Preferential Attachment Coarse Projective Integration

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Introduction

The preferential attachment model, detailed in [**?**], was implemented in C++. The system naturally converges to a limiting "graphon" (see [**?**]), and, in order to increase the rate of convergence, coarse projective integration was implemented. This brief outlines the model dynamics and reviews current simulation progress.

Preferential Attachment Model

The initial state of the preferential attachment model is an Erdős-Rényi random graph with n vertices and $m \sim O(n^2)$ edges. The system evolves as a discrete-time Markov chain, in which the following actions are performed during each step:

1. An edge e_{old} is chosen uniformly at random from the set of all possible edges, $E(G)$.

2. A vertex end of e_{old}, v_1 is chosen uniformly from the two ends.

3. e_{old} is removed from the graph, and a vertex v_2 is chosen from $V(G)$ with a probability determined based on linear preferential attachment:

$$P(v_2 = v_i) = \frac{deg(v_i) + \kappa}{2m + n\kappa}$$