CSC2100-Data Structures

Final Remarks

Department of Computer Science and Engineering
The Chinese University of Hong Kong, Shatin, New Territories

Interesting Topics

- More Graph Algorithms
  -

- Dynamic Programming
  -
    1, 2, 5, 10}, how to give a change using the fewest number of coins?

Final Examination Information

- **_When_**: Monday, December 9, 2013
- **_Time_**: 3:30 pm - 5:30 pm
- **_Where_**: Multi-purpose Hall, Pommerenke Student Centre
  - Close-book, One page of notes
  - No calculator
  - Extra paper will be provided
  - Short answers

Final Examination Information

- ***When***: Tuesday, May 3, 2005
- ***Time***: 9:30 am - 11:30 am
- ***Where***: University Gymnasium
  - Close-book, Close-note Test
  - No calculator
  - Extra paper will be provided
  - Short answers

Final Examination Information

- **When**: Monday, December 9, 2013
- **Time**: 3:30 pm - 5:30 pm
- **Where**: Multi-purpose Hall, Pommerenke Student Centreum
  - Closed-book Test
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Final Examination

- Everything from the 1st class
- Emphasis on
  - Graphs
  - Searching
  - Hashing
  - Sorting
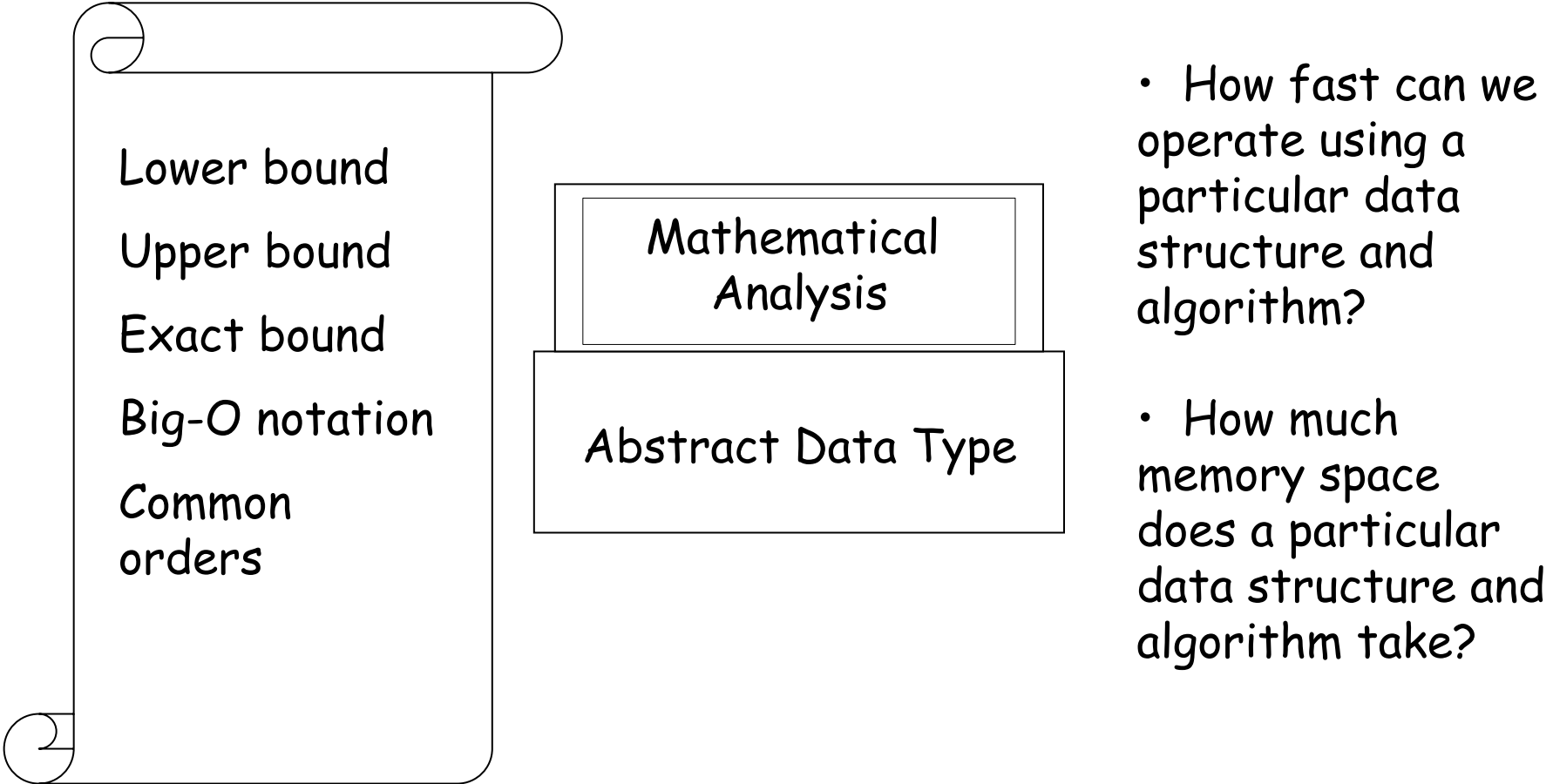
Implementation:

