UNIVERSITY of INFORMATION TECHNOLOGY and MANAGEMENT in Rzeszow, POLAND

Project

Implementing Graphs Algorithms

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Class:	**Field of study**:
Algorithms and Data Structures	Programming

Rzeszów 2021

Content

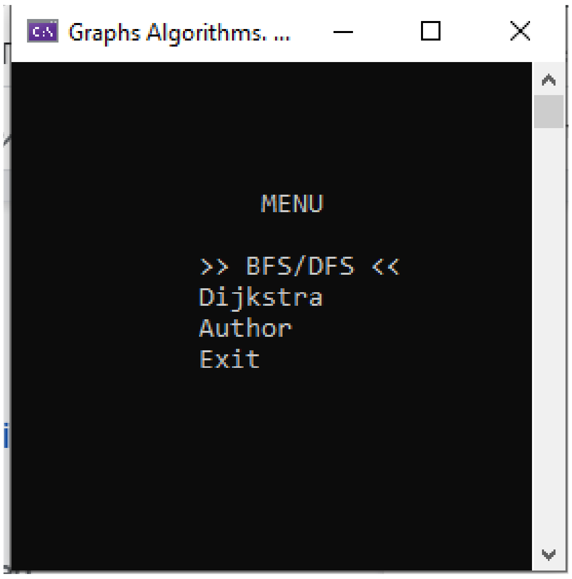
Short description

In this project, the following graphs algorithms will be implemented:
- BFS
- DFS
- Dijkstra (finding the shortest path).

The project is broken into 4 folders:
- “1_sources” containing all project files.
- “2_exe” containing the GraphsAlgorithms.exe file.
- “3_example_data” – empty.
- “4_description” containing short description of the project.

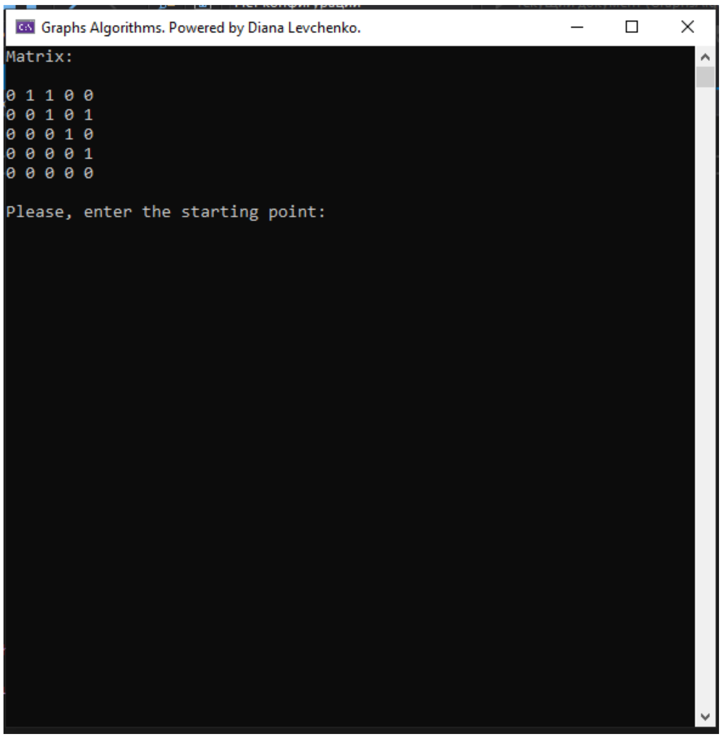
To launch the program:

- open GraphsAlgorithms.exe file in the “2_exe” folder.

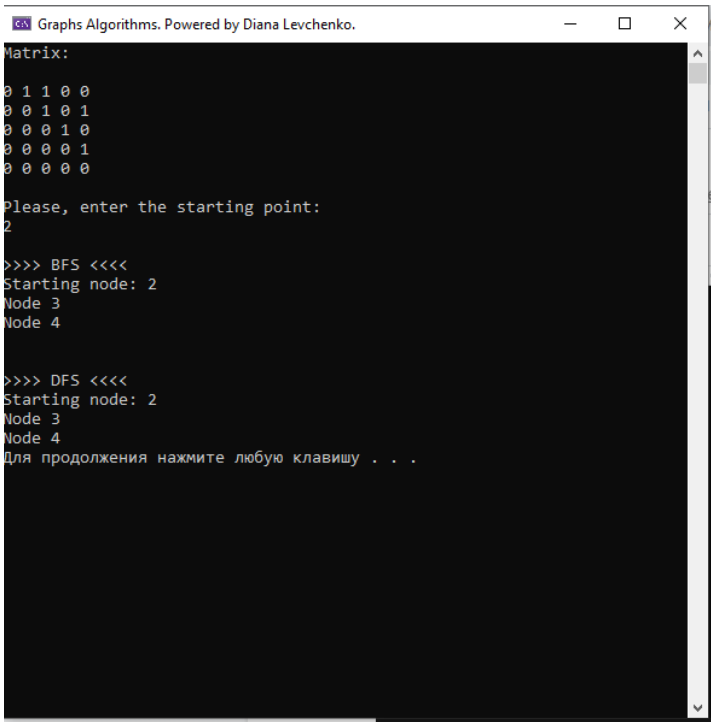


```
        MENU

    >> BFS/DFS <<
    Dijkstra
    Author
    Exit
```

