

CSC 323 Algorithm Design and Analysis

Spring 2016

Instructor: Dr. Natarajan Meghanathan

Project 4: Determining the Maximum Element in a Unimodal Array using the Binary Search Logic

Due: March 10, 2016: 1 PM

In this project, you are given a unimodal array of n integers and your task is to find the maximum integer in the array in $\Theta(\log n)$ time. A unimodal array of integers is an array with entries that monotonically increase up to the maximum integer value and then monotonically decrease for the rest of the array. For example: $\{2, 5, 8, 9, 12, 15, 21, 17, 10, 4\}$ is a unimodal array of ten integers that increase from 2 ... 21 and then decrease from 21 ... 4. The integer 21 is the maximum value of the integer in the array.

You could use a modified version of the binary search algorithm discussed in Module 2 to design and implement an algorithm for the above unimodal array maximum element problem.

Documentation (in both the hard copy report and video):

- (1) Provide a pseudo code of a $\Theta(\log n)$ algorithm for the above problem and explain its working.
- (2) Explain your actual code and execute it with the following three types of unimodal arrays of size at least 10 integers:
 - (i) The maximum integer is the first element in the array: *this is basically an array of integers sorted in descending/reverse order*
 - (ii) The maximum integer is the last element in the array: *this is basically an array of integers sorted in increasing/ascending order*
 - (iii) The array has a sequence of monotonically increasing sequence of at least three integers followed by a monotonically decreasing sequence of at least three integers

Submission: Submit the hard copy of the report with the above documentation in class and send the link for the recorded video via Google drive to natarajan.meghanathan@jsums.edu