Generating equilateral random polygons in confinement II

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Abstract

In this paper we continue an earlier study on the generation algorithms of random equilateral polygons confined in a sphere. Here, the equilateral random polygons are rooted at the center of the confining sphere and the confining sphere behaves like an absorbing boundary. One way to generate such a random polygon is the accept/reject method in which an unconditioned equilateral random polygon rooted at origin is generated. The polygon is accepted if it is within the confining sphere, otherwise it is is rejected and the process is repeated. The algorithm proposed in this paper offers an alternative to the accept/reject method, yielding a faster generation process when the confining sphere is small. In order to use this algorithm effectively, a large, reusable data set needs to be pre-computed only once. We derive the theoretical distribution of the given random polygon model and demonstrate, with strong numerical evidence, that our implementation of the algorithm follows this distribution. A run time analysis and a numerical error estimate are given at the end of the paper.

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