The Secret Santa problem

Statement

With Halloween behind us, there's no stopping the Christmas spirit. All over campus, you're starting to hear about these famous events: Secret Santas.

Secret Santa: an event where each participant receives the name of a target to whom he will have to offer a gift, the gifter remains secret until the moment of the distribution.

Santa after stealing all the pizzas from INSAlgo

You too decide to organize your own Canadian Christmas, for you and your friends, but when you tell them about the event, an additional difficulty emerges.

Indeed, Jennifer announces that she does not want to give a gift to Stéphanie or Tom. Similarly, Jean does not know well the tastes of Maxime and Sandie and he will not be available at the same time as Etienne and Mathieu.

All these additional constraints are making your head spin, and you only told TWO PEOPLE OUT OF THE 20 PLANNED! So, you decide to take matters into your own hands, and ask each participant to list who they want/can give a gift to. While you're at it, you also decide to write an algorithm to decide the distribution of the targets automatically, considering all the constraints.

Resources

To solve this problem, we provide an archive with tests available as text files, as well as a template solution for your algorithms.

Note that the template is given in Python, but you can choose any programming language that you like, you will just have to do a little more work (no templates available).

Note that this problem must be solved on your personal machines and is not found on an online platform.

For this (if you choose to use Python) you will need two things:

- Python installed on your computer.

- A development environment (IDE) we recommend PyCharm, the student license is free with your INSA mail.

Inputs

Each test file is composed as follows:

- On the first line, an integer `1 < N < 51,` the number of people participating in the Secret Santa.
- On each of the following `N` lines, a string Si corresponding to the name of a participant.
- On the next line, an integer `M < 2 500`, the number of constraints.
- On each of the `M` following lines, two strings of characters separated by a space: `Sa Sb` indicating that `Sa` can give a gift to `Sb` (Be careful, the reciprocal is not necessarily true).

Notes: Files of the form `TestCase[number 1-10].txt` *are tests made by hand, to test the different cases.*
Files of the form `TestCase[N1]-[N2].txt` *are randomly created tests with:*
`N1`*: The percentage chance that each pair of names appears in the constraints*
`N2`*: The number of names*

Output

The solution corresponds to an ordered sequence of names.

No specific result format is expected, but a solution must of course meet several conditions:

- All names Si must appear precisely 1 time each in the solution.

- For any successive terms in the solution Sj and Sj+1, then there must exist a constraint of the form Sj Sj+1.

- The last name of the solution must offer its gift to the first name of the solution (there must exist a constraint of the form SN S1).

Two other cases must also be handled:

- If no solution exists

- If the execution time is too long (see the "Time Limit" part in the `TemplateSolution.py` file)

Note: It is possible to give your solutions to the board for verification, for this, in a text file, on each line you will find: the name of the complete file, followed by the ordered sequence of names, separated by a space.

Example:

```
TestCase1.txt name1 name2 name3
TestCase2.txt name2 name1 name4 name3
```

Presentation (optional part)

To add interest to this challenge, we have decided to invite you to present your resolution process (this can be a presentation of your thought process, your solutions, your research, your experience...).

We will then decide on a winner who will win a little something (still being decided), each presentation will be judged on several criteria (other criteria may come into play if deemed relevant):

- Humor of the presentation

- Humor of the support

- Effectiveness of the algorithm

- Search depth on the problem

- Originality of the presentation

- Originality of the code

Bonus points will also be awarded for the following actions:

- The code respects the Christmas spirit

- The presentation is done in costume

- Bribe *wink (no, seriously, it's a joke, don't do it...)

NOTE: EACH PERSON PARTICIPATING IN THE PRESENTATION PROCESS WILL WIN A LITTLE SOMETHING.

Note: Only INSA Lyon students are eligible to win the challenge, however everyone is free to participate and present their results.

LINK TO THE RESSOURCES (INSALGO GITHUB)

LINK TO DISCORD (FOR QUESTIONS AND CHATTING)