How to actually make it work!

Specifications:

Description of the function.

Abstract Data Type

Array, list, linked list, queue, stack, heap, tree, binary search tree, graph, etc.

-
  specifications and implementation?

- What is the relationship between data structures and algorithms?

Lower bound

Upper bound

Exact bound

Big-O notation

Common orders

Mathematical Analysis

Abstract Data Type

- How fast can we operate using a particular data structure and algorithm?

- How much memory space does a particular data structure and algorithm take?

List vs. Array

Queue vs. Stack

Double Linked List

Mathematical Analysis

Abstract Data Type

List, Stacks, & Queues

- Basic data structures found in many programs.

- How can we combine these data structures?

Trees

Binary Trees

Binary Search Trees

B-Tree

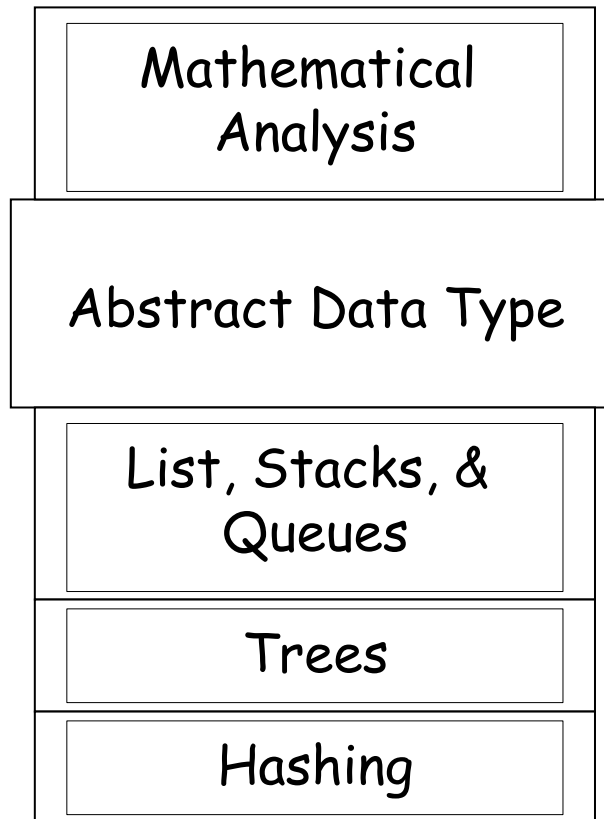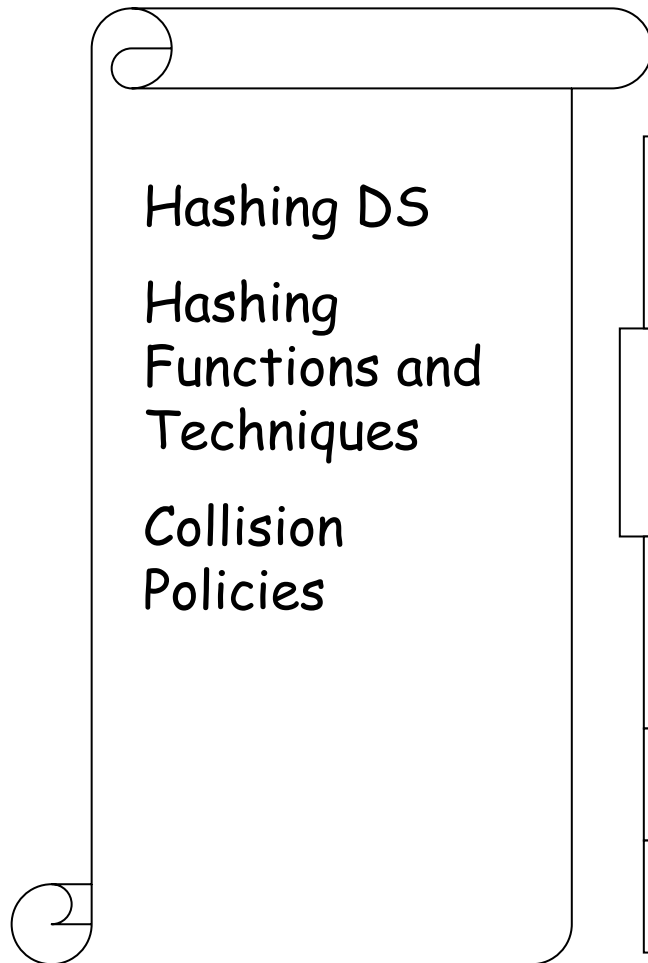AVL Tree

