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A distributed algorithm for finding Hamiltonian cycles in random graphs in $O(\log n)$ time.


Summary: It is known for some time that a random graph $G(n, p)$ contains w.h.p. a Hamiltonian cycle if $p$ is larger than the critical value $p_{crit} = (\log n + \log \log n + \omega_n)/n$. The determination of a concrete Hamiltonian cycle for $G(n, p)$ is a nontrivial task, even when $p$ is much larger than $p_{crit}$. In this paper we consider random graphs $G(n, p)$ with $p$ in $\Omega(1/\sqrt{n})$, where $\Omega$ hides poly-logarithmic factors in $n$. For this range of $p$ we present a distributed algorithm $A_{HC}$ that finds w.h.p. a Hamiltonian cycle in $O(\log n)$ rounds. The algorithm works in the synchronous model and uses messages of size $O(\log n)$ memory per node.

MSC:

68R10 Graph theory (including graph drawing) in computer science
05C38 Paths and cycles
05C45 Eulerian and Hamiltonian graphs
05C80 Random graphs (graph-theoretic aspects)
68W15 Distributed algorithms
68W40 Analysis of algorithms

Keywords:
distributed algorithm; Hamiltonian cycle; random graph

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References:

[1] Levy, E.; Louchard, G.; Petit, J., A distributed algorithm to find Hamiltonian cycles in $\langle G(n, p) \rangle$ random graphs, (Proc. First Int. Conf. on Combinatorial and Algorithmic Aspects of Networking (2005), Springer), 63-74


