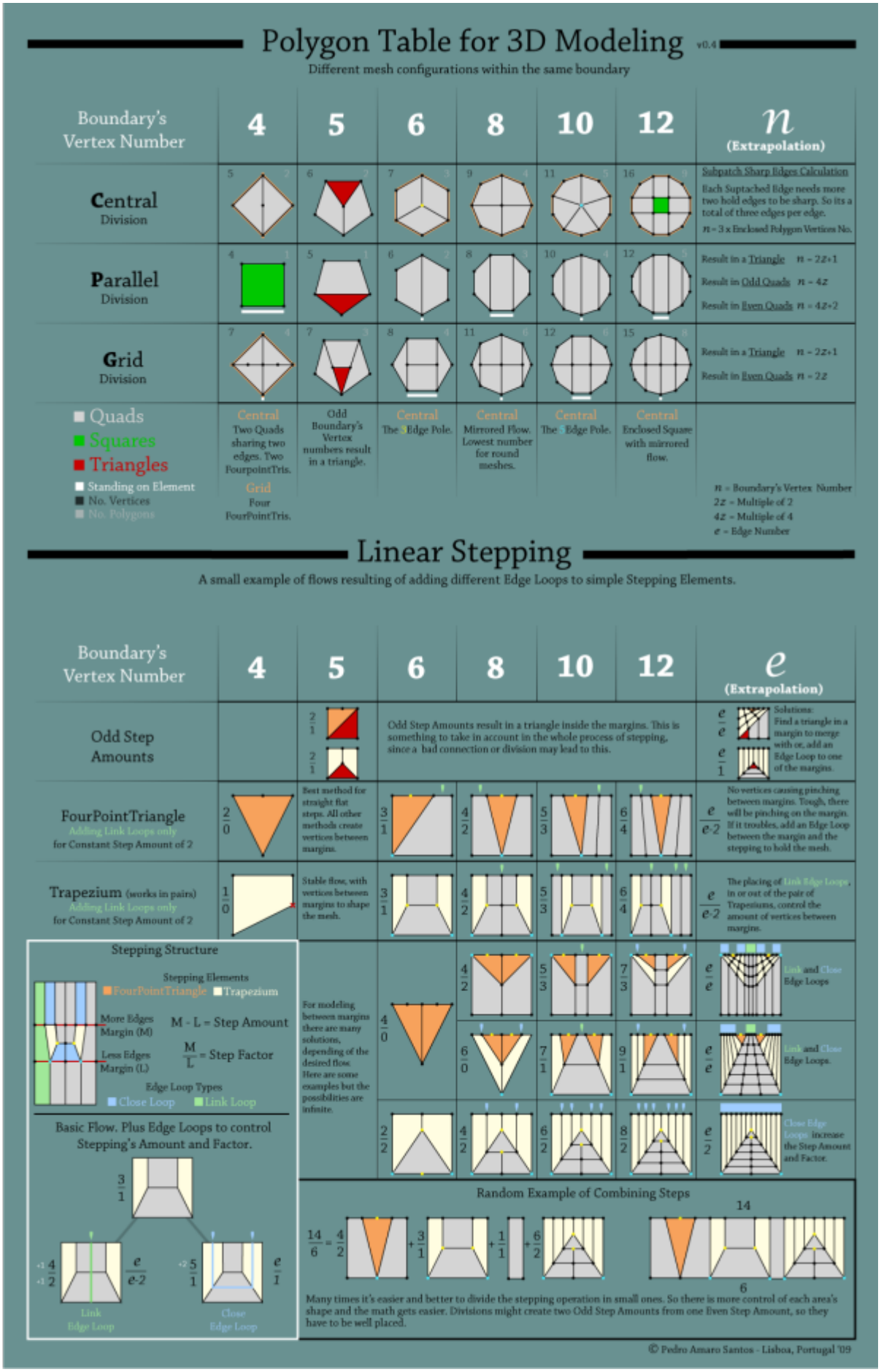
<< Back

Modeling

Opensubdiv Modelling Notes


Polygon Table for 3D Modeling
v0.4
Different mesh configurations within the same boundary
Boundary's Vertex Number
4
5
6
8
10
12
n (Extrapolation)
Central Division
Parallel Division
Grid Division
Subpatch Sharp Edges Calculation
Each Suptached Edge needs more two hold edges to be sharp. So its a total of three edges per edge.
n = 3 x Enclosed Polygon Vertices No.
