COMP108
Data Structures and Algorithms

Data structures - Linked Lists (Part IV Remarks)
Revision for Class Test

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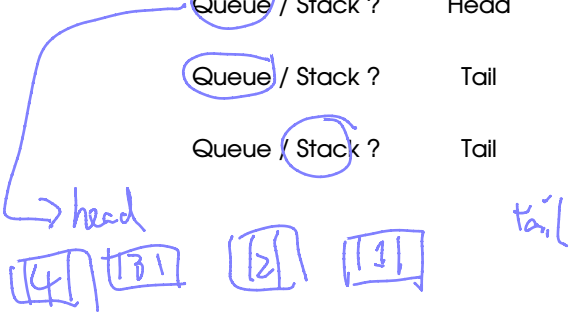
Linked lists - Summary of time complexity

Suppose we have n elements in the list before each of the following operations.

- Traversing: $O(n)$
- Searching: $O(n)$
- Search over sorted list: $O(n)$
- Insertion/Deletion to/from the head/tail: $O(1)$
- Insertion/Deletion in/from the middle: $O(1)$
  Finding the location may take $O(n)$ time though

Linked lists - implementing Queue/Stack

Data Structure	List-Insert	List-Delete
Queue / Stack ?	Head	Head
Queue / Stack ?	Head	Tail
Queue / Stack ?	Tail	Head
Queue / Stack ?	Tail	Tail



Linked list - Allocating and freeing objects

- So far we discuss linked lists as if we have infinite memory space.
- In reality, space is limited, and it's useful to manage the storage.
- Memory needs to be ***allocated*** for a new node.
- We should ***free*** any object that is no longer used, e.g., after we delete a node.
- In some systems, a ***garbage collector*** is responsible for storage management.

Linked list vs Array

- Arrays
  - easy to be accessed, one can access any element in a single access by its index
  - size needs to be predetermined, may waste space
  - if we want to insert an element in the middle, needs to **shift** the rest
- Linked lists
  - needs to traverse the list to access elements in the middle
  - does not need to predefine size, it's flexible to add element
  - once we find the location to insert, we can insert without moving the rest, only need to alter a few pointers

Revision for Class Test

Preparation

Resources

- Lectures: videos, slides, slides with annotations
- Labs/Tutorials: exercises, solutions, feedback
- Weekly revision quizzes

Topics

- Basic pseudo code
- Time complexity
- Arrays / Queues / Stacks
- Linked Lists

Class Test

The class test will run on Thursday 2nd March from 12:00-14:00 (2 hours).

1. You can only attempt the quiz once.
2. time limit - 45 minutes (30 min expected with 15 min extra to account for technical issues)
3. Canvas Quiz - 6 Multiple Choice Questions + 2 Multiple Answers Questions
   - MCQ: 10 points each
   - Multiple Answers: 20 points each
     Mark calculation: point per correct options $\alpha = \frac{20}{\text{number of correct options}}$
     If you choose x correct and y incorrect optioins, you will get $\max\{x\alpha - y\alpha, 0\}$
     Suppose there are 2 correct options ($\alpha = 10$). 2 correct & 0 incorrect $\implies$ 10 * (2-0) = 20; 2 correct & 1 incorrect $\implies$ 10 * (2-1) = 10; 1 correct & 2 incorrect $\implies$ 0.
4. Questions presented one at a time, from a pool; order of options randomised
5. **Backtracking is not allowed**
6. automatically submitted once time limit expired or at 2pm on 02/03, whichever earlier
7. Major technical issue: make extenuating circumstance claim

Go to www.menti.com Mentimeter code: 1308 5434

Revision Quiz

Any Questions?

Summary: Remarks about linked lists

Next: Sorting with arrays and linked lists

For note taking