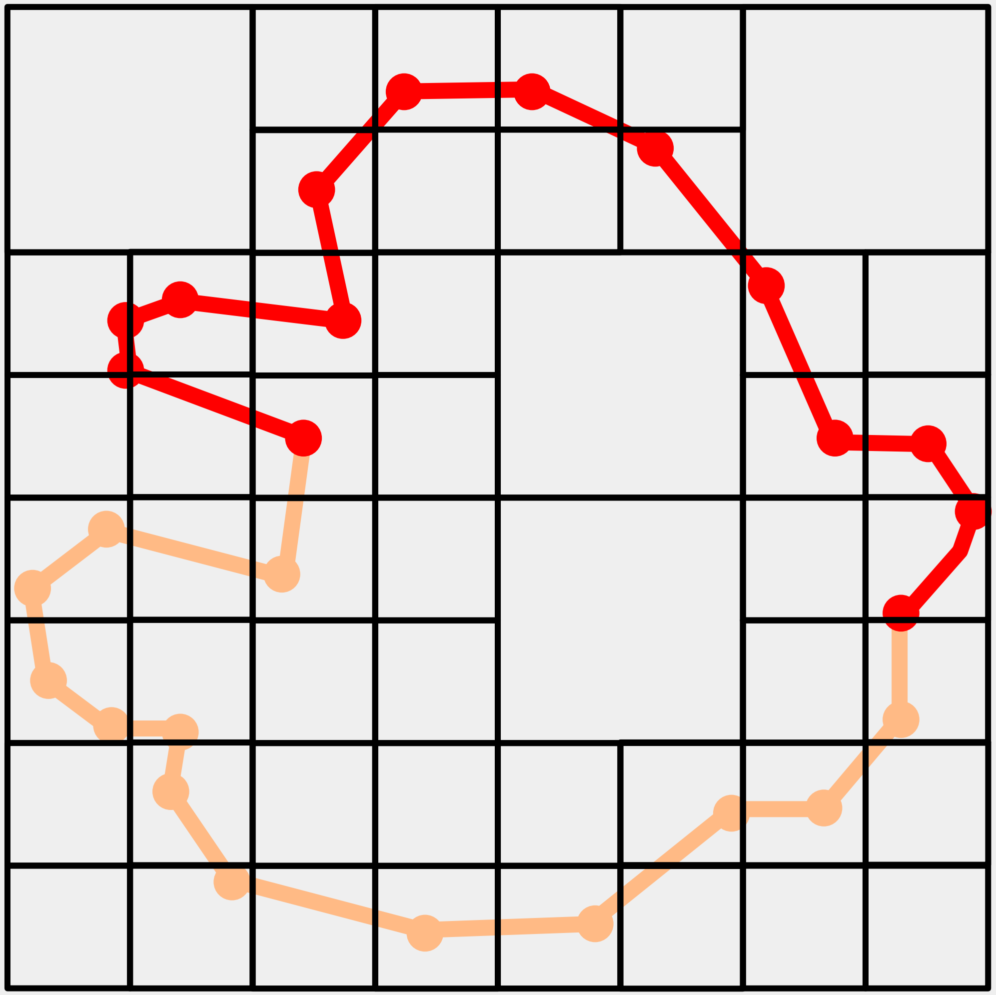
Octrees - Division



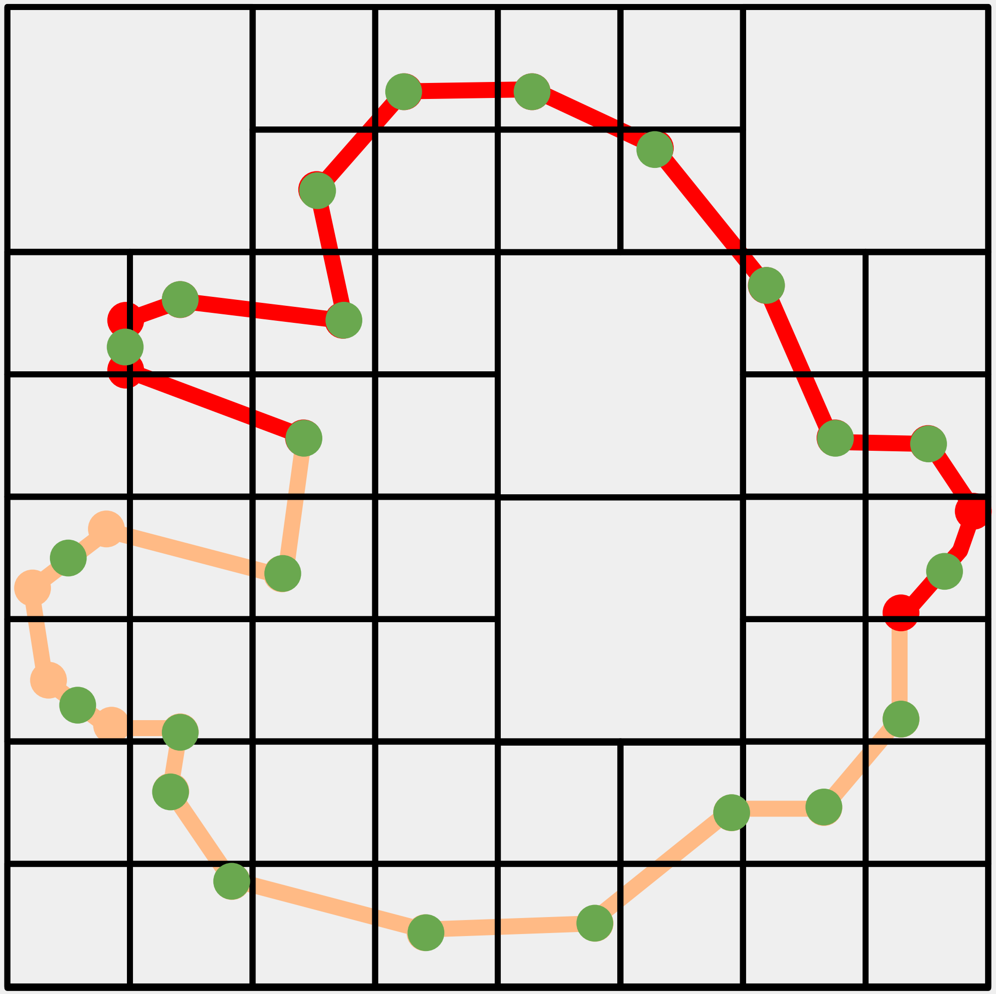
Octrees - Division



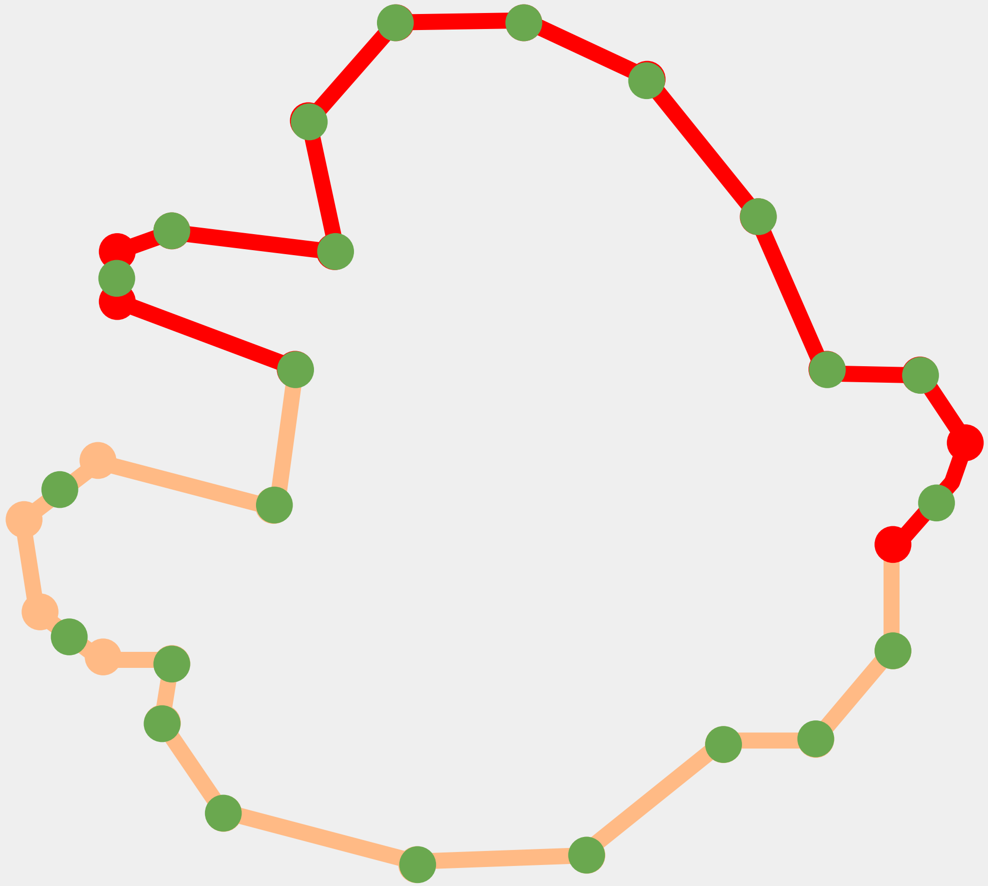
Octrees - Select one level



