Graphs lab3 Documentation

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CONTENTS:

CHAPTER

ONE

PYTHON

1.1 Graph module

class Graph.**Graph**(*vertices*, *edges*)

Bases: object

add_edge(*x*, *y*, *z*)

This function adds the edge from x to y to the graph

Parameters

- **x** (*str*) – the first vertex
- **y** (*str*) – the second vertex
- **z** (*int*) – the cost

Raises

- **Exception** – if types do not follow the specification
- **Exception** – if nodes do not exist
- **Exception** – if edge already exists

add_vertex(*x*)

This function adds the vertex x to the graph

Parameters **x** (*str*) – the vertex to be added

Raises

- **Exception** – if x is not string
- **Exception** – if x already exists

copy()

This function retrieves a copy of the current graph

Returns a Graph copy

get_edge_cost(*x*, *y*)

This function returns the cost of the edge from x to y

Parameters

- **x** (*str*) – the first vertex
- **y** (*str*) – the second vertex

Returns the cost of the edge from x to y

Raises **Exception** – if there is no edge from x to y

get_in_degree(*x*)
This function returns the in degree of a vertex

Parameters **x** (*str*) – the vertex

Returns the in degree of the vertex x

Raises **Exception** – if x doesn't exist

get_out_degree(*x*)
This function returns the out degree of a vertex

Parameters **x** (*str*) – the vertex

Returns the out degree of the vertex x

Raises **Exception** – if x doesn't exist

is_edge(*x*, *y*)
This function returns True if the edge x->y exists, false otherwise

Parameters

- **x** (*str*) – the first vertex
- **y** (*str*) – the second vertex

Returns True if an edge exists, false otherwise

Raises **Exception** – if x or y are not vertices

modify_edge_cost(*x*, *y*, *z*)
This function modifies the cost of the edge from x to y

Parameters

- **x** (*str*) – the first vertex
- **y** (*str*) – the second vertex
- **z** (*int*) – the new cost

Raises **Exception** – if there is no edge from x to y

parse_inbound_edges(*x*)
This function returns an iterable of deepcopied vertices

Parameters **x** – the vertex for which to retrieve the iterator

Returns iterator to a deepcopied list of inbound vertices

Raises **Exception** – if the vertex doesn't exist

parse_outbound_edges(*x*)
This function returns an iterable of deepcopied vertices

Parameters **x** – the vertex for which to retrieve the iterator

Returns iterator to a deepcopied list of outbound vertices

Raises **Exception** – if the vertex doesn't exist

parse_vertices()
This function returns an iterable containing nodes

The nodes are deepcopied, in order to avoid being modified from the outside :return: iterator through a list of deepcopied nodes

remove_edge(*x*, *y*)
This function removes the edge from x to y from the graph

Parameters

- **x** (*str*) – the first vertex
- **y** (*str*) – the second vertex

Raises **Exception** – if edge already exists

remove_vertex(*x*)
This function removes the vertex x from the graph

Parameters **x** (*str*) – the vertex to be removed

Raises **Exception** – if x doesn't exist

Graph.**floyd_warshall**(*graph*, *u*, *v*)
This function returns a tuple containing on the first position the smallest cost, and on the second position the walk from u to v which achieves this cost. Returns (inf,[]) if there is no walk

Parameters

- **graph** (Graph) – the graph
- **u** (*str*) – the first node
- **v** (*str*) – the second node

Returns tuple

Graph.**random_graph**(*n*, *m*)
This function creates a random graph with specified number of vertices and edges

Parameters

- **n** (*int*) – the number of vertices
- **m** (*int*) – the number of edges

Returns a graph with specified parameters

Raises **Exception** – if invalid parameters

Graph.**read_graph**(*filename*)

This function reads a graph from a file. It supports 2 formats .txt and .modified.txt

In case of .txt, the file is supposed to look like this:

On the first line, the number n of vertices and the number m of edges; On each of the following m lines, three numbers, x, y and c, describing an edge: the origin, the target and the cost of that edge.

In case of .modified.txt, the file is supposed to look like this:

On the first line, the number n of vertices and the number m of edges On the second line, a list of the n vertices separated by space On each of the following m lines, three numbers, x, y and c, describing an edge: the origin, the target and the cost of that edge.

Parameters **filename** (*str*) – the file from which to read(name, relative path or absolute path)

Returns Graph

Raises **Exception** – in case of invalid format

Graph.**write_graph**(*filename*, *graph*)

This function writes a graph from a file. It supports 1 format .modified.txt

On the first line, the number n of vertices and the number m of edges On the second line, a list of the n vertices separated by space On each of the following m lines, three numbers, x, y and c, describing an edge: the origin, the target and the cost of that edge.

Parameters

- **filename** (*str*) – the filename to which to read(name, relative path or absolute path), MUST end in .modified.txt
- **graph** (Graph) – the graph to be written

Raises **Exception** – if invalid data

1.2 GraphTests module

class GraphTests.**GraphTests**(*methodName='runTest'*)

Bases: unittest.case.TestCase

setUp()

Hook method for setting up the test fixture before exercising it.

test_add_edge()

test_add_vertex()

test_constructor()

test_copy()

test_eq()

test_floyd_warshall()

test_get_edge_cost()

test_get_in_degree()

test_get_out_degree()

test_is_edge()

test_modify_edge_cost()

test_parse_inbound_edges()

test_parse_outbound_edges()

test_parse_vertices()

test_random_graph()

test_read_graph()

test_remove_edge()

test_remove_vertex()

test_write_graph()

1.3 UI module

UI.**display_edges**(*edges*)
This function displays a given list of edges

Parameters **edges** (*list*) – list of edges represented as tuples

Returns None

UI.**display_vertices**(*vertices*)
This function displays the given vertices

Parameters **vertices** (*list*) – the vertices

Returns None

UI.**main**()
The main of the program

Returns None

CHAPTER

TWO

INDICES AND TABLES

- genindex
- modindex
- search

PYTHON MODULE INDEX

INDEX

U

W