| Mathematical Analysis |
| :---: |
| **Abstract Data Type** |
| List, Stacks, & Queues |
| Trees |

- Tree is a very efficient data structure to store information.

- Variations on the tree can be used in different algorithms.

Hashing DS

Hashing Functions and Techniques

Collision Policies

Mathematical Analysis
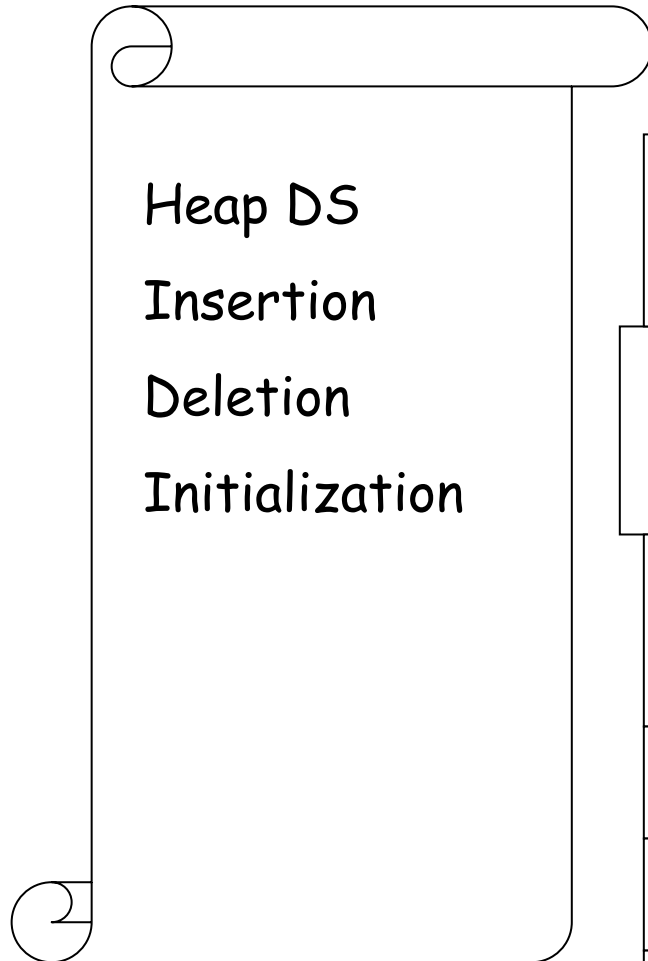
Abstract Data Type

List, Stacks, & Queues

Trees

Hashing

- Hashing is a way to transform objects in one domain into another domain.

