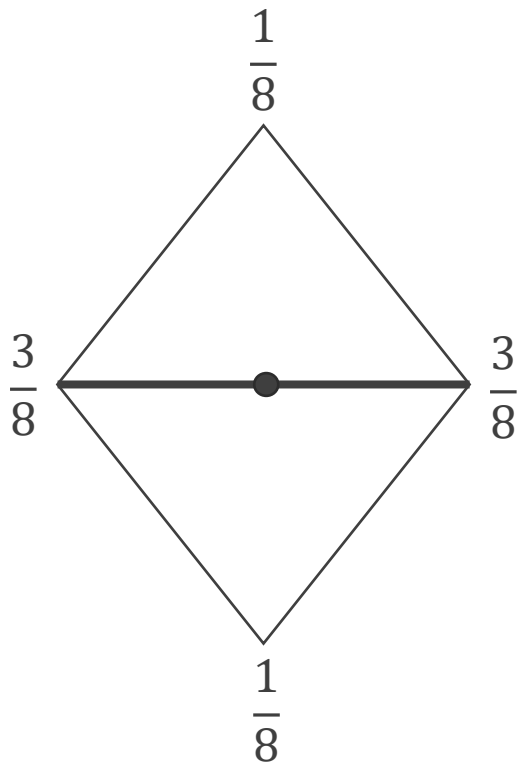
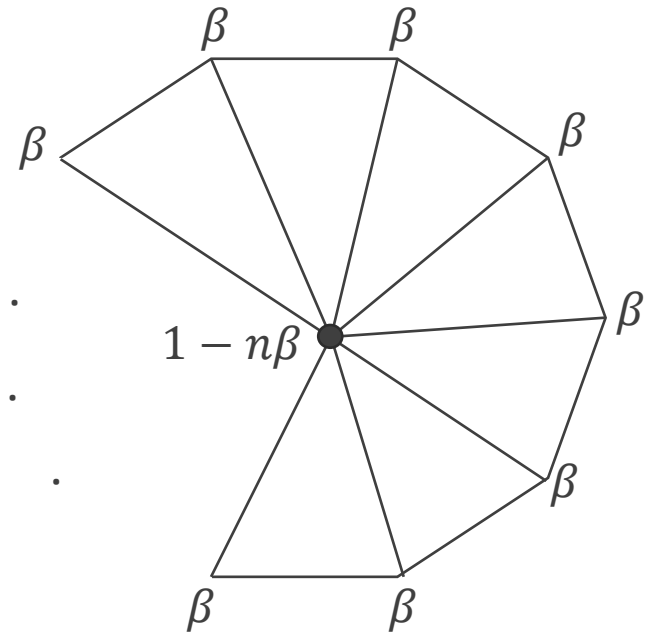
Loop Subdivision

Edge rule:

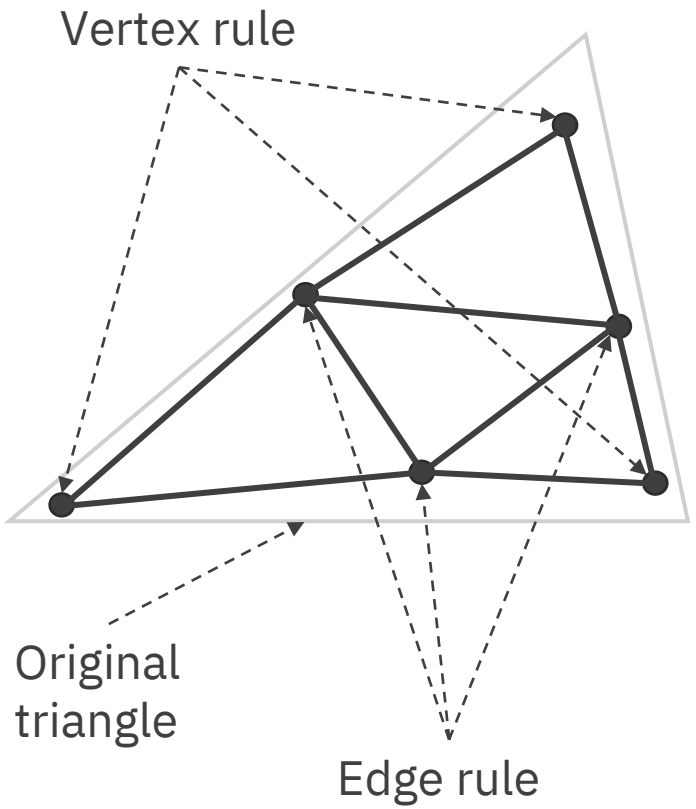


Vertex rule; valence n:



