Implementing a new interface for directed graph analysis by existing and new algorithms

Gergely Kocsis[a], Miklós Becsei[b], Máté Csongor Széll[c]

[a]University of Debrecen
kocsis.gergely@inf.unideb.hu

[b]University of Debrecen
miklosbecsei@gmail.com

[c]University of Debrecen
mate.szell.1010@gmail.com

Abstract

As part of the work, we have developed a multiplatform application that provides an easy-to-use alternative for structural analysis of directed graphs. The work consisted of two major parts. On the one hand, a Java package has been created which, in addition to the implementation of some basic and some moderately complex algorithms, allows for the modular addition of new algorithms. On the other hand, we have created a web interface that can analyze the uploaded graphs online and display the results as a web application. The source of the Java package can be used without a web interface, so it can be easily adapted to a third-party application, or even create a new interface (such as the JavaFX desktop version). In addition to statistics on simple nodes and edges related to the graph, the package is able to find the giant component of the graph using the Tarján algorithm and use the result to map the so-called "tendrils" in the graph [1]. It can also specify the number of triangles of different directions in the graph [2]. The web interface gives the ability to register the user so that it can retain previously uploaded graphs and results in a consistent manner. After logging in, one can upload a new graph to the interface, delete an older one, and run the Java package algorithms on the uploaded graphs. Because this interface is independent of the underlying Java package, it can run all algorithms implemented in it and display the result, even after adding new algorithms. In the current stage of the work we are adding new algorithm implementations by integrating well-known graph analysis software into the package under our common interface. The results of the work are continuously made available at http://dina.inf.unideb.hu.

[1] G. Timár, A. V. Goltsev, S. N. Dorogovtsev, J. F. F. Mendes, Mapping the Structure of Directed Networks: Beyond the Bow-Tie Diagram, Physical Review Letters 118, 078301 (2017).

[2] T. Roughgarden, Reading in Algorithms Counting Triangles, Stanford University (2014).

Acknowledgements: Gergely Kocsis is supported by the EFOP-3.6.1-16-2016-00022 project. The project is co-financed by the European Union and the European Social Fund. Miklós Becsei and Máté Csongor Széll were supported by the construction EFOP-3.6.3-VEKOP-16-2017-00002. The project was supported by the European Union, co-financed by the European Social Fund.

Keywords: directed graph, network topology, web interface