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Program Structures and Algorithms (INFO 6205)
Programming Assignment 2 – 100 points

Assignment 1 (100 points)**.** *You are given a directed graph $G = (V, E)$ with positive edge lengths. Please develop an efficient algorithm by using Dikstra's algorithm to return the length of the shortest cycle in the graph (if the graph is acyclic, it should say so) and implement it. Your algorithm implementation should take time at most $O(|V|^3)$.*

Your input will be a graph described in a file, e.g., "testcase-1.txt". The format will be as follows. source vertex : list of destination vertices

v1 : dest1 wt11 dest2 wt12 . . .
v2 : dest3 wt23 dest7 w27 . . .
. . .
vN : destN-1 wtNN-1 destN-2 wtNN-2. . .

Your program should be able to accept any input file using a command-line argument as follows.
your_program.py **−input** *input_graph_file*

Your program should output, **"The length of the shortest cycle is: \$val"***, where val is the length. It will be* 0 *when there are no cycles.*

For example, if my input file is as follows.
0: 1 1 2 4
1: 3 2
2: 3 1
3: 0 3

The output is, "The length of the shortest cycle is: 6", corresponding to the cycle $0 \xrightarrow{1} 1 \xrightarrow{2} 3 \xrightarrow{3} 0$.

For example, if my input file is as follows.
0: 1 1
1: 2 2
2: 3 3
3: 1 4 0 5

The output is, "The length of the shortest cycle is: 9", corresponding to the cycle $1 \xrightarrow{2} 2 \xrightarrow{3} 3 \xrightarrow{4} 1$.

For example, if my input file is as follows.
0: 1 1
1: 2 2

2: 3 3

The output is, "The length of the shortest cycle is: 0", since the graph is acyclic.

You must submit the following to receive full credit.

(1) Python or Java script or C++ file with comments and structure.

(2) Testcase(s) on which you validated your program. Each testcase must be a testcase-i.txt file where $i = 1, 2, ..., n$ are indices to your testcase files. You MUST include at least one testcase file.

(3) Please make sure you handle corner cases, and gracefully error out when you are provided with incorrect inputs, etc. Program crashes or errors or no outputs will be penalized.