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MODIFICATION OF ANT COLONIES ALGORITHM FOR SOLVING THE PROBLEM OF AUTOMATION SCHEDULING

Discrete optimization problems arise in various branches of science and industry. In their general formulations, most of these problems are difficult to solve, and many of them are NP - complex. This means that today there are no exact algorithms of polynomial complexity for solving such problems, and the existing exact algorithms are somehow reduced to a complete list of options. Thus, it is **important** and **actual** to develop effective approaches to find approximate solutions to such problems, taking into account the level of software development and the ideology of parallel computing.

Formulation of the problem. We consider a strongly NP-hard deterministic problem. Providing the construction of an optimal service schedule for a set of requests on one server with a criterion for minimizing the total weighted tardiness problem (SMTWTP) [1]. This combinatorial optimization problem arises in areas such as planning, resource allocation, routing, transportation, etc. [2]. A general medical institution was chosen as the subject area; the process of managing the medical process is subject to automation. Given the current medical problems associated with the COVID-19 pandemic, this task is highly relevant.

To **solve** this problem, a modification of the ant colony algorithm was used. Given a bipartite graph G = (X, Y, E) with vertices of the investigation relations. It is necessary to find the largest pair that determines the schedule of procedures prescribed to patients.

The ant in this algorithm acts as a software agent, which has a set of defined simple rules of conduct when finding a path on a graph. These rules, first of all, include a ban on revisiting the vertices of the graph. This is implemented by a taboo list. All edges of the initial bipartite graph for ants have the same length (weight). In addition, the ant must remember the path traveled, taking into account the order of visiting the vertices of the graph. This path, usually implemented in the form of a list, is used in the subsequent stages of the algorithm.

The size of the ant population (AP) should be a multiple of | Y | - the power of the set of vertices of the graph corresponding to the procedures assigned to patients

PM = D * \ Y \

where D is the coefficient of proportionality.

Thus, in each vertex of the graph corresponding to the procedure assigned to the patient, there should initially be one ant, or two ants in each, and so on.

Conclusions. The developed modification of the ant algorithm at all its stages (formation of the initial population, movement of the next ant, analysis of found ways, enzyme evaporation procedure, restart and conditions of algorithm completion) confirmed the possibility and adequacy of heuristic algorithms to solve the formulated problem. The software implementation is made using MySQL DataBase, collective exchange functions MPI_Bcast, MPI_Allreduce, MPI_Reduce.

References

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