CS2040C Semester 2 2018/2019

Data Structures and Algorithms

Tutorial 04 - Midterm Test, PQ ADT

For Week 06

Document is last modified on: February 7, 2019

1 Introduction and Objective

This tutorial marks the end of the first $\frac{1}{3}$ of CS2040/C: Basic Java/C++, basic analysis of algorithms (worst case time complexity only), various sorting algorithms, and various linear Data Structures (DSes).

For all tutorial groups except... that tutorial group 08, we would have conducted a 15% midterm test just before this Tut04 about the first $\frac{1}{3}$ of CS2040/C. We will thus spend most of this tutorial to discuss the solutions of the test. Brace for impact...

This tutorial also marks the start of the next $\frac{1}{3}$ of CS2040/C: Various non-linear DSes. We discuss the Priority Queue (PQ) ADT with its Binary Heap implementation (use `https://visualgo.net/en/heap` to help you answer some questions in this tutorial).

2 Tutorial 04 Questions

Midterm Test Solutions

Q1). Brace for impact...

For tutorial group 08, this session will be free and easy (perhaps discussion of past midterm test solutions instead).

Basic Binary Heap Stuffs

Q2). Quick check: Let's review all 5 basic operations of Binary Heap (use the Exploration mode of `http://visualgo.net/en/heap`). During the tutorial session, the tutor will randomize the Binary Heap structure, ask student to `Insert(random-integer)`, perform `ExtractMax()` operations (or the first few steps of `HeapSort()`), and/or the $O(N \log N)$ or the $O(N)$ `Create(from-a-random-array)`.

More About Binary Heap Data Structure

Q3). What is the minimum and maximum number of comparisons between Binary Heap elements required to construct a Binary (Max) Heap of arbitrary n elements using the $O(n)$ `Create(array)`? Note that this question has been integrated in VisuAlgo Online Quiz, so it may appear in future Online Quizzes :).

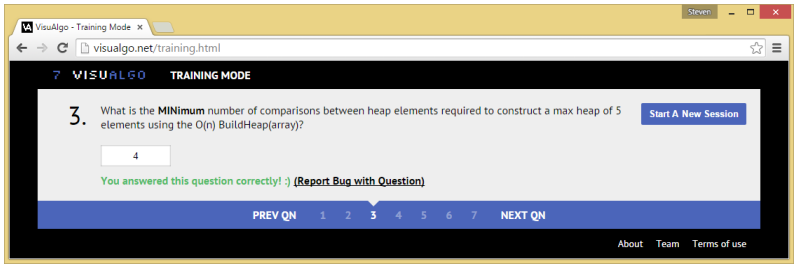

Figure 1: Now automated :)