$$\beta = \frac{1}{n}\left[\frac{5}{8} - \left(\frac{3}{8} + \frac{1}{4}\cos\frac{2\pi}{n}\right)^2\right]$$

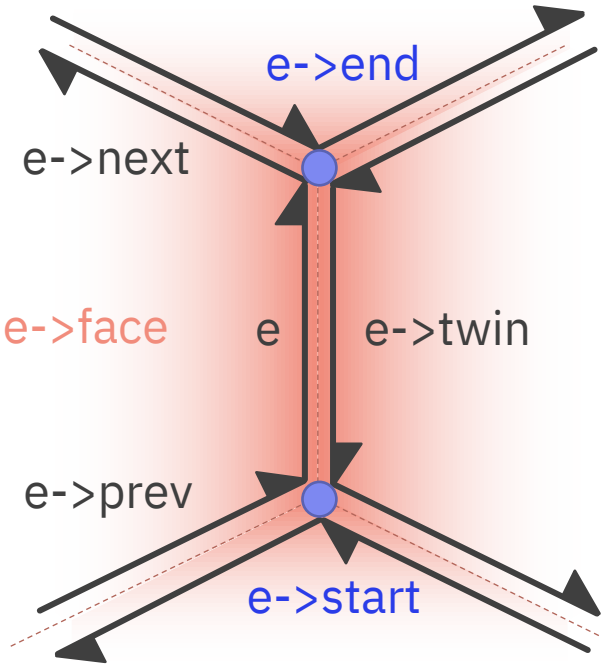
Mesh composition:



Half Edge Data Structure

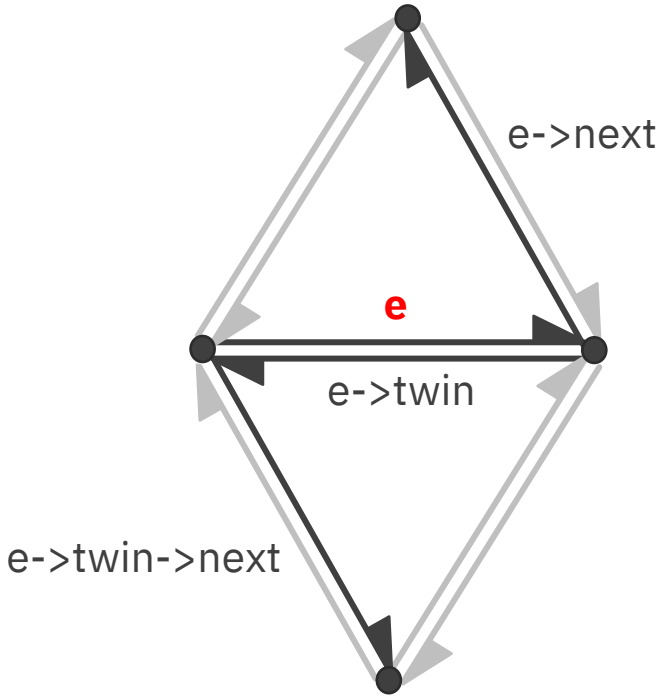
- Data structure with manifold topology
- Fast adjacency search
- Enables easy implementation of mesh modifications

```
Oriented half edge e
  Vertex start    //Starting vertex
  Vertex end      //Ending vertex (optional)
  Edge twin       //Twin half edge of e oriented
                    in opposite direction
  Edge next       //Successor of e
  Edge prev       //Predecessor of e (optional)
  Face face       //Adjacent face
```

