

《计算机辅助几何设计》作业

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1. Implement the Loop subdivision algorithm for triangle mesh. Given a low-resolution triangle mesh, use the Loop subdivision algorithm to perform multiple subdivisions to obtain a high-resolution smooth mesh.

1 Algorithm

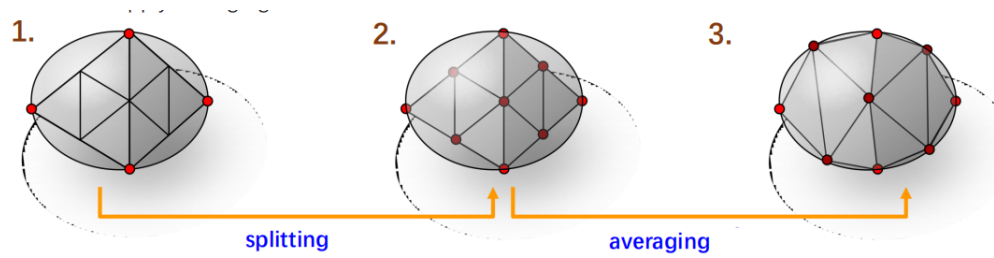


图 1

We use 1:4 triangular splits.

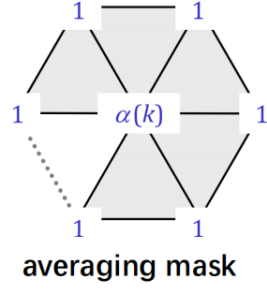


图 2

Neighbouring points and points to be updated are weighted as above when updating the position of the point, k is the number of neighbours of points. The $\alpha(k)$ and $\beta(k)$ are defined as follows:

$$\alpha(k) = \frac{k(1 - \beta(k))}{\beta(k)}$$

$$\beta(k) = \frac{5}{4} - \frac{(3 + 2\cos(\frac{2\pi}{k}))^2}{32}$$

noting that the last normalisation is performed.

2 Result

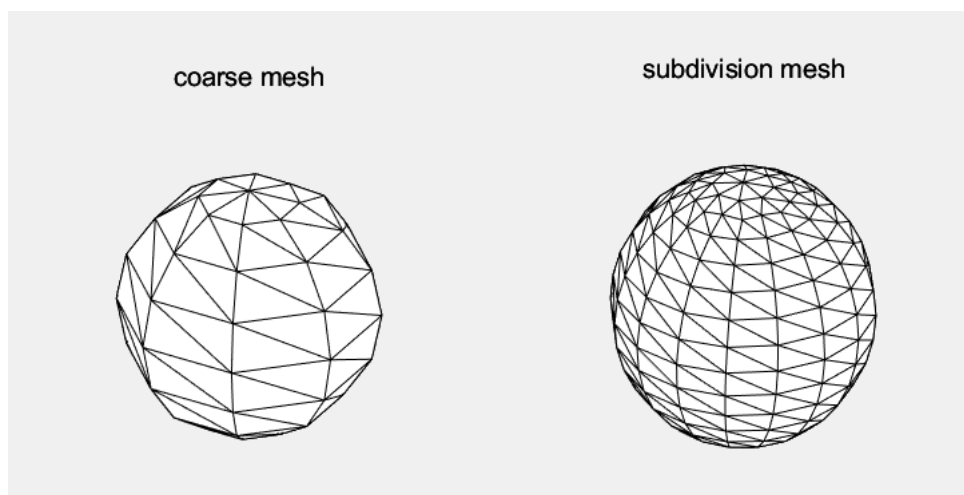


图 3: $\text{loop} = 1$

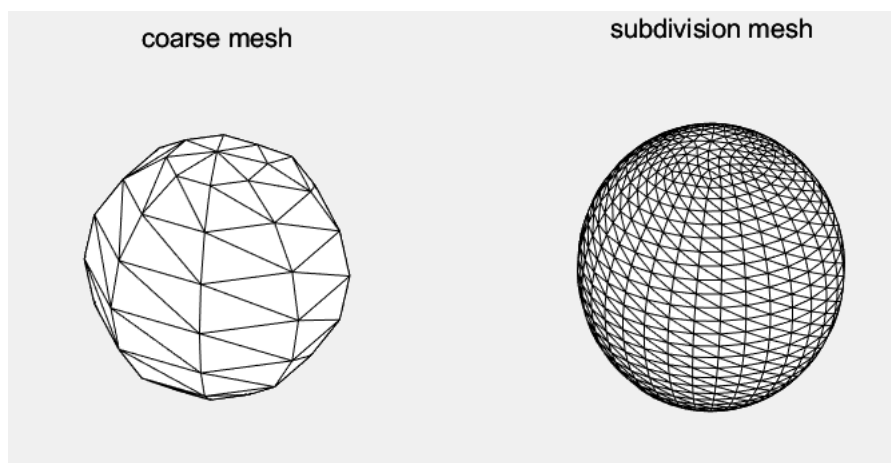


图 4: $\text{loop} = 2$

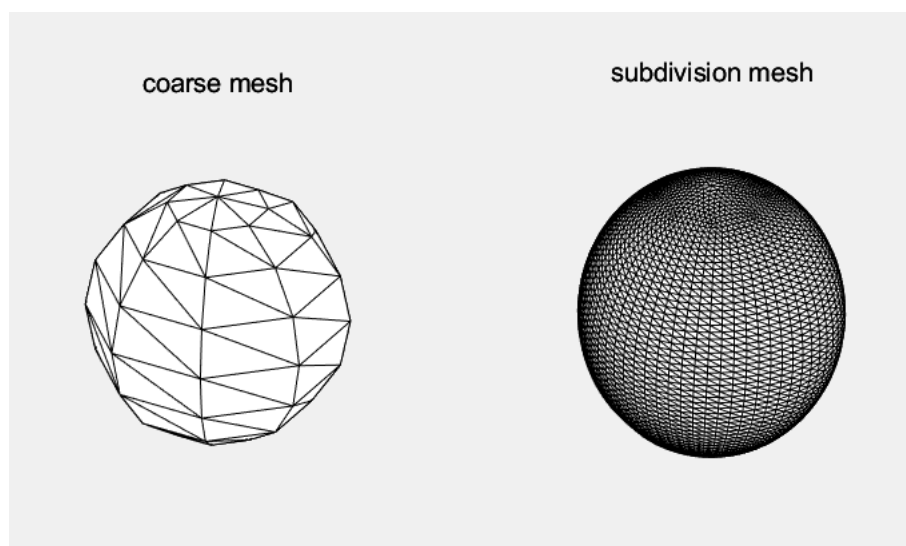


图 5: $\text{loop} = 3$