INFO1105/1905/9105 Week 12 Lecture

A. Discussion of common errors in asst1

Here are some things noted by the markers:

- Some students treat HashMap as O(1) in worst case. The worst-case is typically O(n), but the common case (with a sensible hash function) is O(1). You need to be careful to make true statements.
- Some students did complexity analysis of *nested* loops (say, outer loop is O(n) and inner loop is O(n) or O(log n)) as being O(n). This was because they pick the highest order term as they would in *sequential* loops (where the runtimes are added eg n+log n or n+n). However, when loops are nested, the runtime is multiplied.
- Treating removal as O(1) in cases where it is first traversing the collection searching for the element and only then removing it. In this situation, the cost must include the traversal, often this is itself O(n).
- Reports that were hard to read quickly (they were not well-structured, mixing overview and data structure, or they were quite verbose)

B. In-class design activity

This activity concerns the following situation: we are designing software for a consulting company. The software is to be an online Calendar, that can keep track of Appointment objects, representing appointments for clients with a consultant. Each Appointment object has a clientID (String), consultantID (String), a start time (java.util.Date), and a location (String). The Calendar should allow the following operations to be performed:

(i) the system user can record a new appointment in the calendar, with given client, consultant, start time and location

(ii) the user can remove an Appointment object from the Calendar

(iii) the user can retrieve a List containing all the Appointments that are at a given location (this should include any appointment at that location, no matter what time it starts, or who the client and consultant are)

(iv) the user can retrieve the next Appointment for a given consultant that starts at or after a given time (this should be whichever appointment starts at the earliest time among those allowed, no matter what location it is in or who the client is)

(v) the user can request a report to be printed, that indicates, for each consultant, how many different clients there are that have an appointment with that consultant. Note that if a client has several appointments with the same consultant, the client is only counted once in the score of the consultant.

Show how to design software that supports the operations described. Your answer should describe the data structures that you would use in your software, and indicate by pseudocode the calculations you would perform for each operation; also write down and justify the big-Oh worst case cost of your solution. If you invoke one or more of the algorithms that was taught this semester in INFO1105, you do not need to explain that algorithm in detail (for example, if you say “perform a pre-order traversal”, you are not expected to describe the details of how pre-order traversal is performed). A clearly described correct but inefficient solution will gain at least half the marks.