Result in a Triangle n = 2z+1
Result in Odd Quads n = 4z
Result in Even Quads n = 4z+2
Result in a Triangle n = 2z+1
Result in Even Quads n = 2z
Quads
Squares
Triangles
Standing on Element
No. Vertices
No. Polygons
Central
Two Quads sharing two edges. Two FourpointTris.
Grid
Four FourPointTris.
Odd Boundary's Vertex numbers result in a triangle.
Central
The 3 Edge Pole.
Central
Mirrored Flow. Lowest number for round meshes.
Central
The 5 Edge Pole.
Central
Enclosed Square with mirrored flow.
n = Boundary's Vertex Number
2z = Multiple of 2
4z = Multiple of 4
e = Edge Number
Linear Stepping
A small example of flows resulting of adding different Edge Loops to simple Stepping Elements.
Boundary's Vertex Number
4
5
6
8
10
12
e (Extrapolation)
Odd Step Amounts
Odd Step Amounts result in a triangle inside the margins. This is something to take in account in the whole process of stepping, since a bad connection or division may lead to this.
Solutions: Find a triangle in a margin to merge with or, add an Edge Loop to one of the margins.
FourPointTriangle
Adding Link Loops only
for Constant Step Amount of 2
Best method for straight flat steps. All other methods create vertices between margins.
No vertices causing pinching between margins. Tough, there will be pinching on the margin. If it troubles, add an Edge Loop between the margin and the stepping to hold the mesh.
Trapezium (works in pairs)
Adding Link Loops only
for Constant Step Amount of 2
Stable flow, with vertices between margins to shape the mesh.
The placing of Link Edge Loops, in or out of the pair of Trapeziums, control the amount of vertices between margins.
Stepping Structure
Stepping Elements
FourPointTriangle
Trapezium
More Edges Margin (M)
Less Edges Margin (L)
M - L = Step Amount
M/L = Step Factor
Edge Loop Types
Close Loop
Link Loop
For modeling between margins there are many solutions, depending of the desired flow. Here are some examples but the possibilities are infinite.
Link and Close Edge Loops
Link and Close Edge Loops.
Close Edge Loops increase the Step Amount and Factor.
Basic Flow. Plus Edge Loops to control Stepping's Amount and Factor.
Link Edge Loop
Close Edge Loop
Random Example of Combining Steps
Many times it's easier and better to divide the stepping operation in small ones. So there is more control of each area's shape and the math gets easier. Divisions might create two Odd Step Amounts from one Even Step Amount, so they have to be well placed.