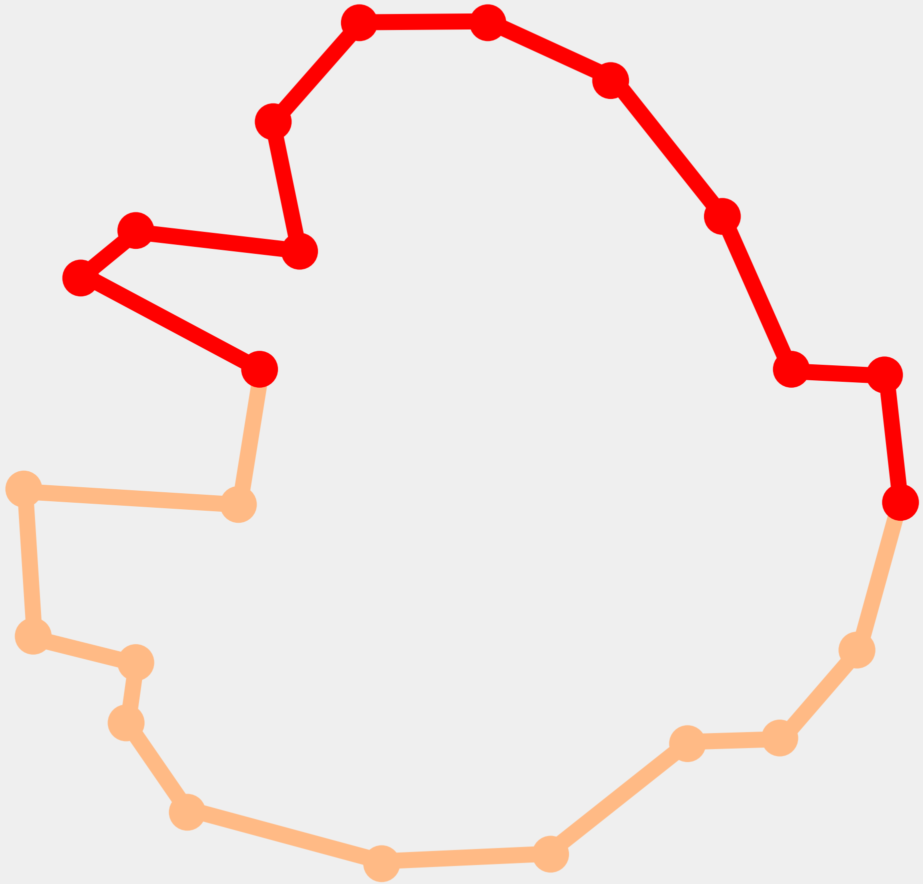
Octrees - New Vertices



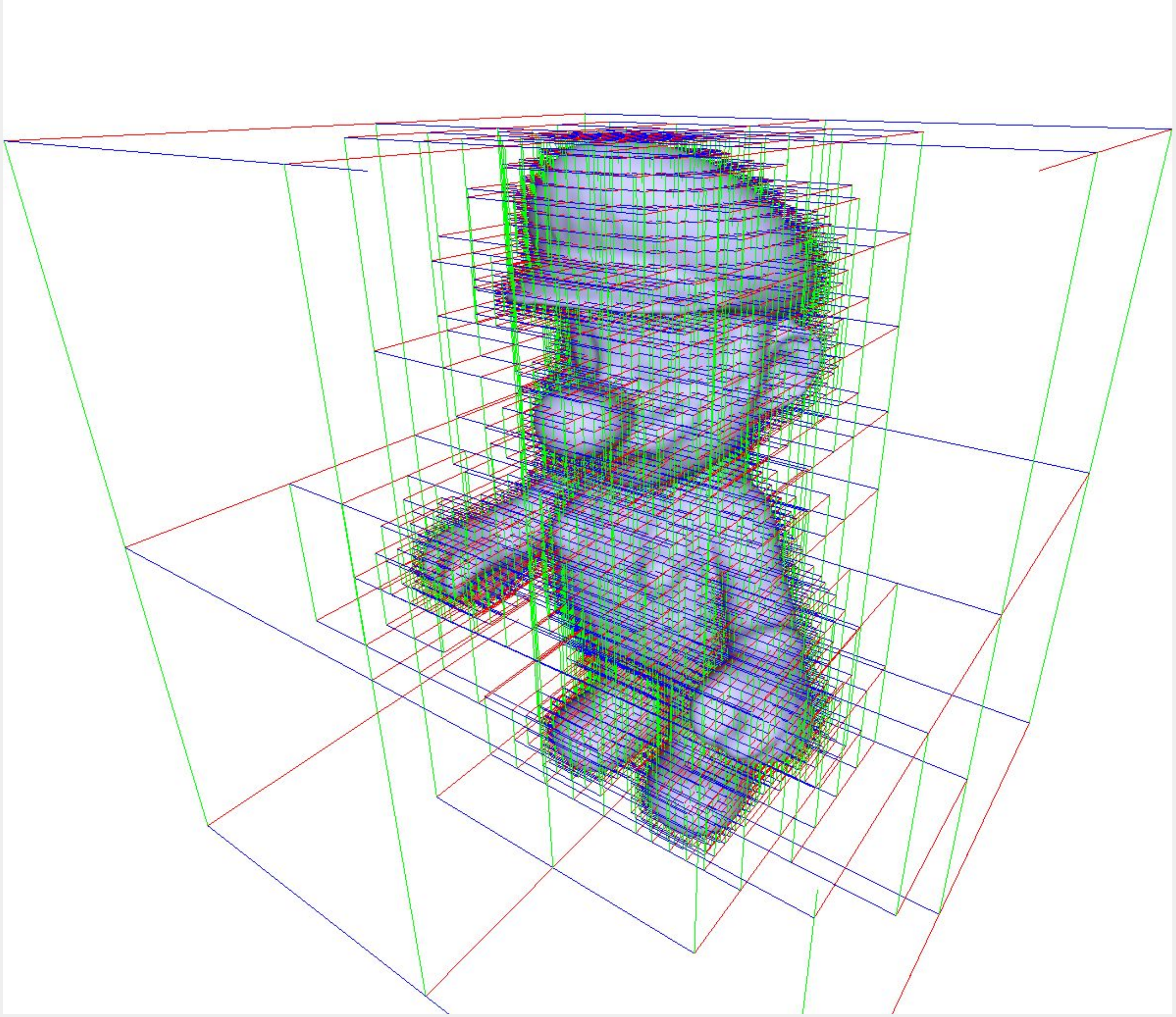
Octrees - New Vertices



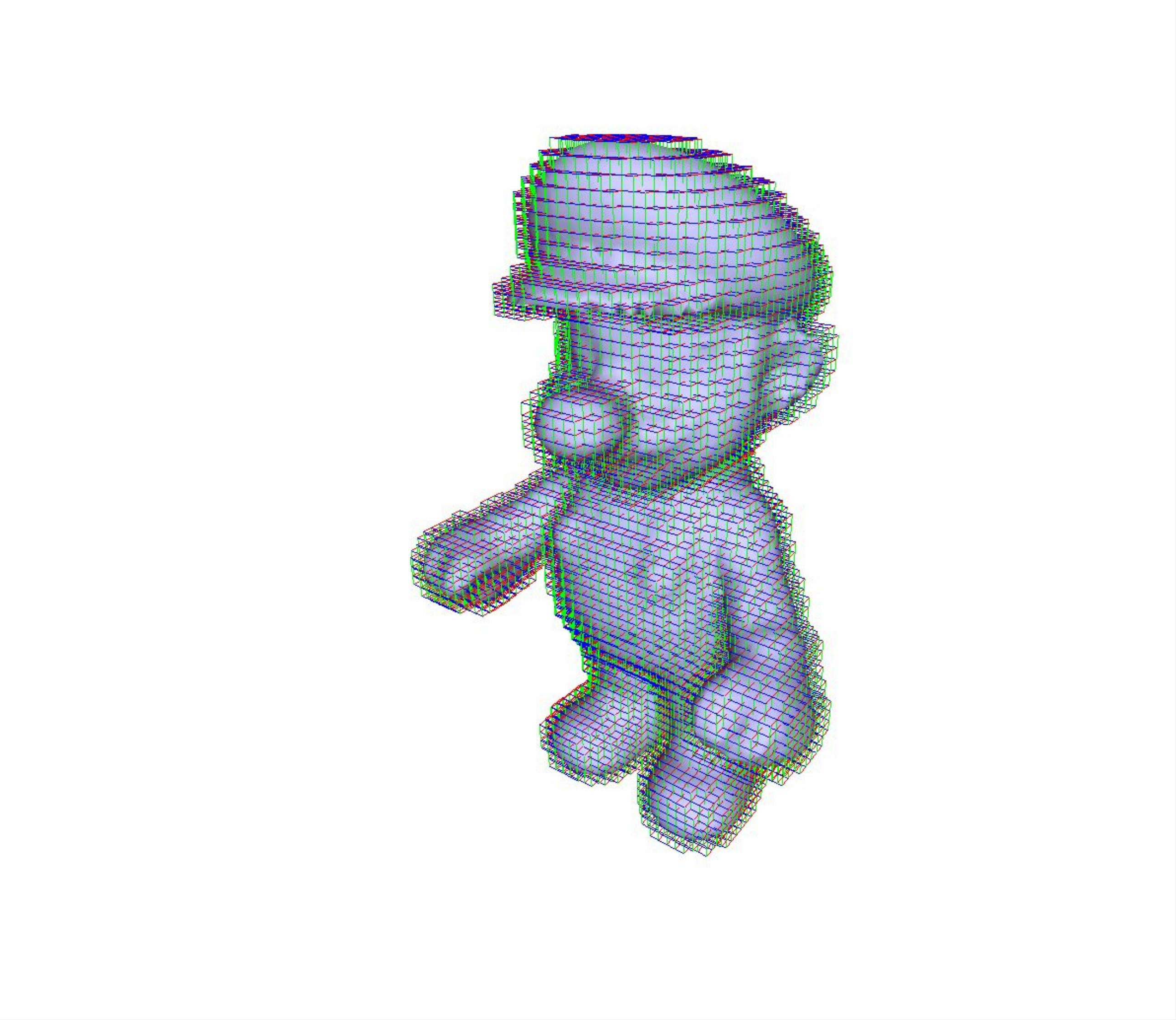
