Hamiltonian Circuit

Rakibul Islam [1]
Mrittunjay Roy [1]

[1]Department of CSE,BUET

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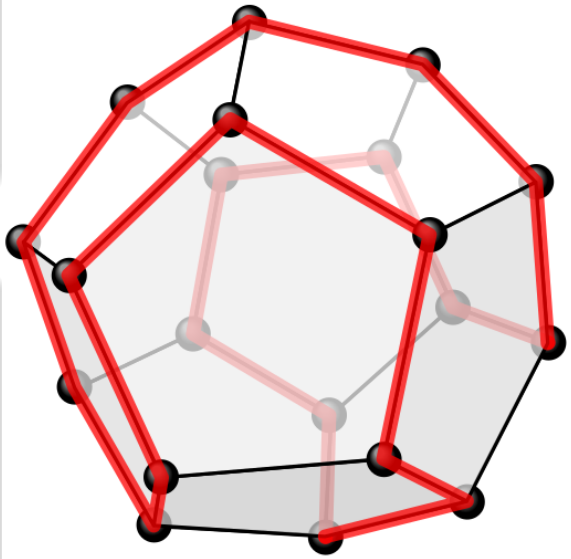
What is Hamitonian Cycle?

Cycle

In graph theory, a cycle is a path of edges and vertices wherein a vertex is reachable from itself.

Hamiltonian Circuit

A Hamiltonian circuit,also known as Hamiltonian cycle, is a cycle that visits each vertex exactly once (except for the vertex that is both the start and end, which is visited twice).



History

- The Hamiltonian cycle is named after Sir William Rowan Hamilton.
- He devised a puzzle in which such a path along the polyhedron edges of an dodecahedron was sought (the Icosian game).
- The Icosian Game was invented in 1857.
- The Icosian game is the problem of finding a Hamiltonian cycle along the edges of an dodecahedron, i.e., a path such that every vertex is visited a single time, no edge is visited twice, and the ending point is the same as the starting point.
- Hamilton sold it to a London game dealer in 1859 for 25 pounds.
- the game was subsequently marketed in Europe in a number of forms (Gardner 1957).

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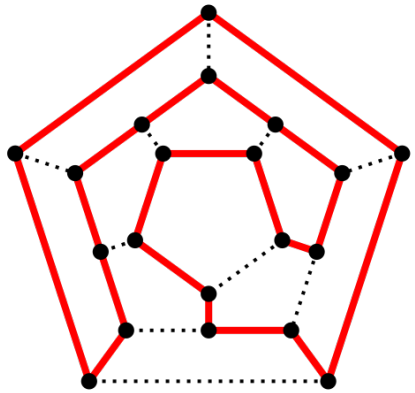
Hamiltonian Graph

Definition

A graph that contains a Hamiltonian cycle is called a Hamiltonian graph.



Hamiltonian Graph

Does every graph has a Hamiltonian Cycle?

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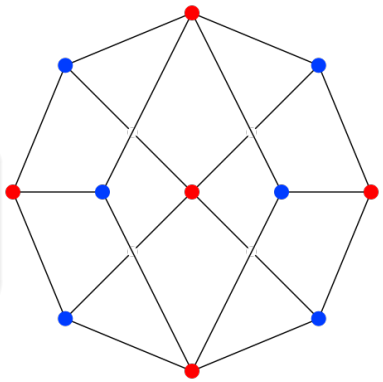
Caution

Not every graph is a Hamiltonian graph.



Finding Hamiltonian Cycle in Graphs

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- So,the only known way to determine whether a given general graph has a Hamiltonian cycle is to undertake an exhaustive search.

Algoritms

Algorithm of Martello

A brute force algorithm.Tests n! different sequences of vertices that might be Hamiltonian paths in a given n-vertex graph.

Algoritms

Algorithm of Rubin

A search procedure that divides the edges of the graph into three classes: those that must be in the path, those that cannot be in the path, and undecided. As the search proceeds, a set of decision rules classifies the undecided edges, and determines whether to halt or continue the search.

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Algorithm of Bellman,Held and Karp

A dynamic programming algorithm that can be used to solve the problem in time $O(n^2\ 2^n)$.

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Any Questions?