- choose the algorithm tested. There will be four proposed tests for both BFS and DFS algorithms, which will be randomly chosen by the program. Enter the starting point to test the algorithms.

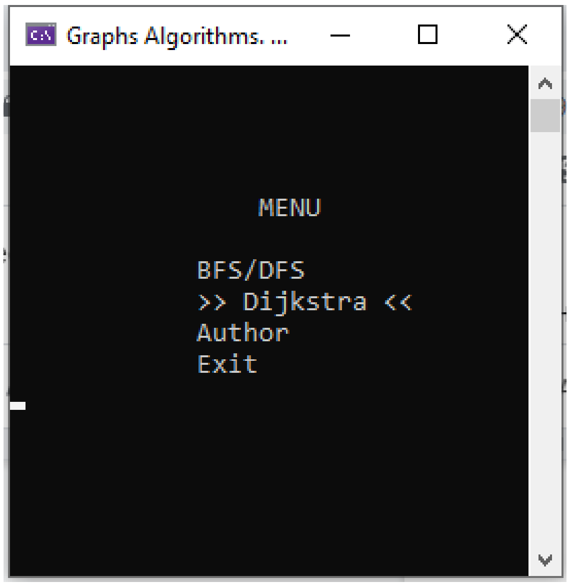


```
Matrix:

0 1 1 0 0
0 0 1 0 1
0 0 0 1 0
0 0 0 0 1
0 0 0 0 0

Please, enter the starting point:
```

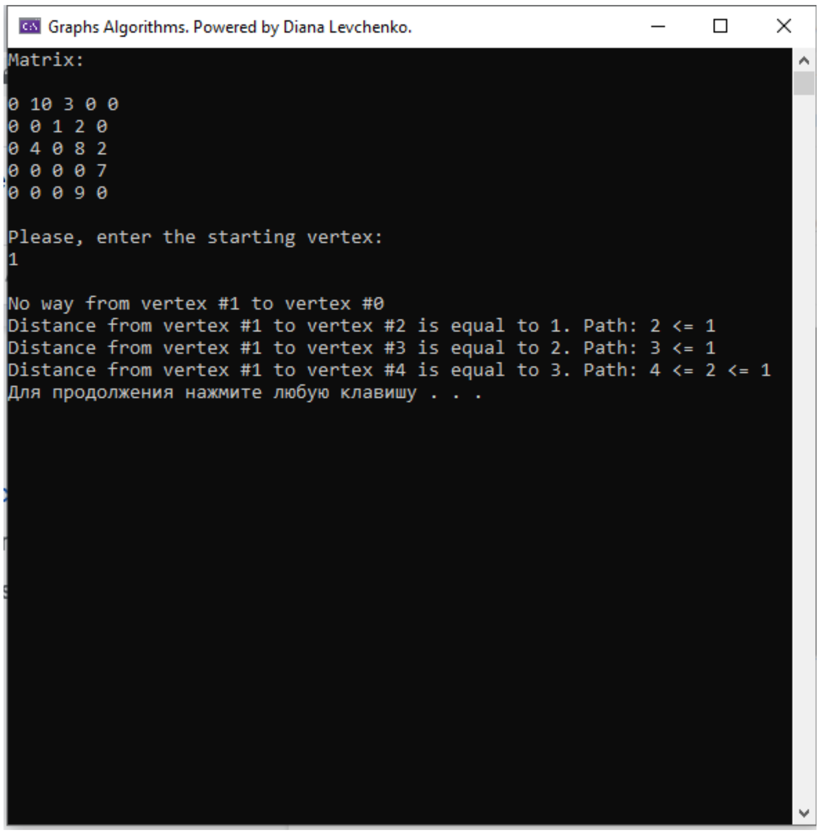


```
Matrix:

0 1 1 0 0
0 0 1 0 1
0 0 0 1 0
0 0 0 0 1
0 0 0 0 0

Please, enter the starting point:
2

>>>> BFS <<<<
Starting node: 2
Node 3
Node 4


>>>> DFS <<<<
Starting node: 2
Node 3
Node 4
Для продолжения нажмите любую клавишу . . .
```

