Loop Subdivision

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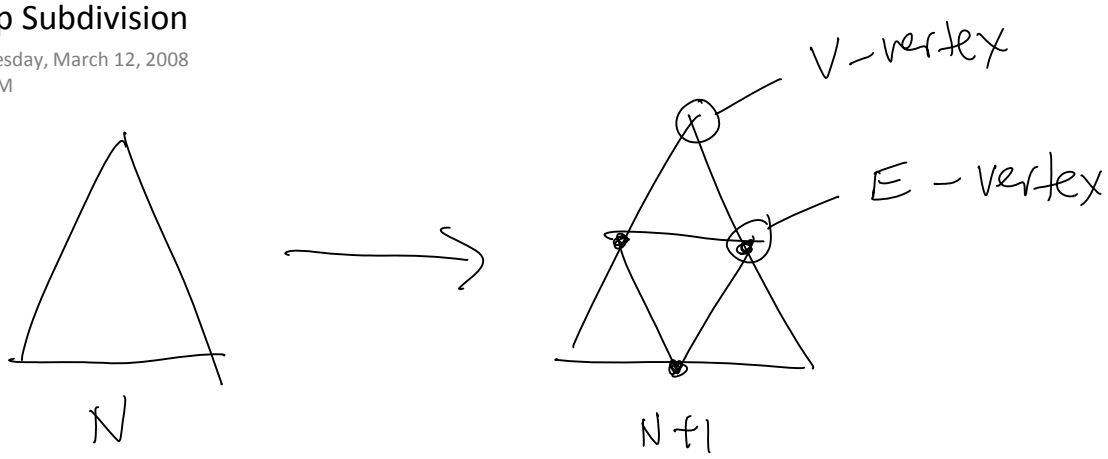


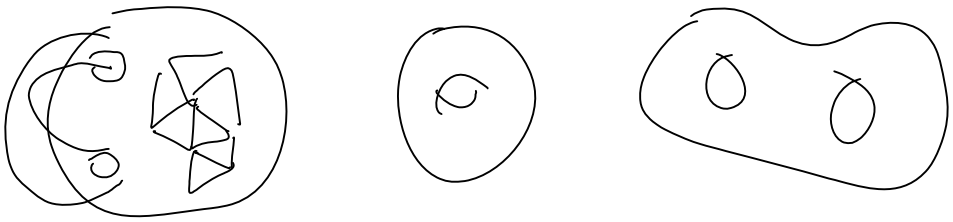
V vertices
E edges
F faces

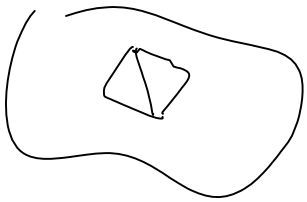
V+E
2E+3F
4F

Euler formula

$V-E+F \simeq 2(1-G)$

$(V+E)-(2E+3F)-4F =$
$V-E+F$

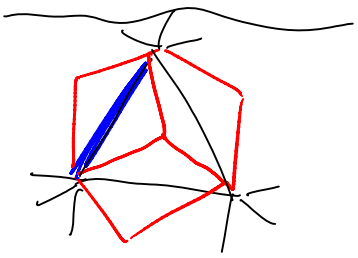




V
E
F

V-1
E-3
F-2

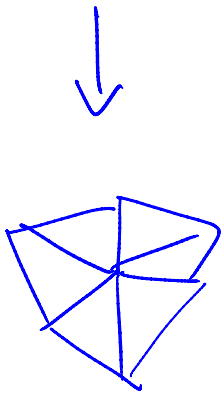
$(V-1)-(E-3)+(F-2) =$
$V-E+F$



$3F = 2E$ for manifold without bdry

$V-E+F = V-\frac{1}{2}F \simeq 0$

$\sqrt{3}$



$\frac{3}{2}F$

Euler Formula with Boundary

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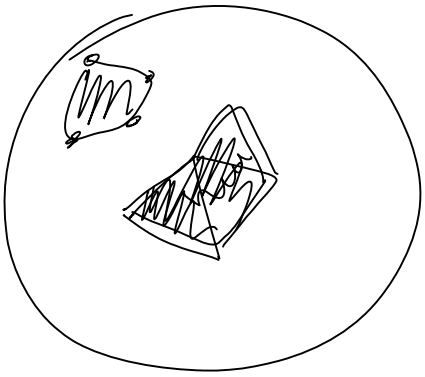
Euler Formula with Boundary

