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Monte Carlo Sampling of Self-Avoiding Walks and Polygons

A Monte Carlo method for sampling self-avoiding walks and polygons is presented. The method (GAS, for Generalised Atmospheric Sampling), samples polygons or walks along weighted sequences by implementing elementary moves generated by the positive, negative and neutral atmospheric statistics of the polygons or walks. GAS is a self-tuning algorithm which samples from uniform distributions over lengths of polygons and walks in an interval $[0, n_{\max}]$ - this implementation is called "flatGAS" (flat histogram GAS).

In the case of polygons, states along a sequence realised by GAS are weighted such that the average weight of states of length n edges is proportional to p_n (the number of polygons of length n). Hence, GAS is an approximate enumeration method, and I shall present data estimating the numbers of cubic lattice polygons of specified knot type.