

LAB GUIDE. SESSION 7

GOALS:

- Branch and bound algorithms

1. Working with graphs

These graphs have the same characteristics as those in the previous lab 6, and the problem to be solved is the same: **calculating the first simple path between a source node (e.g., 0) and a destination node (e.g., n-1), passing through all nodes, with a predetermined target cost (e.g., 0) and an allowed tolerance (e.g., 99).**

In the previous lab, the solution (and corresponding time) was obtained using backtracking, which we now aim to significantly improve. To this end, we propose developing the problem's state tree following a **branching heuristic** whose objective is to find the desired path as quickly as possible.

YOU ARE REQUESTED TO:

PART A:

Explain what the proposed **branching heuristic** consists of.

PART B:

A class **NullPathBB.java** (expecting as a parameter **n**). Initially, this class will randomly generate (for **n** nodes) a weight matrix according to the conditions stated above, then it will calculate and write the first **NullPath** found.

PART C:

A class **NullPathTimesBB.java**. It will grow in graph size like this: (**n = 20, 25, 30, 35, ...**, until you lose patience).

For each **n**, 100 random weight matrices will be generated and for each of them the time will be calculated and accumulated, so that at the end the average time will be calculated and written (**t_accumulated/100**).

PART D:

Finally, fill in a table showing the average times obtained (in milliseconds) for the sizes indicated in the previous step. Comparing these times with those obtained in the previous lab, conclude to what extent the desired objective was achieved (significantly reducing the execution time required to obtain the solution).

2. Work to be done

- An `algstudent.s7` **package** in your course project. The content of the package should be the Java files used and created during this session.
- A `session7.pdf` **document** using the course template (the document should be included in the same package as the code files). You should create one activity each time you find a “YOU ARE REQUESTED TO” instruction.

Deadline: The delivery of this lab will be carried out, in time and form, according to the instructions given by the lab teacher.
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