

A performance comparison of search trees

User Guide

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0.0.1	30.12.2011	Przemysław Rosiński	Created document
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0.7	2.01.2012	Przemysław Rosiński	Created Realized range and Summary
0.8	5.01.2012	Piotr Janaszek	Added Application startup and Result set
0.9	7.01.2012	Piotr Janaszek	Changed Display tree and Summary
1.0	8.01.2012	Przemysław Rosiński	Fixed mistakes and changed document formatting

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PREFACE

Developed application shows capabilities of search tree libraries. Libraries are of C# generic type standardized to DLL format.

Program is able to retrieve necessary data about tree nodes manually by user input via GUI (Graphical User Interface) and/or automatically from external CSV file.

The application graphically presents structure of the tree to the user. Result of searching algorithm execution should be also visualized by marking the path from root to the particular node.

Program gives possibility to compare the performance of search trees using external tool. Application exports external file compliant with CSV format.

TEST CASES

Test scenarios are built based on requirements contained in business analysis. Tests are run on different tree types. Each test consists of:

- ID - unique number of the test
- Scenario - description of the test
- Result - gets value OK, when functionality is fully accepted or NOK, when functionality does not cover requirements in 100%
- Remarks - description of program activity when running the test and classification of the problem (minor or major) with brief description of the issue, if Result value is NOK

APPLICATION STARTUP

ID	Scenario	Result	Remarks
1a	With <i>ForRest.Provider</i> , <i>Microsoft.GLEE</i> , <i>Microsoft.GLEE.Drawing</i> , <i>Microsoft.GLEE.GraphViewerGDI</i> DLL files	OK	Application starts
1b	Without <i>ForRest.Provider</i> DLL file	OK	Application informs the user that it will close because of lacking file and closes
1c	Without <i>Microsoft.GLEE</i> DLL file	OK	Application informs the user that GLEE graph will not be available because of lacking file and starts
1d	Without <i>Microsoft.GLEE.Drawing</i> DLL file	OK	Application informs the user that GLEE graph will not be available because of lacking file and starts
1e	Without <i>Microsoft.GLEE.GraphViewerGDI</i> DLL file	OK	Application informs the user that GLEE graph will not be available because of lacking file and starts

LOAD INPUT FILE

ID	Scenario	Result	Remarks
2a	Load CSV file	OK	File loaded correctly
2b	Load CSV file with text entries for numeric data type	OK	File not loaded, information displayed
2c	Load CSV file with numeric entries for text data type	OK	File loaded, numbers converted into text entries
2d	Load CSV file with wrong separator	OK	File loaded, one line treated as one entry
2e	Load CSV file not compliant with standard	OK	File not loaded, relevant information displayed

ADD TREE FROM FILE

ID	Scenario	Result	Remarks
3a	Add tree from file with file loaded	OK	Tree added correctly
3b	Add tree from file without file loaded	OK	Tree not added, relevant information displayed

ADD TREE MANUALLY

ID	Scenario	Result	Remarks
4a	Add tree manually	OK	Tree added correctly

REMOVE TREE

ID	Scenario	Result	Remarks
5a	Remove tree	OK	Tree removed correctly

ADD NODE

ID	Scenario	Result	Remarks
6a	Add numeric node to numeric tree	OK	Node added correctly
6b	Add text node to numeric tree	OK	Node not added, relevant information displayed
6c	Add numeric node to text tree	OK	Node added correctly, number converted into text entry
6d	Add text node to text tree	OK	Node added correctly

REMOVE NODE

ID	Scenario	Result	Remarks
7a	Remove existing node	OK	Node removed correctly
7b	Remove not existing node	OK	Node not removed, relevant information displayed

SEARCH ELEMENT

ID	Scenario	Result	Remarks
8a	Search existing node	OK	Node found correctly
8b	Search not existing node	OK	Node not found, relevant information displayed

RESULT SET

ID	Scenario	Result	Remarks
9a	Display empty result set	OK	Result set displayed correctly
9b	Display nonempty result set	OK	Result set displayed correctly
9c	Reset result set	OK	Result set cleared correctly
9d	Save empty result set	OK	Result set not saved, relevant information displayed
9e	Save nonempty result set	OK	Result set saved correctly

BATCH PROCESS

ID	Scenario	Result	Remarks
10a	Open CSV file	OK	File loaded correctly
10b	Open multiple CSV files	OK	Files loaded correctly
10c	Create numeric trees	OK	Trees added correctly
10d	Create text trees	OK	Trees added correctly
10e	Search node	OK	Search performed correctly
10f	Search multiple nodes	OK	Search performed correctly
10g	Save result set	OK	Result set saved correctly
10h	Displaying information	OK	Information displayed correctly in <i>Action log</i> panel

DISPLAY TREE

ID	Scenario	Result	Remarks
11a	Display tree as Tree view without search path	OK	Tree view displayed correctly
11b	Display tree as Graph without search path	NOK	<p>MINOR ISSUE</p> <p>Only in some (not all) cases of B+ tree and Graph displaying mode: when edge connects two siblings, edge is directed to sibling, but does not “reach” this;</p> <p>In other cases graph displayed correctly</p>
11c	Display tree as GLEE Graph without search path	OK	GLEE Graph displayed correctly
11d	Display tree as Tree view with search path	OK	Tree view displayed correctly
11e	Display tree as Graph with search path	NOK	<p>MINOR ISSUE</p> <p>Only in some (not all) cases of B+ tree and Graph displaying mode: when edge connects two siblings, edge is directed to sibling, but does not “reach” this;</p> <p>In other cases graph and path displayed correctly</p>
11f	Display tree as GLEE Graph with search path	NOK	<p>MINOR ISSUE</p> <p>Only in the case of B+ tree and GLEE graph displaying mode, when path must go from one sibling to another: graph is displayed correctly, but not the path; when path must go from one sibling to another, path stops on first sibling;</p> <p>In other cases graph and path displayed correctly</p>

REALIZED RANGE

All the provided features starting from program startup, through main functionalities to saving results was tested very carefully. Tests were run on all provided trees (2-3, 2-3-4, AVL, B, B+, BST, Red-Black, Splay) and both (numeric, text) data types.

Testing also covered user interface and ease of usage.

Tests were run on two different machines. Both 32 and 64-bit operating systems were used during testing.

SUMMARY

The application functionality is rather simple. What is more, it is very intuitive, when symbols are displayed on the buttons. Whole program is written in C# language what makes it runnable on most computers (with Windows operating system) and reliable.

The main parts, which are: creating trees and searching elements work correctly. Also displaying is very good, but there are problems, when it comes to trees that have nodes with more than one parent (like B+ tree). This feature should be fixed, but it does not affect overall very good evaluation of the application. Program can be accepted as it is.