Having implemented the algorithms, the program will return to the Menu, where one may continue testing the algorithms:

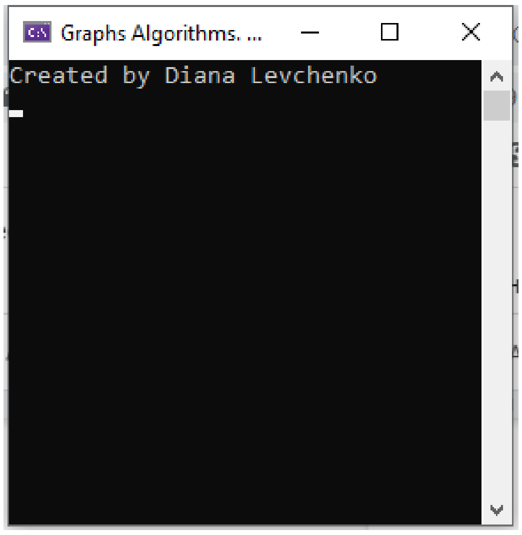


```
Graphs Algorithms. ...

        MENU

    BFS/DFS
    >> Dijkstra <<
    Author
    Exit
```



```
Graphs Algorithms. Powered by Diana Levchenko.
Matrix:

0 10 3 0 0
0 0 1 2 0
0 4 0 8 2
0 0 0 0 7
0 0 0 9 0

Please, enter the starting vertex:
1

No way from vertex #1 to vertex #0
Distance from vertex #1 to vertex #2 is equal to 1. Path: 2 <= 1
Distance from vertex #1 to vertex #3 is equal to 2. Path: 3 <= 1
Distance from vertex #1 to vertex #4 is equal to 3. Path: 4 <= 2 <= 1
Для продолжения нажмите любую клавишу . . .
```

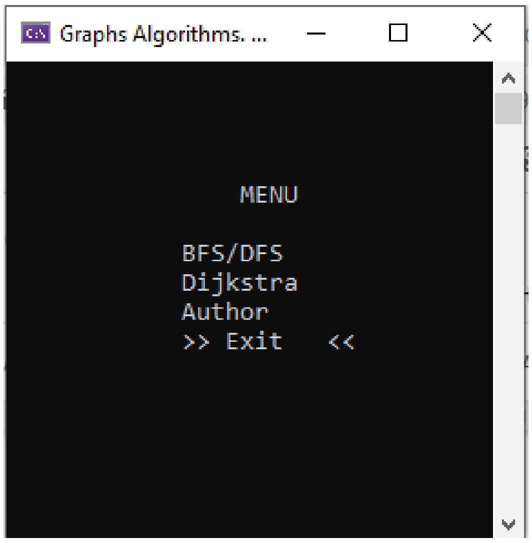
In the “Author” section the name of the creator is depicted:



Graphs Algorithms. ...

```
Created by Diana Levchenko
```

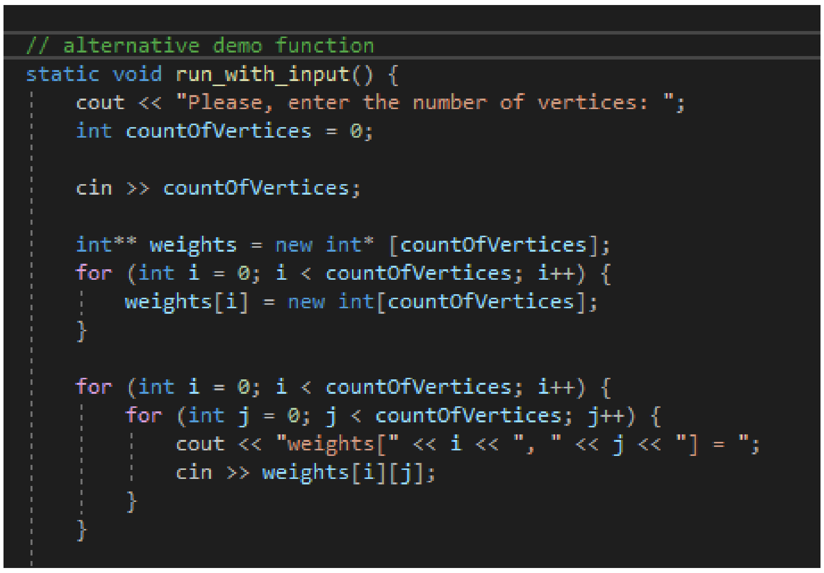
To close the program, choose the “Exit” section:



