

ON THE MEAN AND VARIANCE OF THE  
WRITHE OF RANDOM POLYGONS

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**Abstract**

In this paper, we study two issues concerning the writhe of a random polygon. Suppose that we are dealing with a set of random polygons with the same length and knot type (which could be the model of some circular DNA with the same topological property) and would like to know whether the corresponding knot type is chiral or not, then a simple way of detecting this is to compute the mean writhe of these polygons. A nonzero writhe would imply the chirality of the knot type of these polygons. However, how feasible is this method? If the mean writhe would decrease to zero as the length of the polygons increases, then this method would be limited in the case of long polygons. We conjecture that this is not the case and show the support of this conjecture through numerical studies. The second part of our study focuses on the variance of the writhe, a problem that has not received much attention in the past. In this case, we focused on the equilateral random polygons. We give numerical as well as analytical evidence that shows the variance of the writhe of equilateral random polygons (of length  $n$ ) behaves as a linear function of the length of the equilateral random polygon.

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