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A linear-size conversion of HCP to 3HCP. (English) Zbl 1321.05144

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Summary: We provide an algorithm that converts any instance of the Hamiltonian cycle problem (HCP) into a cubic instance of HCP (3HCP), and prove that the input size of the new instance is only a linear function of that of the original instance. This result is reminiscent of the famous SAT to 3SAT conversion by *R. M. Karp* [*Kibern. Sb., Nov. Ser.* 12, 16–38 (1975); translation from *Complexity of Computer Computations 1972*, Plenum Press, New York, 85–103 (1973; [Zbl 0366.68041](#))]. Known conversions from directed HCP to undirected HCP, and sub-cubic HCP to cubic HCP are given. We introduce a new subgraph called a 4-gate and provide a procedure that converts any sub-quartic instance of HCP to a sub-cubic instance. Finally, we describe a procedure to convert any graph to a sub-quartic graph, and use the previous results to provide an algorithm which converts HCP to 3HCP with only linear growth in the instance size.

MSC:

[05C45](#) Eulerian and Hamiltonian graphs

[05C85](#) Graph algorithms (graph-theoretic aspects)

Cited in 1 Document

Keywords:

Hamiltonian cycle problem; sub-quartic graph

Software:

GENREG

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