- It is efficient to locate an object, but can t keep the ordering.

Heap DS

Insertion

Deletion

Initialization

Mathematical Analysis
Abstract Data Type
List, Stacks, & Queues
Trees
Hashing
Heaps
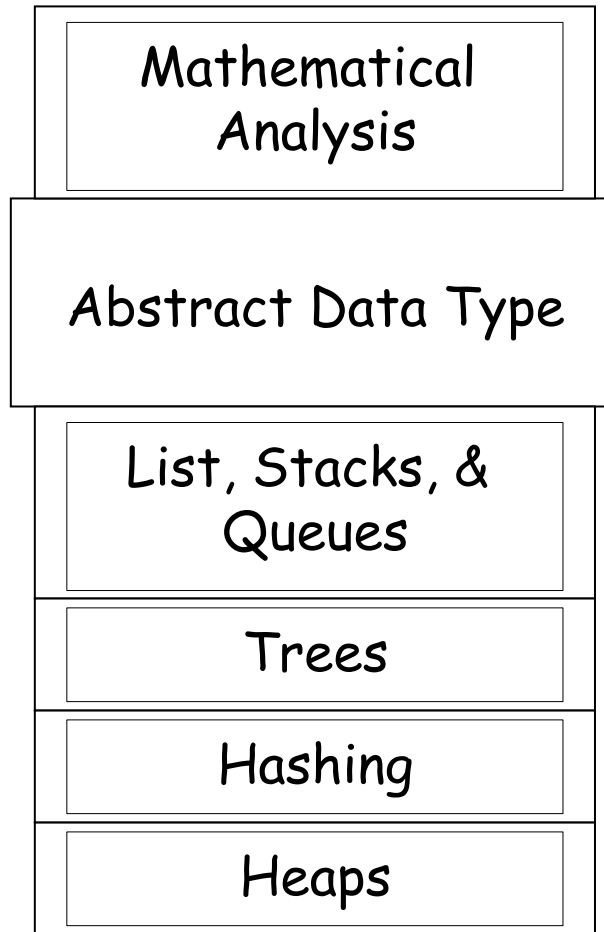
- Heap is a priority list which is most efficient when a priority is needed.

- It has a relative ordering, but not an exact one.