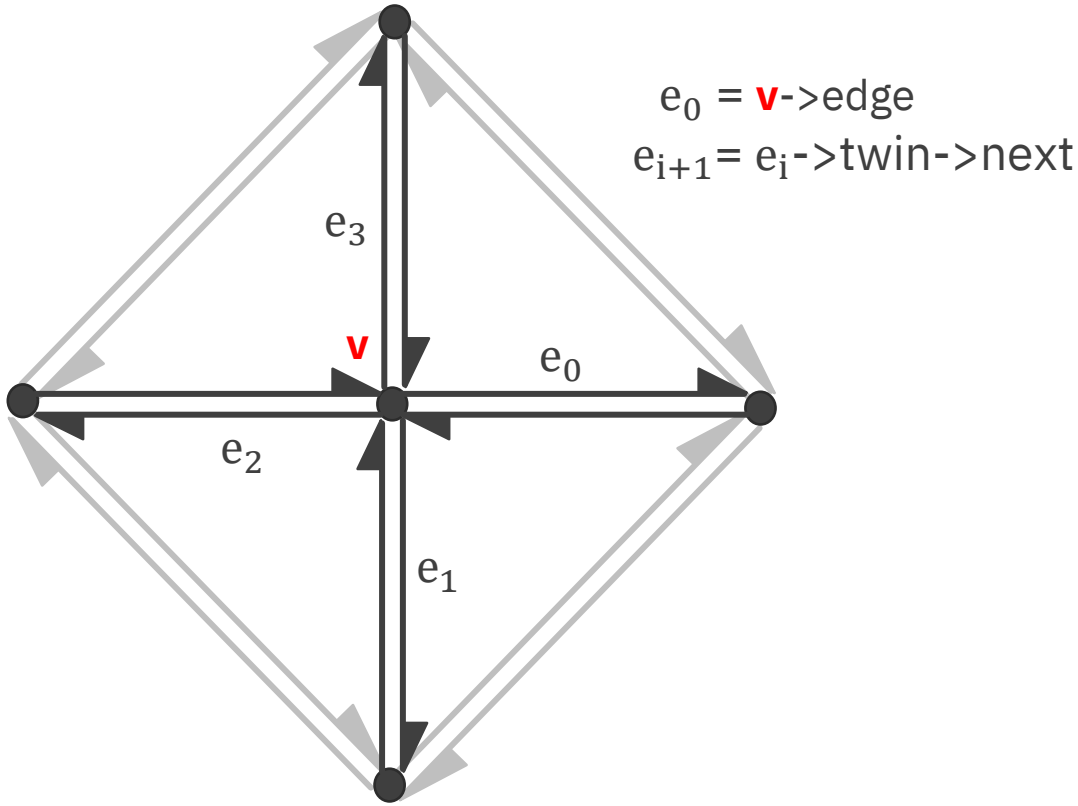


Implementation of Rules

Application::edge_rule:

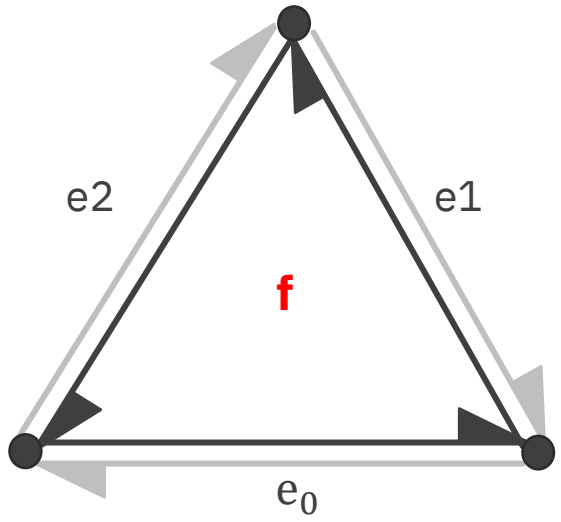


Application:: vertex_rule:



Assembling the Subdivided Mesh

Building edge_rule_vertices **and** vertex_rule_vertices:



- For each e_i and e_i->start obtain vertices of the destination mesh.

e_0 = **f**->edge

e_{i+1}= e_i->next

Assembling triangles: