Task 6. Algorithms on graphs. Path search algorithms on weighted graphs

Goal

The use of path search algorithms on weighted graphs (Dijkstra's, A* and Bellman-Ford algorithms).

Problems and methods

I. Generate a random adjacency matrix for a simple undirected weighted graph of 100 vertices and 2000 edges with assigned random positive integer weights (note that the matrix should be symmetric and contain only 0s and weights as elements). Use Dijkstra's and Bellman-Ford algorithms to find shortest paths between a random starting vertex and other vertices. Measure the time required to find the paths for each algorithm. Repeat the experiment 10 times for the same starting vertex and calculate the average time required for the paths search of each algorithm. Report and analyse the results.

II. Generate a 10x10 cell grid with obstacles (in total 30 cells). Choose two random non-obstacle cells and find a shortest path between them using A* algorithm. Repeat the experiment 10 times with different random pair of cells. Report and analyse the results.

Comments

Use any programming language you want. You may use existing implementations of the algorithms. The findings and the plots should be informative and correct.

The report should be a pdf-document containing

- Task number and its topic, your group name, your name and surname, the report date;
- code of your programs required values and graphs, as well as analysis of the results.

Reports must be sent to chunaev@itmo.ru no later than three weeks after the task is given in English. Use the following format for the email subject: Task #, Name Surname, Group.