B

$V - E + F = 2$



V

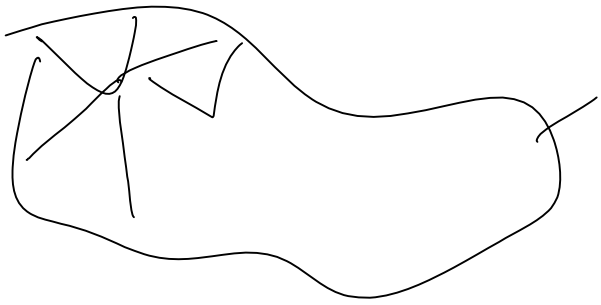
$E-2$

$F-3$

$V-(E-2)+(F-3) =$

$V-E+F+(2-3) = 1$

$V-E+(F+B) = 2(1-6) \leftarrow$



Disk

$V-E+F=1$

Regular Triangular Meshes

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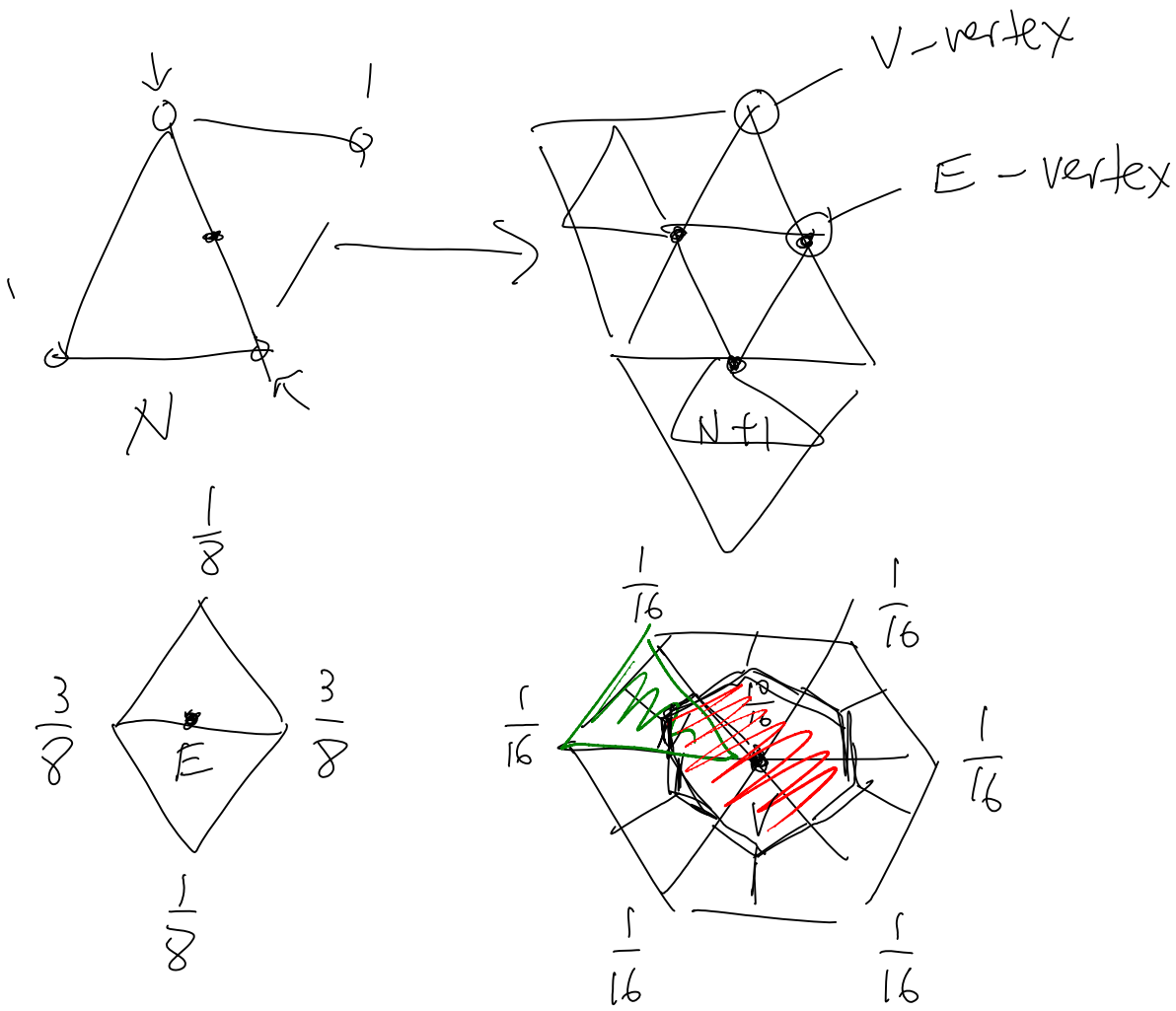
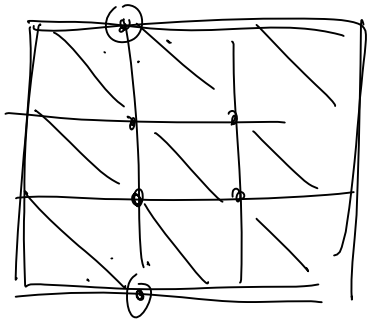
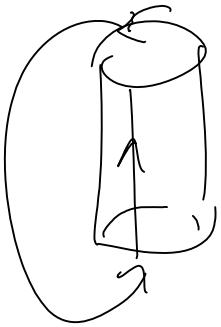


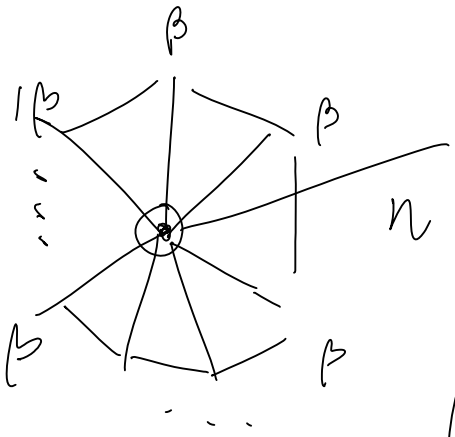
$$V - E + F = 2(1 - G)$$

$$V - \frac{1}{2}F = 0 \Rightarrow G = 1$$

$$\begin{cases} 6V = 3F \\ V = \frac{F}{2} \end{cases}$$







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

$$\beta = \begin{cases} \frac{3}{8n} & n > 3 \\ \frac{3}{16} & n = 3 \end{cases}$$