Octrees - Simplified



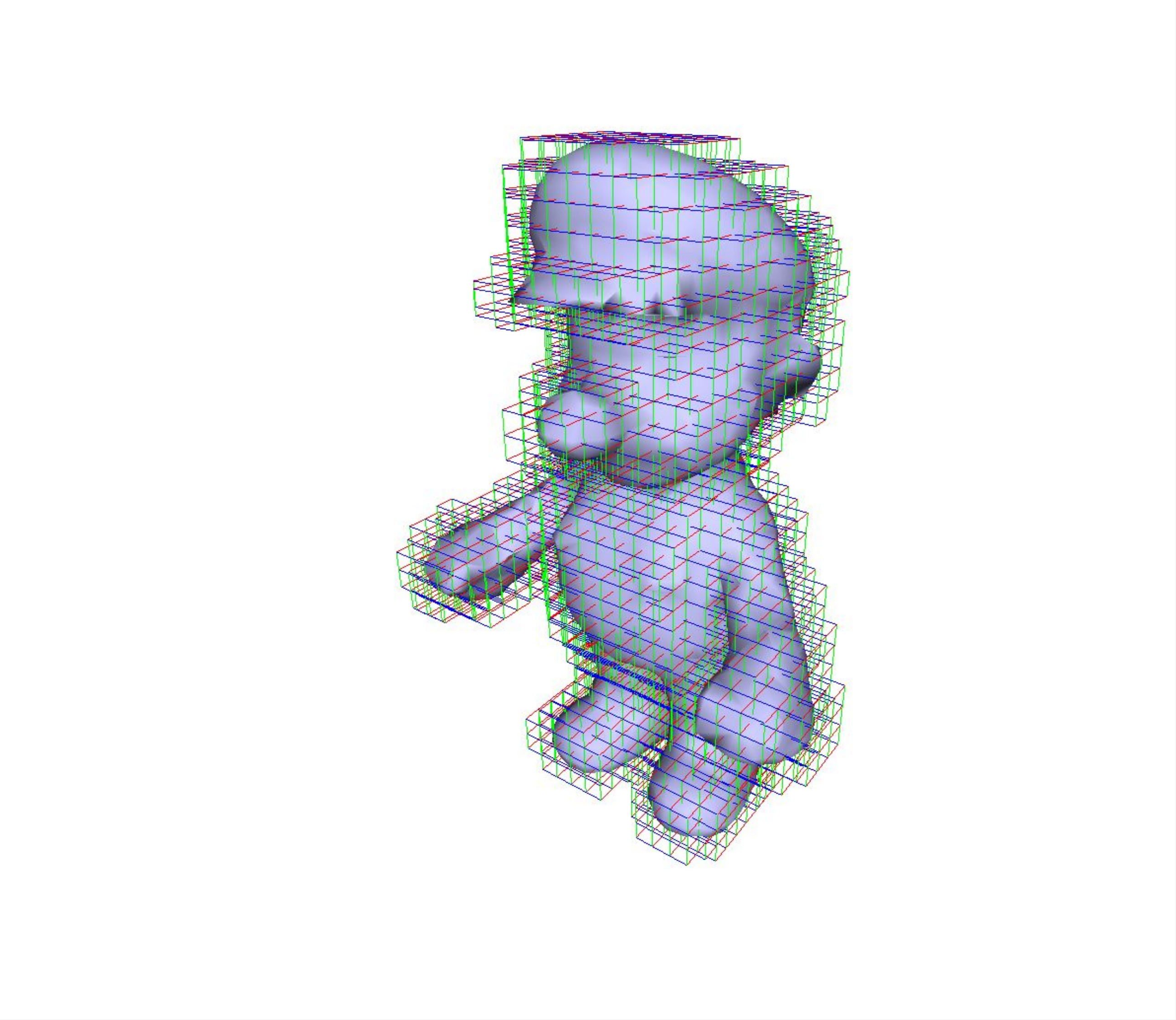
Octrees



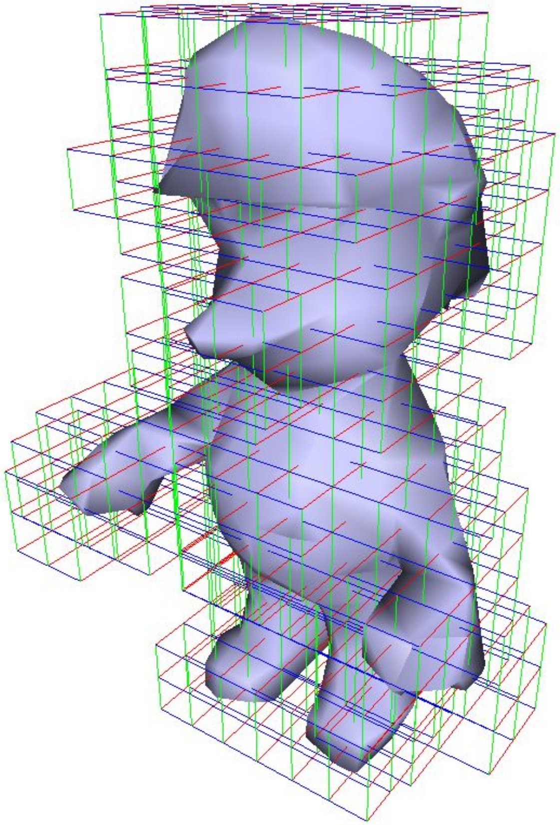
Octrees



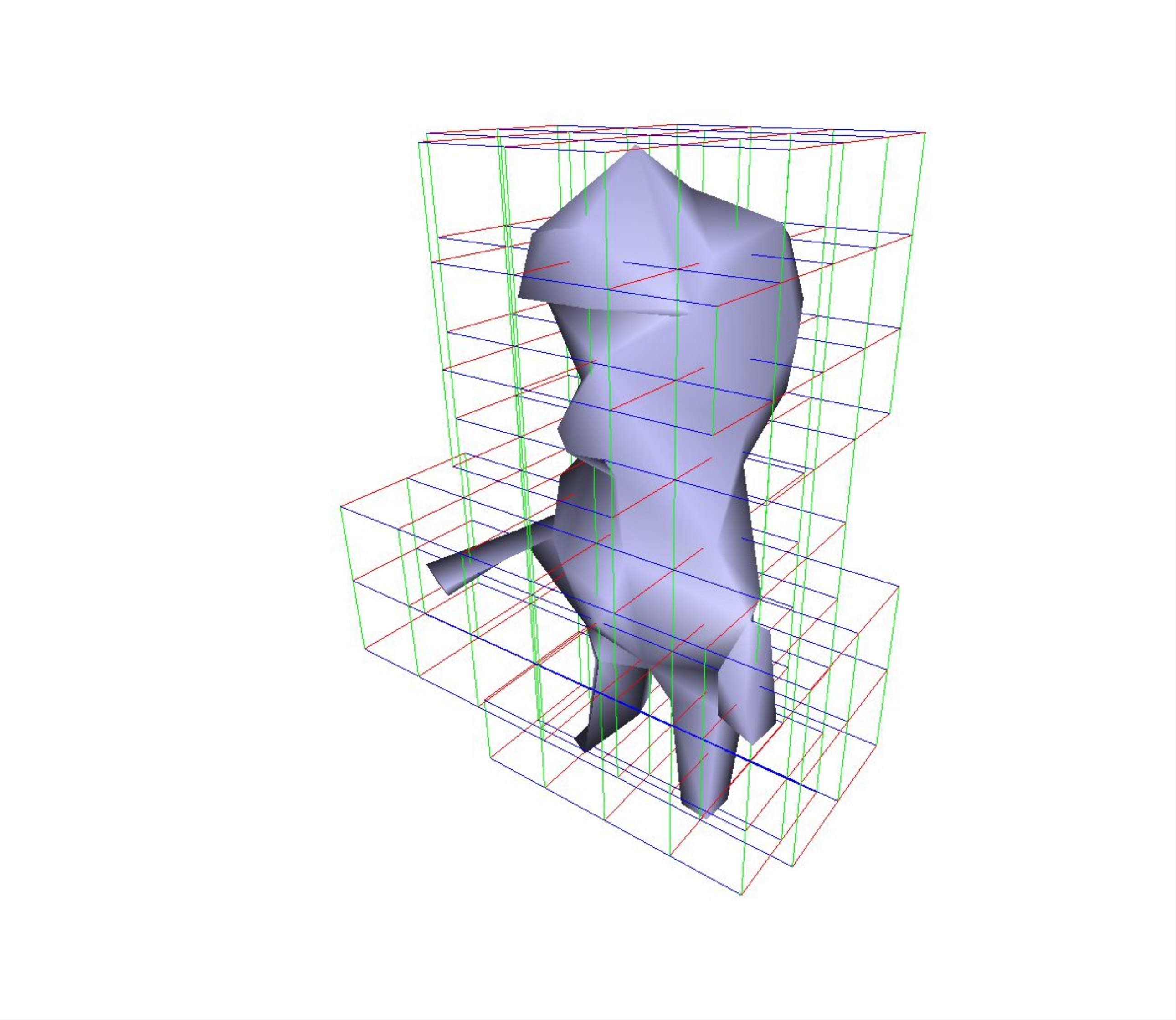
Octrees



Octrees

