

Tutorial 11

Introduction

This tutorial focuses on pathfinding and shortest path algorithms in a graph.

Example 01 demonstrates the implementation of FindMyCoffee game, that is introduced in the lecture.

Example 02 shows the implementation of three algorithms to deal with the shortest path problem in a graph. They are Dijkstra algorithm, Bellman ford algorithm and Floyd Warshall algorithm.

Examples

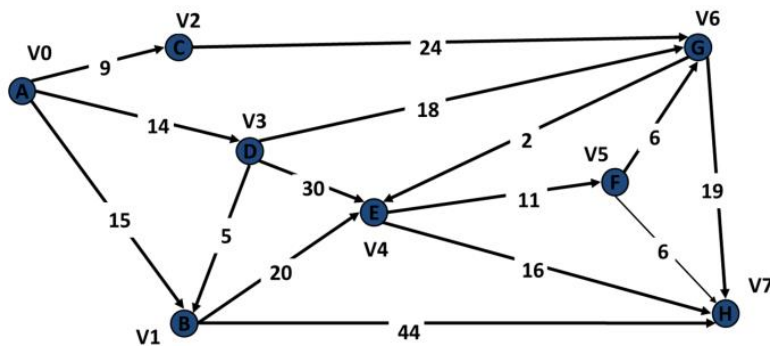
1. Example 01 – FindMyCoffee game implementation

This example implements game FindMyCoffee introduced in the lecture. The following notations must be taken into account:

- A matrix map of the size $N \times M$ is used to represent the map. Each cell of the matrix contains a character:
 - o $\text{map}[i][j] = 'Y'$ your position is the cell $[i][j]$
 - o $\text{map}[i][j] = 'C'$ cell $[i][j]$ has a cup of coffee
 - o $\text{map}[i][j] = 'X'$ cell $[i][j]$ contains solid wall, you could not go through this wall.
 - o $\text{map}[i][j] = 'G'$ cell $[i][j]$ does not have solid wall
- Class GVertex represents a vertex of the graph. Actually a vertex is a cell in the map.
- Class ArrayQueue implements a queue of vertices. This queue is used in BFS algorithm for pathfinding.
- Class FindMyCoffee implements the game.

2. Example 02 – Shortest path algorithms

Given a directed weighted graph $G = \{V, E\}$ with the weighted matrix $w = N \times N$ ($N = |V|$).



	V0	V1	V2	V3	V4	V5	V6	V7
V0	0	15	9	14	∞	∞	∞	∞
V1	∞	0	∞	∞	20	∞	∞	44
V2	∞	∞	0	∞	∞	∞	24	∞
V3	∞	5	∞	0	30	∞	18	∞
V4	∞	∞	∞	∞	0	11	∞	16
V5	∞	∞	∞	∞	∞	0	6	6
V6	∞	∞	∞	∞	2	∞	0	19
V7	∞	∞	∞	∞	∞	∞	∞	0

This example demonstrates the implementation of Dijkstra algorithm, Bellman-Ford algorithm and Floyd-Warshall algorithm on G. Please refer to class ***ShortestPath*** in the tutorial example code.