Bubble Sort

Insertion Sort

Selection Sort

Heap Sort

Shell Sort

Merge Sort

Quick Sort

Sorting Algorithms
Mathematical Analysis
Abstract Data Type
List, Stacks, & Queues
Trees
Hashing
Heaps
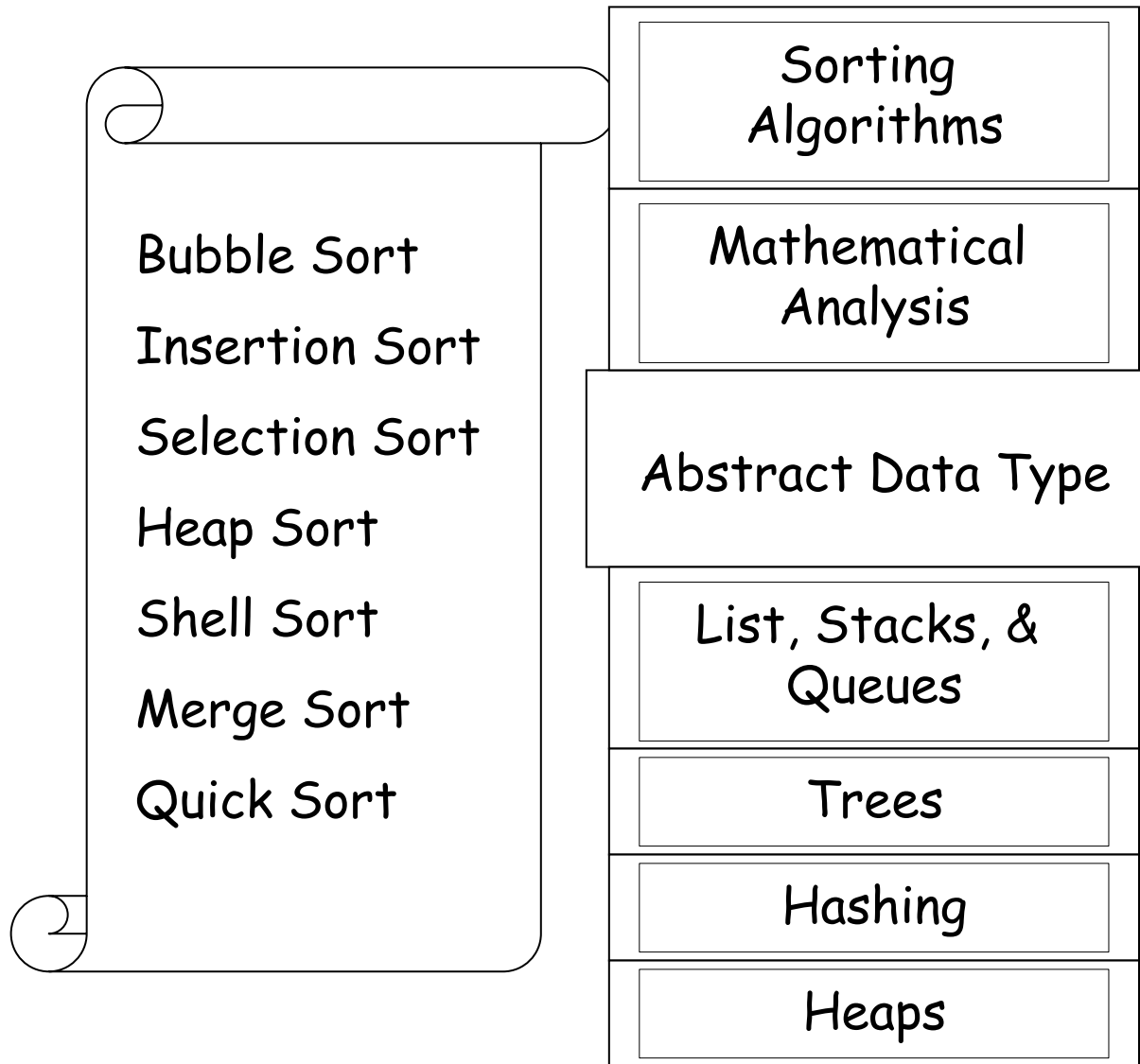
- Sorting is a very important topic.

- Make sure you know the differences of the algorithms well.

- Stability issues.

- Invariant in the Quick Sort.

Graph DS

Adjacency Matrix

Definition of Connectivity

Topological Sort

Shortest Path

Minimum Cost Spanning Tree

Maximum Flow

Sorting Algorithms

Mathematical Analysis

Abstract Data Type

List, Stacks, & Queues

Trees

Hashing

Heaps

Graph Data Structures and Algorithms

- Graph Theory is important in many areas of CS.

- Important to know the exact way to express the algorithm on graphs.

CSC2100B - I. King

Course Summary

- Introduction
- Analysis
- Lists, Stacks, and Queues
- Trees
- Hashing
- Heaps
- Sorting Algorithms
- Graph Algorithms

Examination Questions

- Define the big-O, omega, and small-o function and show how they work.
- Program Analysis
- Heaps
  - operations, e.g., insertion, deletion, etc. can be performed on these numbers.
- Hashing
  - Given a list of numbers, show how the processing of different collision policies affect the outcome.

Examination Questions

- ## Sorting
  - Define what is an inversion.
  - Given a sequence of unordered numbers, show and illustrate the sorting process for a particular sorting algorithm.

- ## Graph Theory
  - Given a graph, show how to obtain (1) topological sort, (2) minimum cost spanning tree, (3) shortest path, and (4) maximum flow using the tables or figures shown in the class.

Others

- All grades are final before the final examination (with the exception of the last homework assignment).

- The extra credit problem is due on the deadline.

- Welcome to drop by my or TA's office for discussion.

Education's purpose is to replace an empty mind with <u>an open one</u>.

Malcolm S. Forbes