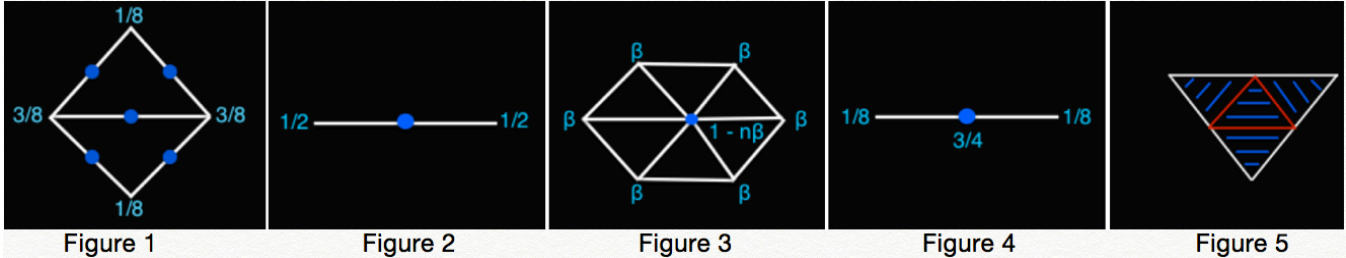


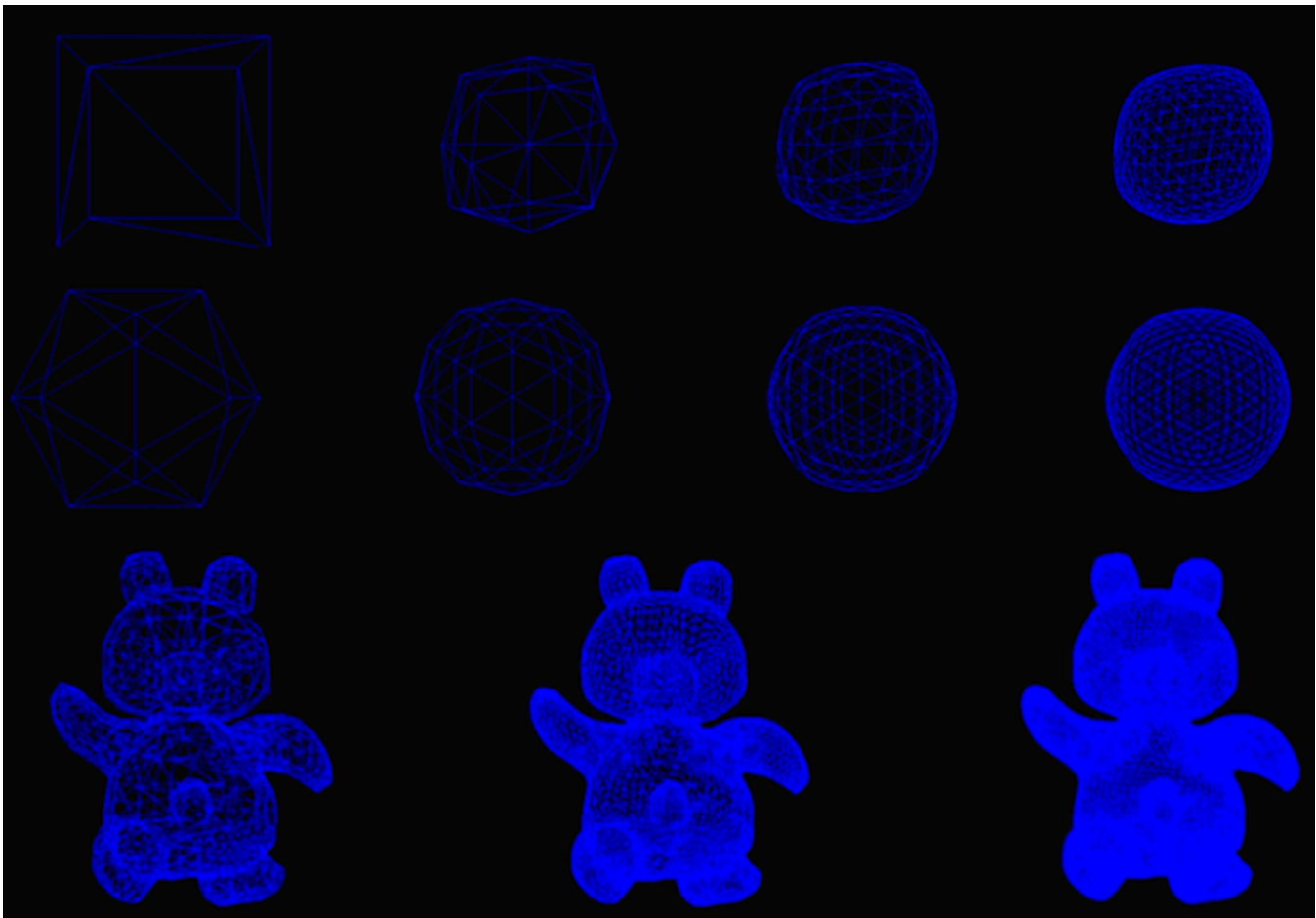
## Subdivision

Subdivision algorithms generate smooth well defined surfaces from coarse input meshes through an iterative refinement process that smooths the mesh while increasing its polygon count. The shape of the output mesh depends on the subdivision algorithm used. The Catmull-Clark subdivision scheme is used widely to smooth quad meshes while the loop subdivision algorithm is generally used for triangle meshes.



The loop subdivision algorithm works as follows:

1. For every interior edge in the source mesh, create a new vertex whose position is determined as a linear combination of its four surrounding vertices (Figure 1). For boundary edges, the new vertex's position is the average position of an edge's vertices (Figure 2).
2. Update the position of every interior vertex in the source mesh as in Figure 3. If the number of neighboring vertices  $n = 3$ ,  $\beta = 3 / 16$ . Else  $\beta = 3 / 8n$ . For boundary vertices, update it as in Figure 4.
3. Split every triangle in the source mesh into four new triangles created from the vertices in 1. and 2. (Figure 5)



Implementation: <https://github.com/rohan-sawhney/subdivide>