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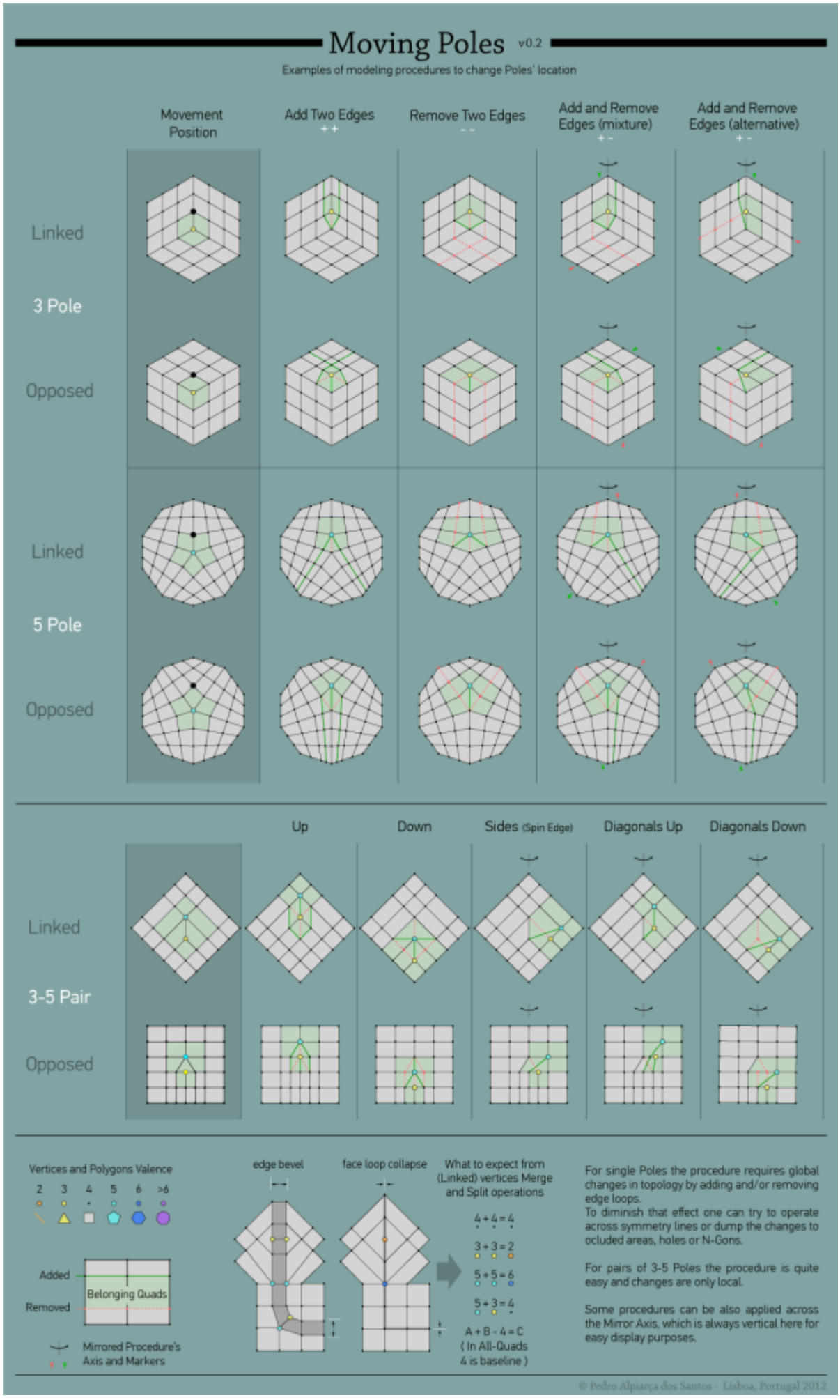
Moving Poles v0.2
Examples of modeling procedures to change Poles' location
Movement Position
Add Two Edges + +
Remove Two Edges - -
Add and Remove Edges (mixture) + -
Add and Remove Edges (alternative) + -
Linked
3 Pole
Opposed
Linked
5 Pole
Opposed
Up
Down
Sides (Spin Edge)
Diagonals Up
Diagonals Down
Linked
3-5 Pair
Opposed
Vertices and Polygons Valence
2 3 4 5 6 >6
Added
Removed
Belonging Quads
Mirrored Procedure's Axis and Markers
edge bevel
face loop collapse
What to expect from (Linked) vertices Merge and Split operations
4 + 4 = 4
3 + 3 = 2
5 + 5 = 6
5 + 3 = 4
A + B - 4 = C
(In All-Quads 4 is baseline)
For single Poles the procedure requires global changes in topology by adding and/or removing edge loops.
To diminish that effect one can try to operate across symmetry lines or dump the changes to ocluded areas, holes or N-Gons.
For pairs of 3-5 Poles the procedure is quite easy and changes are only local.
Some procedures can be also applied across the Mirror Axis, which is always vertical here for easy display purposes.
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