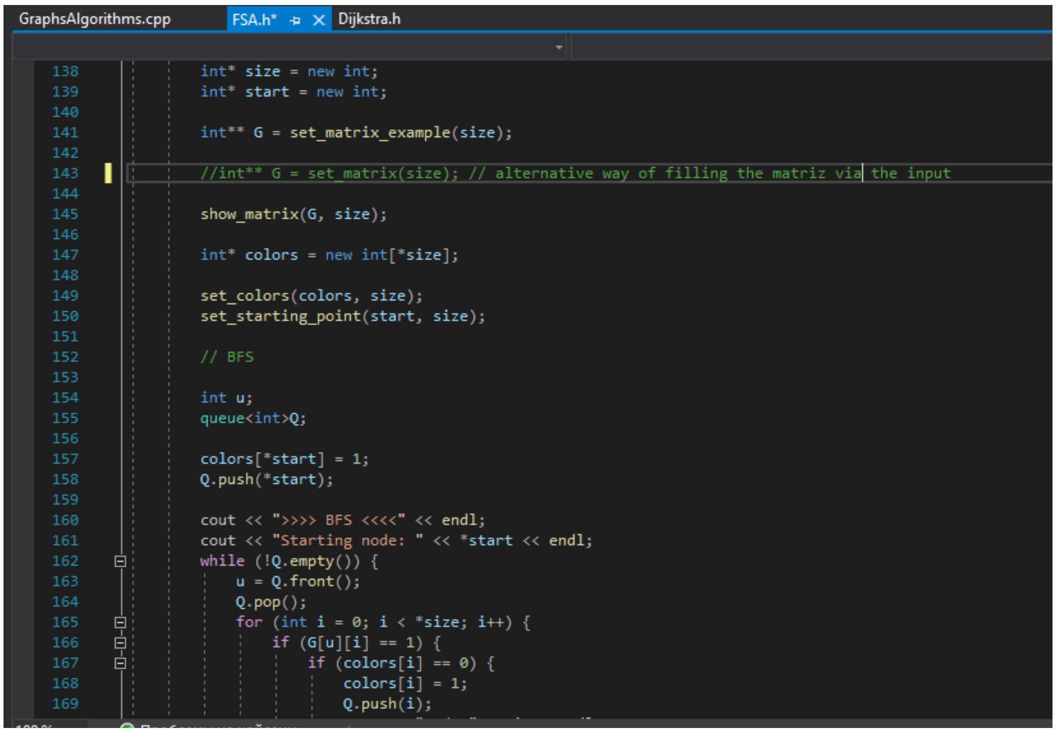
Graphs Algorithms. ...

```
          MENU

      BFS/DFS
      Dijkstra
      Author
      >> Exit   <<
```

Within the program, additional functions, allowing a user to enter the matrices himself/herself were added. However, due to the testing nature of the program, they were not demonstrated.



```
// alternative demo function
static void run_with_input() {
    cout << "Please, enter the number of vertices: ";
    int countOfVertices = 0;

    cin >> countOfVertices;

    int** weights = new int* [countOfVertices];
    for (int i = 0; i < countOfVertices; i++) {
        weights[i] = new int[countOfVertices];
    }

    for (int i = 0; i < countOfVertices; i++) {
        for (int j = 0; j < countOfVertices; j++) {
            cout << "weights[" << i << ", " << j << "] = ";
            cin >> weights[i][j];
        }
    }
```



```
        int* size = new int;
        int* start = new int;

        int** G = set_matrix_example(size);

        //int** G = set_matrix(size); // alternative way of filling the matriz via the input

        show_matrix(G, size);

        int* colors = new int[*size];

        set_colors(colors, size);
        set_starting_point(start, size);

        // BFS

        int u;
        queue<int>Q;

        colors[*start] = 1;
        Q.push(*start);

        cout << ">>>> BFS <<<<" << endl;
        cout << "Starting node: " << *start << endl;
        while (!Q.empty()) {
            u = Q.front();
            Q.pop();
            for (int i = 0; i < *size; i++) {
                if (G[u][i] == 1) {
                    if (colors[i] == 0) {
                        colors[i] = 1;
                        Q.push(i);
```

Sources used

The information presented as well as the algorithms used were implemented and presented on the basis of the materials given during the lecture and the laboratories, as well as where modified and adapted for the needs of the experiment.