Framework for Visualization and Performance Analysis of Algorithms and Data Structures

Roberto Giachetta[a], István Fekete[b]

[a]Department ot Software Technology and Methodology
Eötvös Loránd University
e-mail: groberto@inf.elte.hu

[b]Department of Algorithms and Their Applications
Eötvös Loránd University
e-mail: fekete@inf.elte.hu

Abstract

The subject of algorithm and data structure visualization and animation is a field in which many solutions can be found both online and offline. However, these applications usually focus only on one particular example and in most cases, they have fixed or less flexible input data and visualization possibilities. In this paper, we present the principles and realization of a framework primary for demonstrational and educational purposes that aims to provide unified presentation and performance analysis for any algorithm and data structure implemented in the system. This debuting approach has already proven to be useful in our other research fields.

The framework can display and animate the data structures – ranging from simple arrays to various types of trees and graphs – with different abstraction and detail levels, therefore, it is an excellent platform for mastering the principles behind their usage. The system is open for the creation and addition of any kind of data structure through an application programming interface. These additions automatically become part of the framework's library and can be used in the program. It is possible to write any algorithm working on the data structures and debug them step by step, even multiple algorithms at once. Efficiency factors – such as running time, operation count and memory usage – can be monitored during running. It is possible to manually fill in, generate or permute input data and run the algorithms several times on them and compare performance results through tables and charts.

Keywords: algorithms, data structures, visualization, performance analysis

MSC: 68W40, 68U20