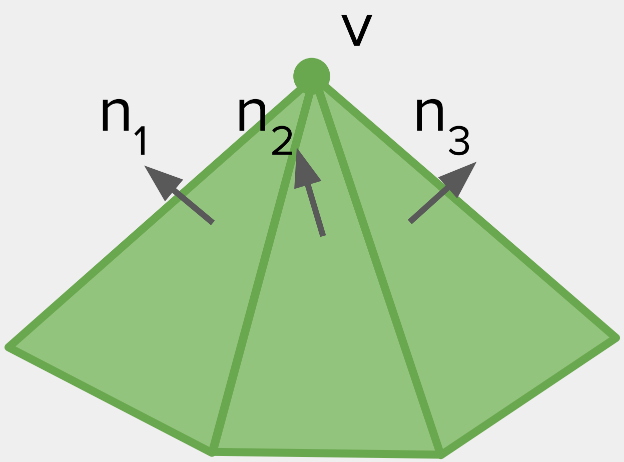


Octrees



Quadric Error Metrics

Garland *et al.*
https://dl.acm.org/citation.cfm?id=258849



$$\triangle(v) = \sum_{p \in planes(v)} v^T (pp^T) v = v^T \Big(\sum_{p \in planes(v)} (pp^T) \Big) v = v Q_v v^T$$

Quadric Error Metrics

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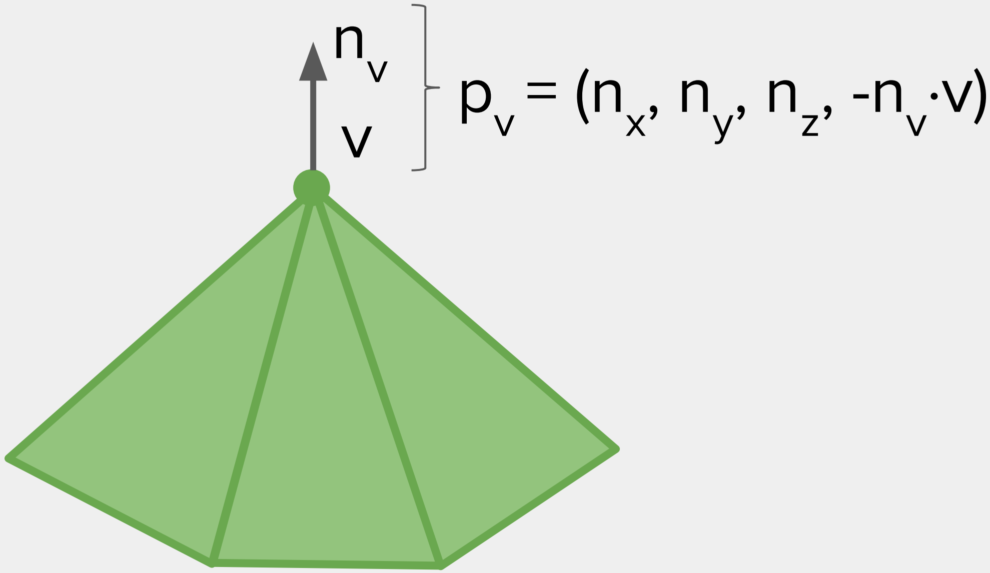

