Laboratory project. Non-Linear Data Structures (Nov/2019)

GRAPHS

Marvel Comics

General Problem Description[1]

The Spanish comic book artist Javier Rodríguez has been hired by Marvel Comics Group to handle one of the publisher's most ambitious works: Creating a new comic based on a collection of stories entitled "*History of Marvel Universe*". A task of this magnitude requires an encyclopaedic knowledge of the characters of the franchise. Fortunately, Javier and the Data Structures students are allied to deal with this monumental task.

At the website https://github.com/melaniewalsh/sample-social-network-datasets/tree/master/sample-datasets/marvel , you can find a file in CSV format (**`marvel-unimodal-edges.csv`**) that represents a network of relationships between Marvel characters. In each line of the file, in addition to the names of two characters, a positive integer indicates the number of interactions they have had.

The objective of this lab task is to implement a Java program that processes the previous CSV file and responds to the following requirements:

a. Build the corresponding graph and show the number of characters, the total number of relationships between characters, the most sociable character (the one that has more interactions with others), and the character who works the least in a team (the one that has fewer interactions with the rest); in the last two cases, if there is more than one character that meets the condition, all will be shown.
b. Each page of the comic will be designed from two characters who want to shape their story in common. As it only has one page to show the information, Javier decides to configure the story with as few characters as possible (the minimum number of characters) and only drawing the most relevant ones with which they have been related. In this way, the shortest sequence of relevant characters[2] connecting two given characters (read by keyboard) will be indicated.
c. As Javier's work is stunning, the publisher asks him to design an original and unpublished team of superheroes formed from two given characters (read by keyboard). For this to be original, characters that have had few interactions between them will be used. In this way, in order to configure the team, any sequence of characters will be calculated considering the connection between such two characters and taking into account that the number of interactions between characters does not exceed 10.

Recommendations and requirements

- In point c) it is mandatory to use a DFS algorithm.
- It will be valued that the path search is repeated at the user's request with the aim of making the program useful to Javier.
- The implementation of Graphs provided in the subject will be used.
- The Decorated Element pattern seen in class will be used to decorate or collect the set of technical attributes related to the manipulation and route of graphs, which should be based on generic data types.
- The use of castings will not be allowed, except for the implementation of the equals method of the Element class.
- Each implemented class must be in a different file.

[1] Graphs problem inspired in the work *Marvel Universe looks almost like a real social network* originally compiled by Cesc Rosselló, Ricardo Alberich and Joe Miro.
[2] A character is understood to have a relevant relationship with another character when they have a number of interactions equal to or greater than 15.

- Each class in the program should include appropriate internal documentation to make it fully understandable. The `InternalDocumentation.pdf` file (lab section in Campus Virtual) contains a brief guide to writing internal documentation.
- If desired, the CSV file, which is hosted in a repository on the Github platform, can be imported or cloned from the IDE.

Running and delivery rules

- The project must be carried out by each of the work groups that have been previously formed in lab classes. It cannot be done individually.
- The delivery and evaluation will be made on the day previously indicated in the Campus Virtual. One of the members of the group will send a compressed file with all the classes compose the program. Individually you must also submit the participation template, which will be available in the Campus Virtual.
- For the practice to be evaluated, the program must compile and run correctly.
- Remember that this activity is mandatory to be able to pass the subject.