Parallel DCEL Construction Report

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Records in the DCEL construction

- Vertex(x: Double, y: Double, edge: Half-edge)
- Half-edge(origen: Vertex, twin: Half-edge, next: Half-edge, prev: Half-edge, face: Face)
- Face(egde: Half-edge, label: String)

DCEL construction outline

- Input: Set of polygons.
- Output: Dataset of Half-edge records
  1. Read set of polygons
  2. Partition set of polygons according to a grid
  3. For each partition extract its MBR polygon and clip the polygons inside each partition
  4. For each polygon at each partiion:
     - 4.1 Extract set of vertices
     - 4.2 Create half-edges for each vertex (Algorithm 2)[1]
  5. Merge half-edges from each partition

[1] Algorithm 2 follows the logic from `https://tinyurl.com/y58xk82e`

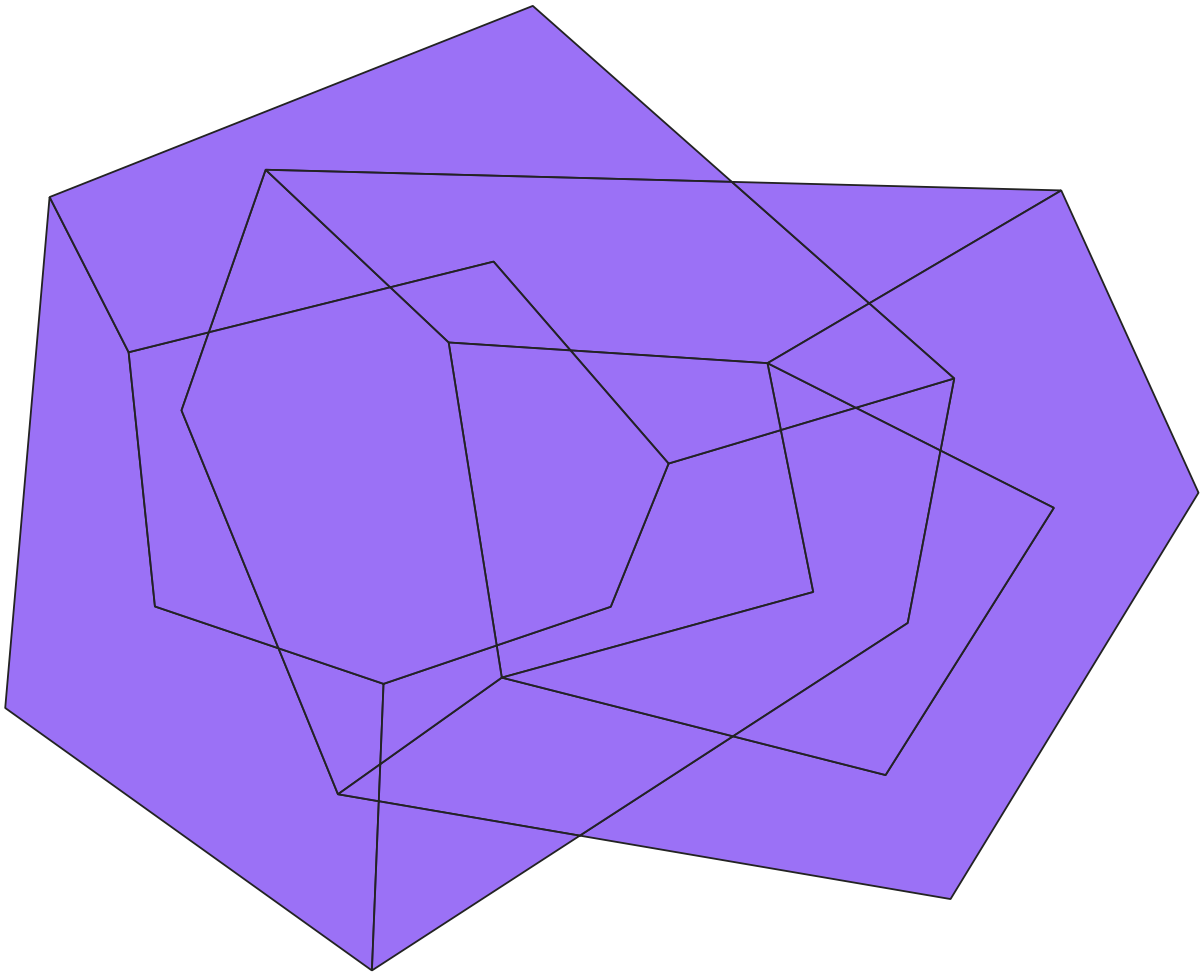
Algorithm 2

- Input: Set of vertices.
- Output: List of Half-edge records

1. Create lists for Vertex, Half-edge and Face records
2. Create a Face record for this set of vertices
3. Set Half-edge records prevLeft and prevRight to null
4. For each vertex in vertices:
   - 4.1 Create a Vertex record from the vertex.
   - 4.2 Create two Half-edge records (left and right) and add to the Half-edge list
   - 4.3 Update the the Vertex record and add to the Vertex list
   - 4.4 Set the previous next edge to this left edge, Set the previous right edge origen to this vertex
   - 4.5 Update prevLeft and prevRight Half-edges to left and right
5. Update the initial Half-edges from the Half-edges list
6. Update the Face record with one of the Half-edges from the list
7. Merge half-edges from each partition