$$Q_v = p_v \, p_v^T$$

Quadric Error Metrics

Garland *et al.*
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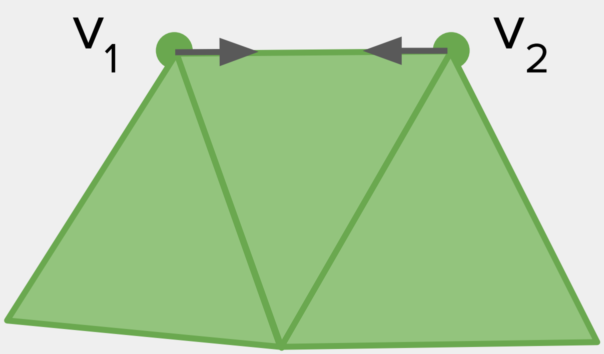


$$Q_v = Q_1 + Q_2$$

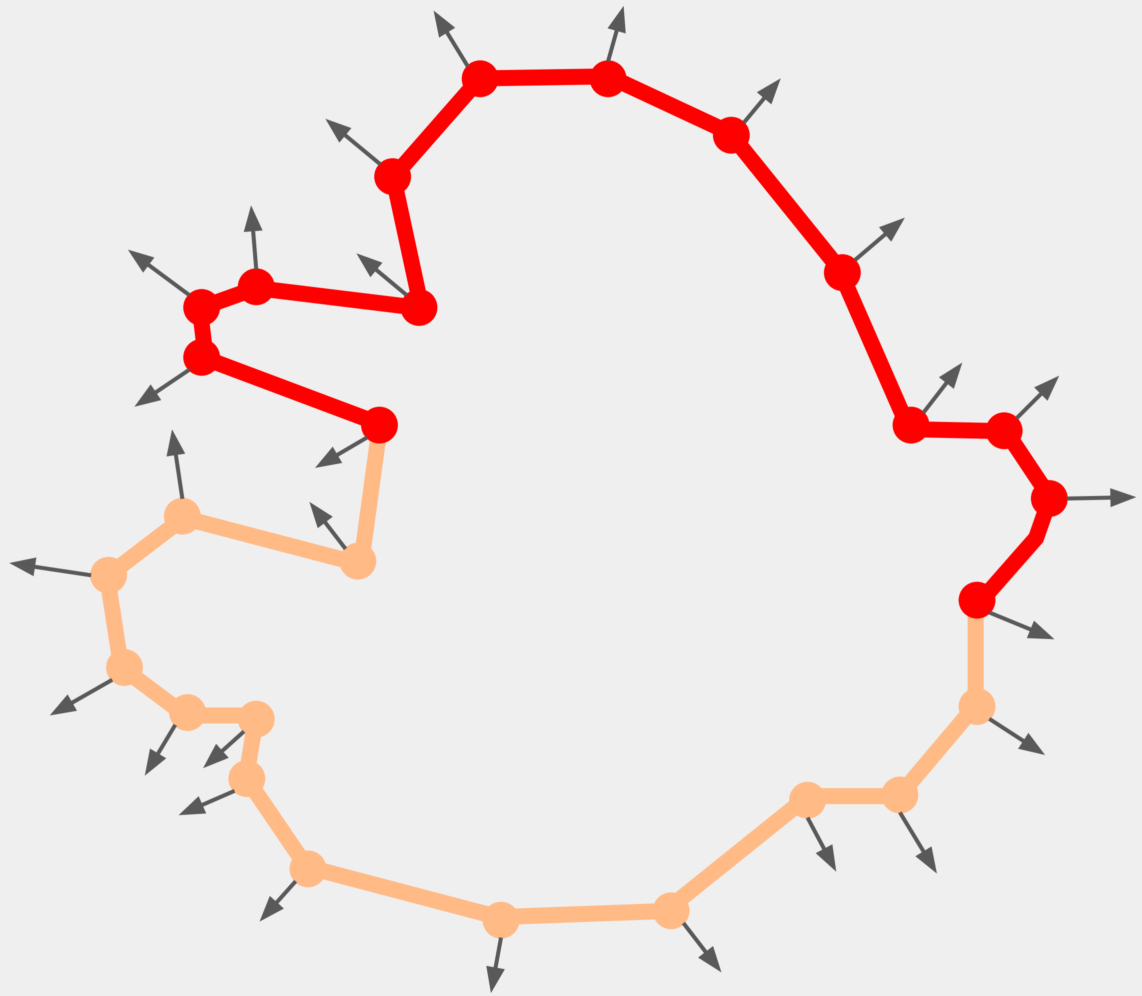
$$\begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{12} & q_{22} & q_{23} & q_{24} \\ q_{13} & q_{23} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix} \bar{\mathbf{v}} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

$$\bar{\mathbf{v}} = \begin{bmatrix} q_{11} & q_{12} & q_{13} & q_{14} \\ q_{12} & q_{22} & q_{23} & q_{24} \\ q_{13} & q_{23} & q_{33} & q_{34} \\ 0 & 0 & 0 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

