Generating equilateral random polygons in confinement III

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Abstract

In this paper we continue our earlier studies on the generation methods of random equilateral polygons confined in a sphere. The first half of the paper is concerned with the generation of confined equilateral random walks. We show that if the selection of a vertex is uniform subject to the position of its previous vertex and the confining condition, then the distributions of the vertices are not uniform, although there exists a distribution such that if the initial vertex is selected following this distribution, then all vertices of the random walk follow this same distribution. Thus in order to generate a confined equilateral random walk, the selection of a vertex cannot be uniform subject to the position of its previous vertex and the confining condition. We provide a simple algorithm capable of generating confined equilateral random walks whose vertex distribution is almost uniform in the confinement sphere. In the second half of the paper we show that any process generating confined equilateral random walks can be turned into a process generating confined equilateral random polygons with the property that the vertex distribution of the polygons approaches the vertex distribution of the walks as the polygons get longer and longer. In our earlier studies, the starting point of the confined polygon is fixed at the center of the sphere. The new approach here allows us to move the the starting point of the confined polygon off the center of the sphere.

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