THE DEFERRED SOLUTIONS SCHEME FOR THE PROBLEM OF FINDING A HAMILTONIAN CYCLE SOLVING

Prokopenkov V.P., Kozhyn Y.N.
National technical university «Kharkiv polytechnic institute», Kharkiv

The problem of finding a Hamiltonian cycle on a graph belongs to the complexity class NP. The failure to develop a polynomial method for solving this problem is explained by the inability to formulate the conditions for finding the optimal solution.

The main way to find the optimal solution is to iterate through the possible solutions. Possible solutions can be constructed by using graph traversal algorithm, but the factorial cost requires reducing the enumeration space, for example, using the branch and bound method. This method is based on an ordered search of acceptable solutions and considering only promising partial solutions to find the optimal one, and discarding at once entire sets of solutions that are not such. For the method to work, a function of the cost of partial solutions must be defined which depending on certain parameters, which is difficult (or impossible) for the problem under consideration.

At the same time, if the function generates a probabilistic estimate, there is a high risk of losing the optimal solution of the problem when discarding.

The only reliable estimate for a valid solution is the length of the cycle, which, unfortunately, becomes known after its complete formation.

As a way out, a new scheme of deferred solutions is proposed, in which all possible partial solutions that can be completed are constructed at the same time and sequentially and storing.

Each partial solution is characterized by its own estimate – the length of the path already constructed.

At each step, we'll trying to continue the current partial solution (the original partial solution includes one initial vertex) by adding a vertex to it, to which we can go from its last vertex.

As a result, we build as many new partial solutions as there are options for moving from the last vertex of the current partial solution.

The generated new partial solutions are saved, and the original worked-out solution is deleted. To perform the next step of the algorithm, which constructed partial solution that has the lowest estimate, is selected, and the execution of the scheme continues until the desired optimal solution is constructed.

In such a scheme, only one optimal solution will be built until the end, and the scheme completely eliminates the loss of the optimal solution when discarding.

The scheme has a significant drawback – high costs for storing partial solutions. The possible memory costs can be justified by a significant reduction in the time that spent on finding the optimal solution.