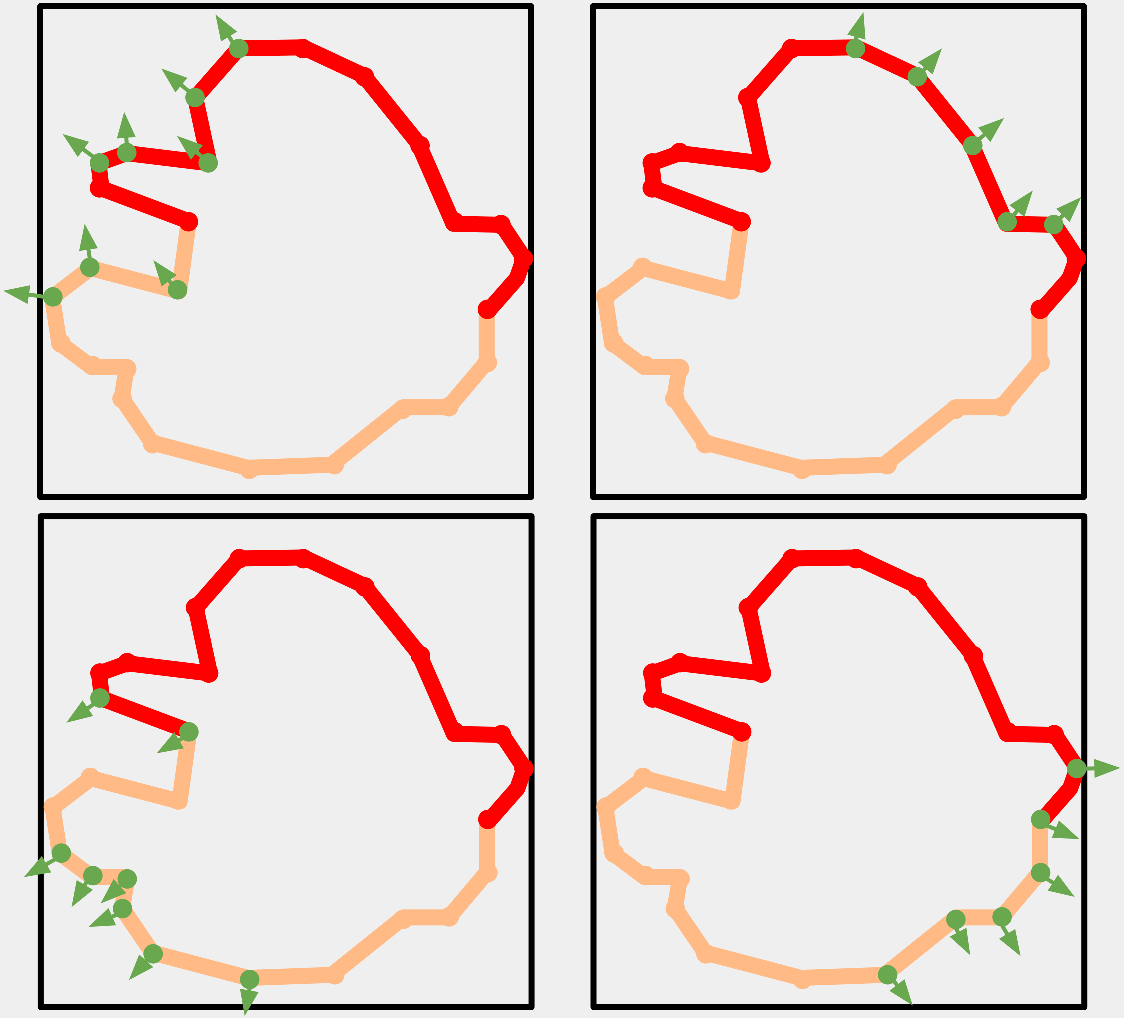
```
q.computeInverseWithCheck(inverse, invertible, 0.1);
```

