CSC 323 Algorithm Design and Analysis
Fall 2016
Instructor: Dr. Natarajan Meghanathan

Project 3
Binary Search vs. Brute Force Search Algorithms for Finding a Local Minimum in a Two-Dimensional Array

Due: October 27, 2016: 11.30 AM

No LATE submission will be accepted for ANY REASON.

In this project, you will implement the binary search-based $\Theta(n)$ algorithm to determine the local minimum in an 'n' x 'n' two-dimensional array (as discussed in Module 2) and compare its run-time performance with that of a brute force $\Theta(n^2)$ algorithm that searches for the local minimum element by element until one is found.

Note that both the binary search and the brute force search algorithms should stop once a local minimum is found.

You should create random two-dimensional arrays (with numRows = numCols) with unique elements in the range [1... numRows * numCols] for the following values of numRows (numCols) and determine the average execution time of the binary search and the brute force search algorithms by running 100 trials for each of the numRows (numCols) values. Determine the running times in nano seconds or milli seconds, as appropriate.

numRows (numCols) values: 4, 6, 8, 10, 15, 20, 25, 30, 35, 40, 50, 75, 100, 150, 200, 250, 300, 350

Plot the results with numRows in X-axis and the average execution times of the binary search and the brute force search algorithms in the Y-axis.

Submission
(1) Submit a hardcopy of your codes for the binary search and brute force search algorithms, the Excel plots of the numRows vs. average execution times of the two algorithms as well as your interpretation of the results.
(2) Submit a desktop-recorded video of your explanation of the codes for the binary search and brute force search algorithms and your interpretation of the results for the execution time for the two algorithms.

Helpful Videos
You may find the videos here to be useful:
Basics of Vector class: https://youtu.be/vbySmVOjLIk
Creating Random Elements (for 1-dim and 2-dim arrays): https://youtu.be/J0A3qrfiq38