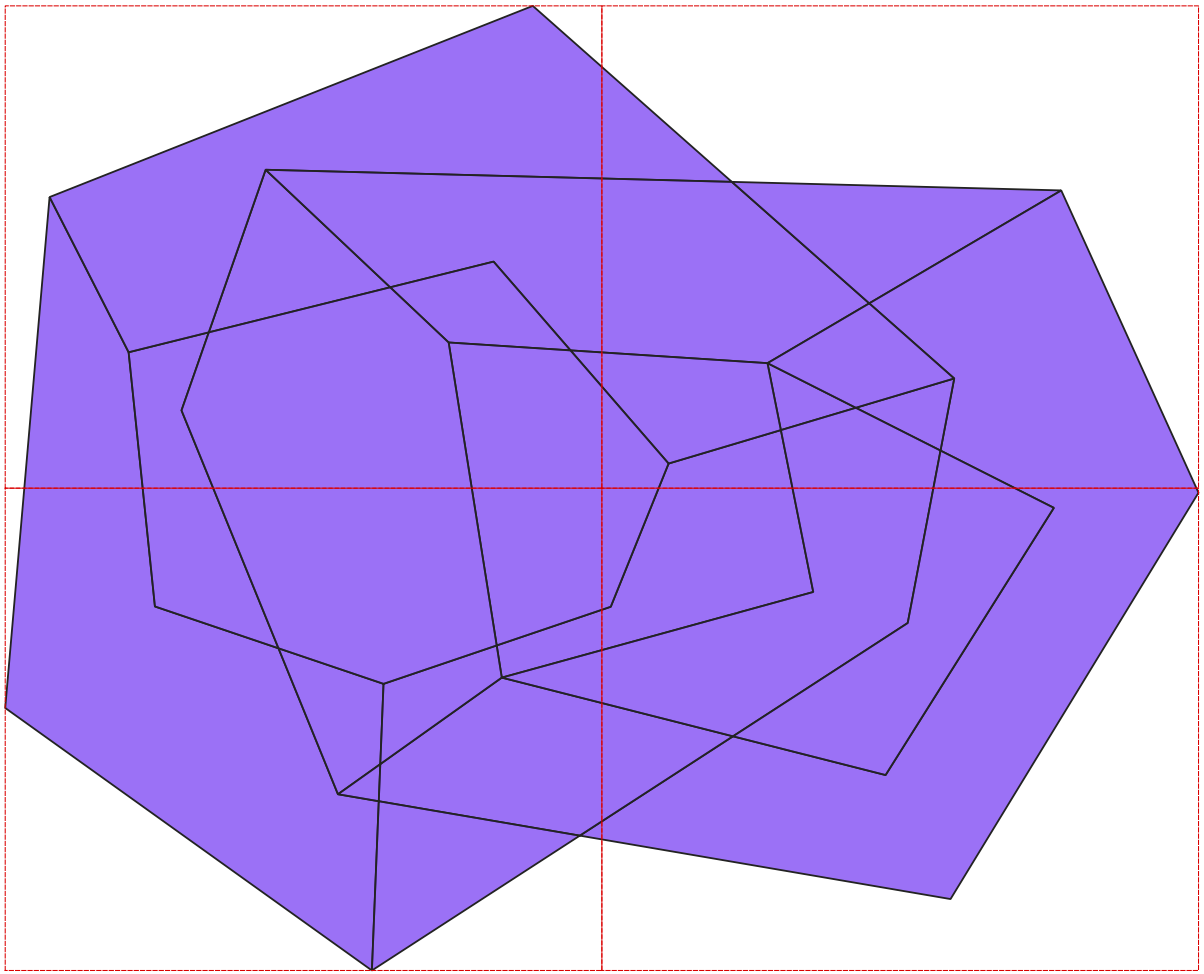
DCEL construction example

Set of polygons



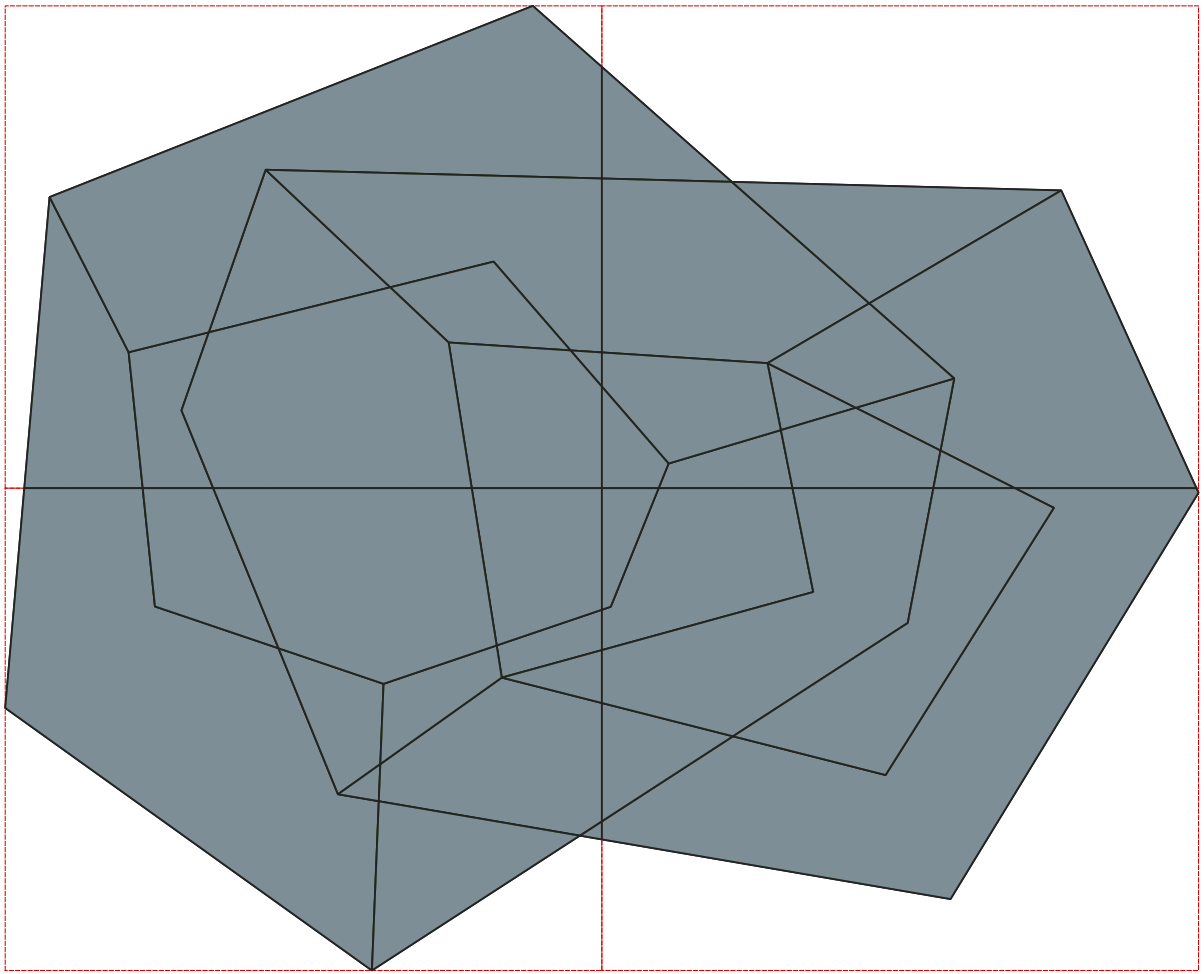
DCEL construction example

Partitioning



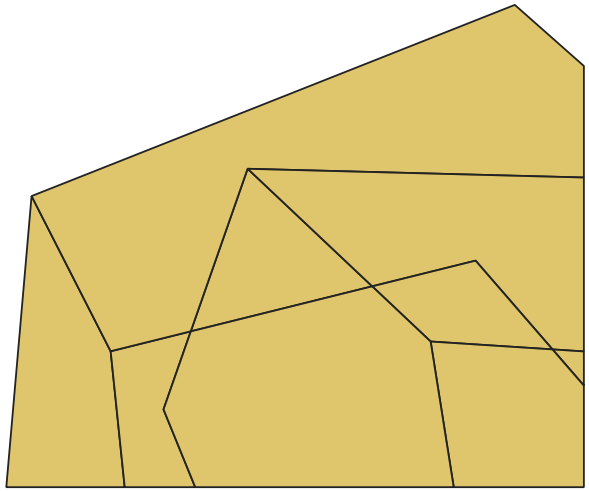
DCEL construction example

Clipping



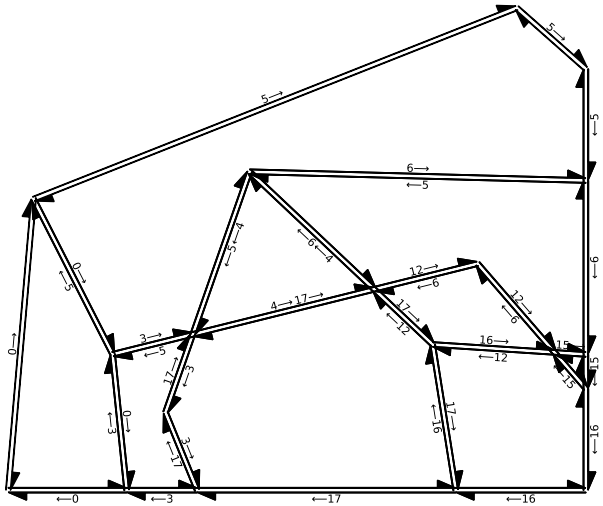
DCEL construction example

Local step input (set of clipped polygons)



DCEL construction example

Local step output (set of Half-edge records)



DCEL construction example