Shape Preserving

Willmott *et al.*
https://dl.acm.org/citation.cfm?id=2018347



Shape Preserving



Shape Preserving

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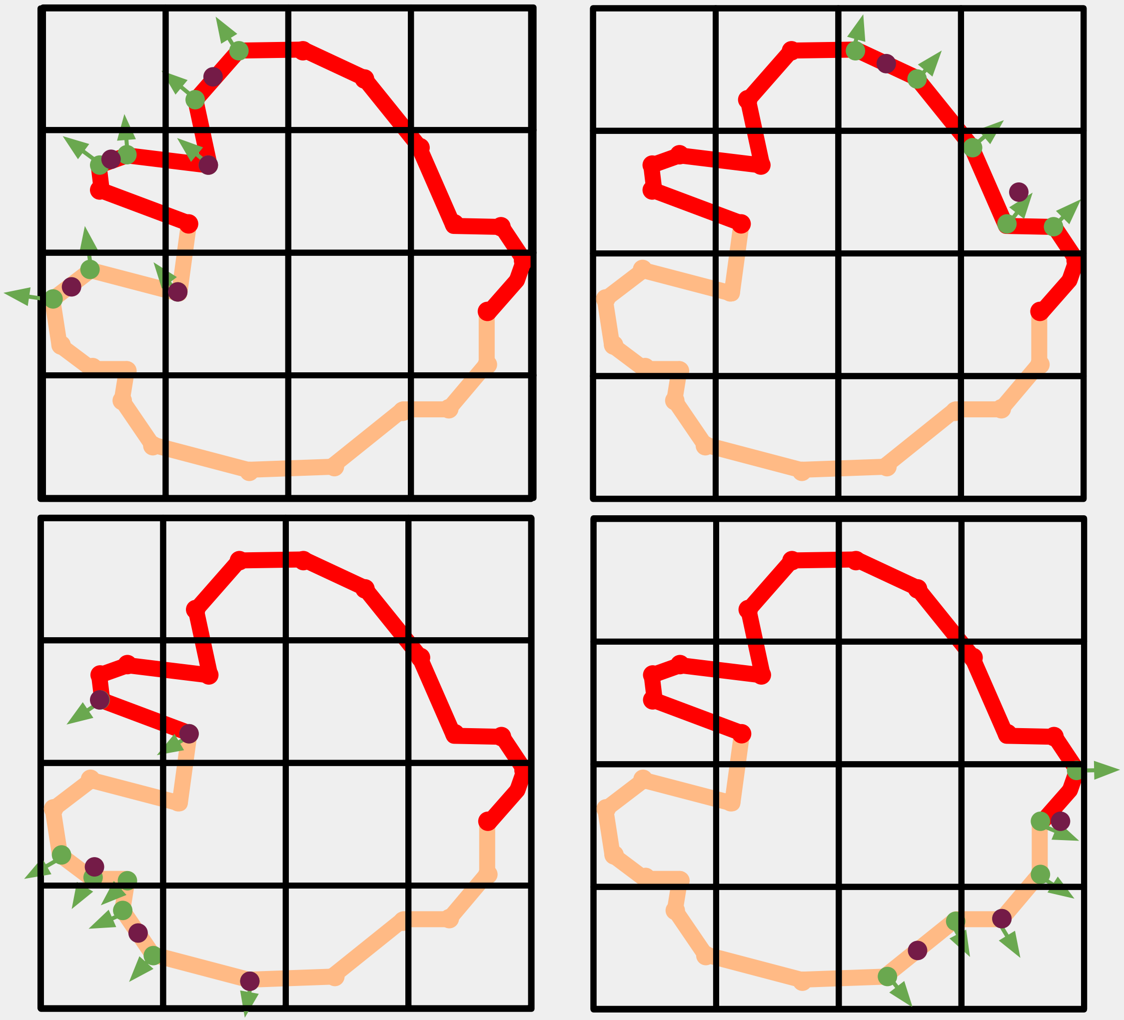
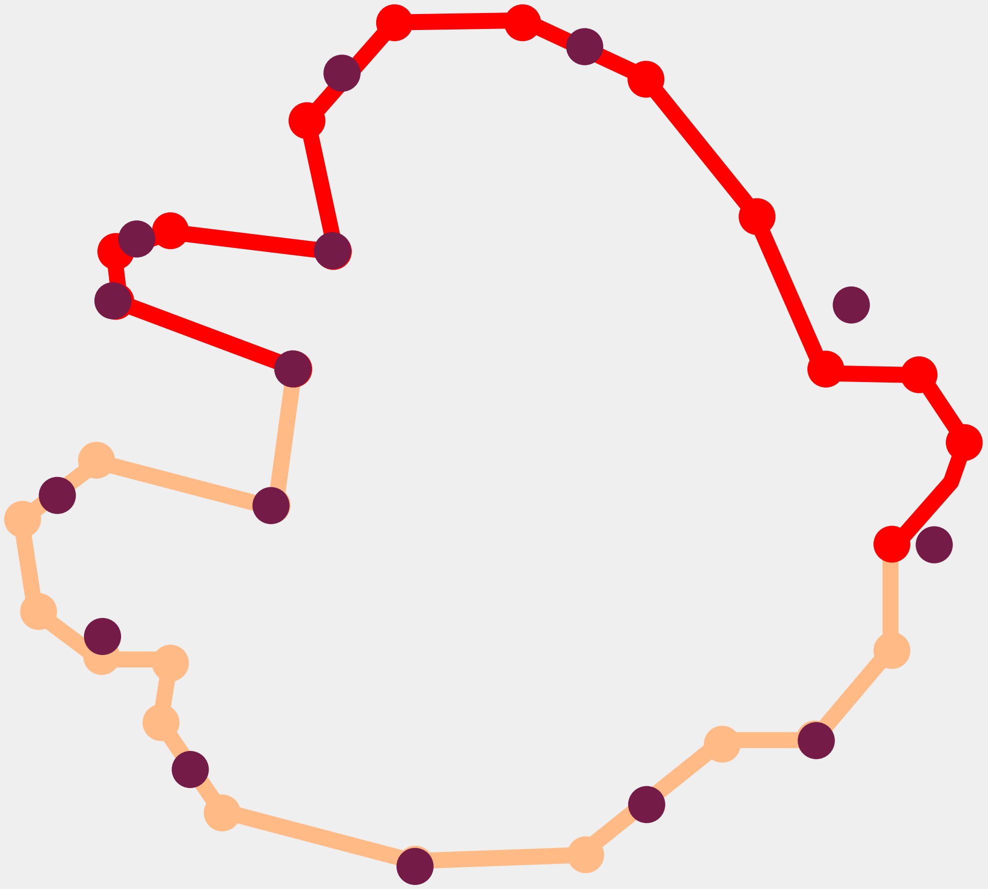
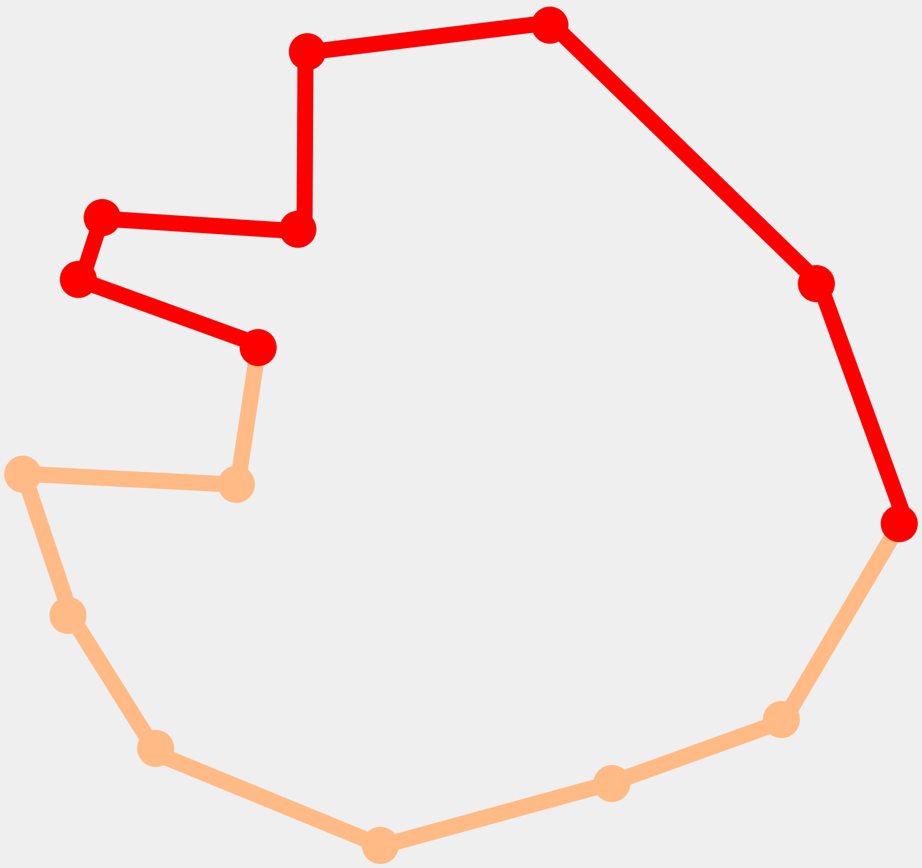


Shape Preserving



Shape Preserving



Shape Preserving - Compare

Willmott *et al.*

https://dl.acm.org/citation.cfm?id=2018347