**Final project for Algorithms and data structures 2LID-A-P**

## Algorithms

In this project I implemented next algorithms:

- Insertion Sort;

- Bubble Sort;

- Binary Search;

- Selection Sort;

- Quick Sort;

- Merge Sort;

- Dijkstra algorithm;

- Depth-first algorithm

- Breadth-first algorithm

## Data

For sorting algorithms I used 3 types of arrays:

- Randomised;

- Sorted;

- Reversed;

All of them contains n\*1000 elements, where n=1,2,3,4,5,6

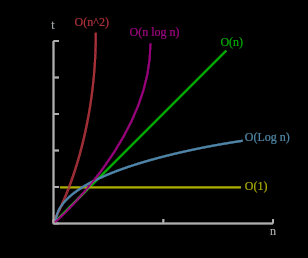
For Binary search I used sorted array with n\*1000 elements, where n=1,2,3,4,5,6

In Dijkstra algorithm there is a directed Graph with 8 vertices

All algorithms implemented during labs

The graphs contains of 10 vertices

## Results



Insertion sort

|  |  |  |  |
| --- | --- | --- | --- |
|  | Randomised | Sorted | Reversed |
| 1000 | 0.000800242 sec. | 6.101e-06 sec. | 0.00143862 sec. |
| 2000 | 0.00331879 sec | 7.886e-06 sec. | 0.00507548 sec. |
| 3000 | 0.00552794 sec. | 1.0178e-05 sec | 0.0114453 sec |
| 4000 | 0.00982971 sec. | 1.353e-05 sec. | 0.0199583 sec. |
| 5000 | 0.0150614 sec. | 1.6894e-05 sec. | 0.0309932 sec. |
| 6000 | 0.0218427 sec. | 2.0269e-05 sec. | 0.0435553 sec. |

Bubble Sort

|  |  |  |  |
| --- | --- | --- | --- |
|  | Randomised | Sorted | Reversed |
| 1000 | 0.0030902 sec. | 0.00115537 sec. | 0.00391441 sec |
| 2000 | 0.0137265 sec. | 0.00421105 sec. | 0.0159602 sec. |
| 3000 | 0.0321082 sec. | 0.00921444 sec. | 0.0359165 sec. |
| 4000 | 0.0593774 sec. | 0.0162429 sec. | 0.0637566 sec. |
| 5000 | 0.0943092 sec. | 0.0258974 sec. | 0.0988732 sec. |
| 6000 | 0.138919 sec. | 0.0369051 sec. | 0.144109 sec. |

Selection Sort

|  |  |  |  |
| --- | --- | --- | --- |
|  | Randomised | Sorted | Reversed |
| 1000 | 0.00124778 sec. | 0.00104924 sec. | 0.00112021 sec. |
| 2000 | 0.00441009 sec. | 0.0042679 sec. | 0.00475064 sec. |
| 3000 | 0.00974783 sec. | 0.00946037 sec. | 0.0103396 sec. |
| 4000 | 0.0162749 sec. | 0.017007 sec. | 0.019737 sec. |
| 5000 | 0.0247466 sec. | 0.0260106 sec. | 0.0317509 sec. |
| 6000 | 0.0361431 sec. | 0.0371153 sec. | 0.0486464 sec. |

Quick Sort

|  |  |  |  |
| --- | --- | --- | --- |
|  | Randomised | Sorted | Reversed |
| 1000 | 0.00018108 sec. | 0.00401778 sec. | 0.0028678 sec. |
| 2000 | 0.000288781 sec. | 0.0146838 sec. | 0.00939025 sec. |
| 3000 | 0.000424243 sec. | 0.0307544 sec. | 0.0204145 sec. |
| 4000 | 0.000576327 sec. | 0.0513645 sec. | 0.0355611 sec. |
| 5000 | 0.00073711 sec | 0.0768136 sec. | 0.0542478 sec. |
| 6000 | 0.000849704 sec. | 0.106008 sec. | 0.0760753 sec. |

Merge Sort

|  |  |  |  |
| --- | --- | --- | --- |
|  | Randomised | Sorted | Reversed |
| 1000 | 0.00036256 sec. | 0.000300654 sec. | 0.000356983 sec. |
| 2000 | 0.000775218 sec. | 0.000546615 sec. | 0.0005761 sec. |
| 3000 | 0.0010409 sec. | 0.000815883 sec. | 0.00114135 sec. |
| 4000 | 0.00138121 sec. | 0.00106687 sec. | 0.00114151 sec. |
| 5000 | 0.00194527 sec. | 0.00133756 sec. | 0.00135369 sec. |
| 6000 | 0.0024293 sec. | 0.00182628 sec. | 0.00171148 sec. |

Binary Search

|  |  |
| --- | --- |
|  | Sorted |
| 1000 | 3.18e-07 sec. |
| 2000 | 3.38e-07 sec. |
| 3000 | 7.87e-07 sec. |
| 4000 | 5.13e-07 sec. |
| 5000 | 6.88e-07 sec. |
| 6000 | 1.01e-06 sec. |

Dijkstra algorithm with 10 vertices:

3.5821e-05 sec.

Depth-first traversal for the given graph:

2.1273e-05

Following is Breadth First Traversal (starting from vertex 0)

4.2494e-05