

INVESTIGATION OF THE DEFERRED SOLUTIONS METHOD FOR HAMILTONIAN CYCLE FINDING

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The problem of finding a Hamiltonian cycle on a graph belongs to the NP class of complexity and still retains itself interest. A guaranteed way to obtain an optimal solution is to iterate over all valid solutions. For a graph of n vertices, the size of the iteration space is $(n - 1)!$. With a large n , the time spent on searching is unacceptably large.

In [1], a method for solving the problem is proposed, which involves the simultaneous construction of all possible solutions to the problem. Solutions are built sequentially step by step and stored as partial solutions in the deferred solutions queue. Each partial solution is characterized by its own estimate. At each step, a partial solution with the best estimate is selected from the queue. As many new partial solutions are built from it as there are transition options from its last vertex. As a result of applying the algorithm, only one complete solution is constructed, which should be optimal. By discarding unpromising partial solutions, the search time is significantly reduced. The real path length is used as an estimate of partial solutions.

For an incomplete graph of 20 vertices, the optimal solution was found in 0.005 minutes, but for a complete graph of 20 vertices, the search time was commensurate with the time of sorting through all possible solutions to the problem. The conducted research and analysis of the algorithm have shown that the path length as an estimate is logically justified and allows you to find the optimal solution, but does not always guarantee the minimum time spent on its search.

The reason is that when enumeration through the space of acceptable solutions, a breadth-first search scheme is worked out, which entails the construction of almost all acceptable solutions to the problem. It is this fact that explains the different time spent on finding the optimal solution – the cardinalities of the sets of admissible solutions for incomplete and complete graphs differ significantly.

As an alternative, another estimate is considered – the path length of the partial solution, measured in the arcs of the graph. Using this estimate leads to an enumeration of solutions to the problem in depth. This estimate reduces the time to find a solution, but does not guarantee an optimal result.

For the successful application of the method, it is necessary to develop a new estimate of partial solutions that would combine the qualities of the considered ones.

References:

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