Dark energy and the tessellated 3-sphere

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Abstract

The tessellation of space is considered for both the 2-sphere and the 3-sphere. As hypothesized in an earlier work, it is found that there is a dark energy associated with the 3-sphere, but not the 2-sphere.

1 Tessellations without and with dark energy

For a method of calculating the curvature of triangle meshes and tetrahedra meshes, please see [1]. Unlike in [1], the tessellations in this paper will rely on psuedorandomly placed vertices, rather than the vertices placed by Marching Cubes and Marching Hypercubes.

It is found that for a tessellated 2-sphere, the local curvature vanishes when the tessellation is made up of finer and finer triangles. That is, the more vertices used in the tessellation, the less the local curvature is. See Fig. 1 for a tessellated 2-sphere, made up of triangles. There is no dark energy because of this vanishing curvature.

On the other hand, it is found that for a tessellated 3-sphere, the local curvature does *not* vanish when the tessellation is made up of finer and finer tetrahedra. The curvature settles around $K = 0.284$. Where curvature is proportional to energy,

$$K \propto E, \tag{1}$$

there is a dark energy because of this non-vanishing curvature. See Fig. 2 for a 3-sphere edge length histogram, where Vertex Count $= 1,000,000$. See Table 1 for a list of properties of the histograms where Vertex Count is variable.

References

[1] Halayka, S. (2020) "The curvature and dimension of a closed surface". `https://vixra.org/abs/1812.0423`

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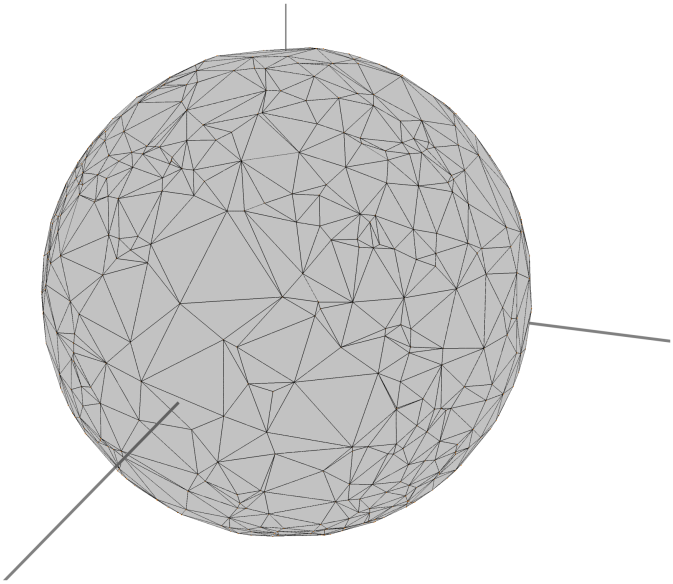

Figure 1: 2-sphere, where Vertex Count $= 1,000$.

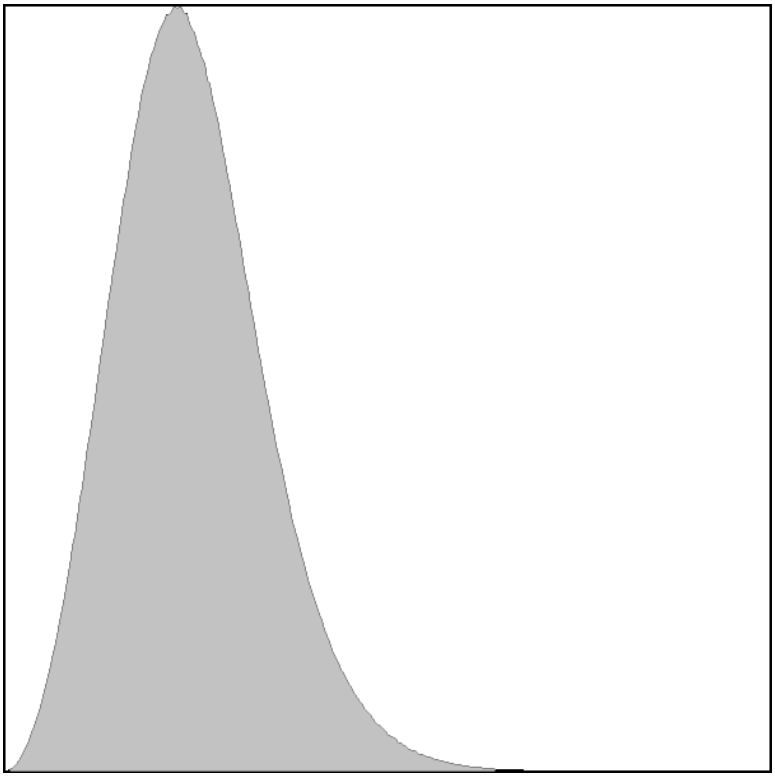

Figure 2: 3-sphere edge length histogram, where Vertex Count $= 1,000,000$. Max $= 0.0565194$, mode $= 0.012455$. curvature K $= 0.28452$.

Vertex Count	K	Max	Mode	Max / Mode
1,000	0.29473	0.405105	0.132555	3.05612
10,000	0.28821	0.215664	0.0619268	3.48256
100,000	0.28413	0.113452	0.0268951	4.21831
1,000,000	0.28452	0.0565194	0.012455	4.53788

Table 1: Properties of the histograms where Vertex Count is variable.