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CSM 387 Data Structures I



Dr. Kofi E. Appiah
2012/2013

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Prerequisites

- C/C++ from CSM 157/158
- Java from CSM 281/282
- If you do not meet the prerequisite requirements for this course, you should see me immediately.

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Texts

- Optional
 - *C++ Plus Data Structures* by N. Dale, Jones and Bartlett Publishers, 4th edition, 2007.
 - *Java Collections: An Introduction to abstract Data Types, Data Structures and Algorithms* by Watt and Brown
 - *Data Structures with C++* by W.Ford and W.Topp, Prentice Hall.



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Course Objectives

- Introduce you to fundamental and advanced data structures.

Algorithm Analysis

- Discuss different implementations and analyze algorithm efficiency in terms of **time** and **memory**.
- Expose you to the field of image processing where data structures could be used to efficiently solve many practical problems.

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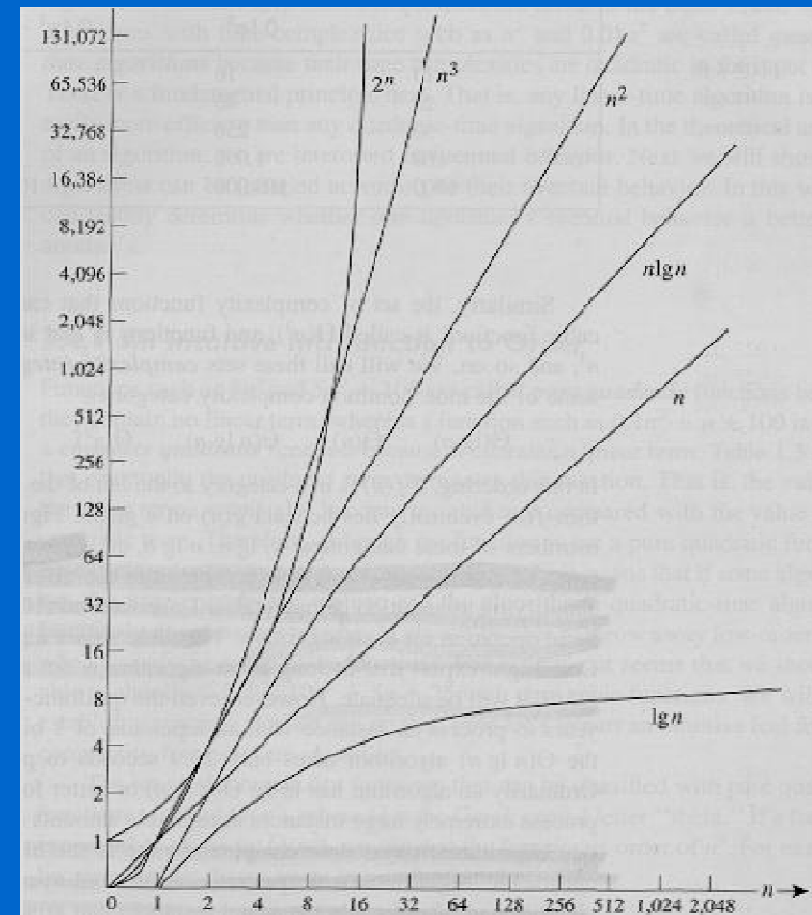
Lecture 2 (tentative – 10/09/12)

- C++ Review
 - Call by value/reference
 - Dynamic Array Allocation
 - Constructors/Destructors/Copy-constructors
 - Operator Overloading

Study for next time!

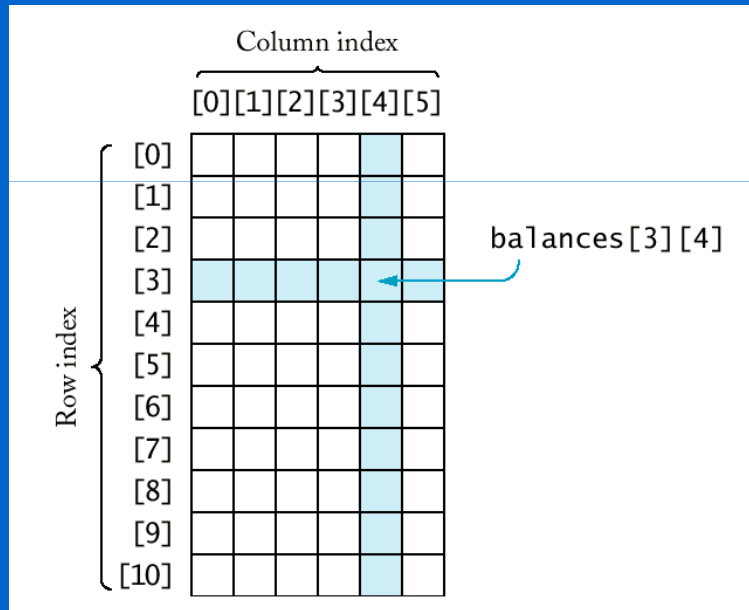
Lecture 3 (tentative – 17/09/12)

- Analysis of Algorithms
 - Predict how **running time** increases as the **size of the problem** increases.
 - Should be independent of machine, programming style.
 - Best/Average/Worst

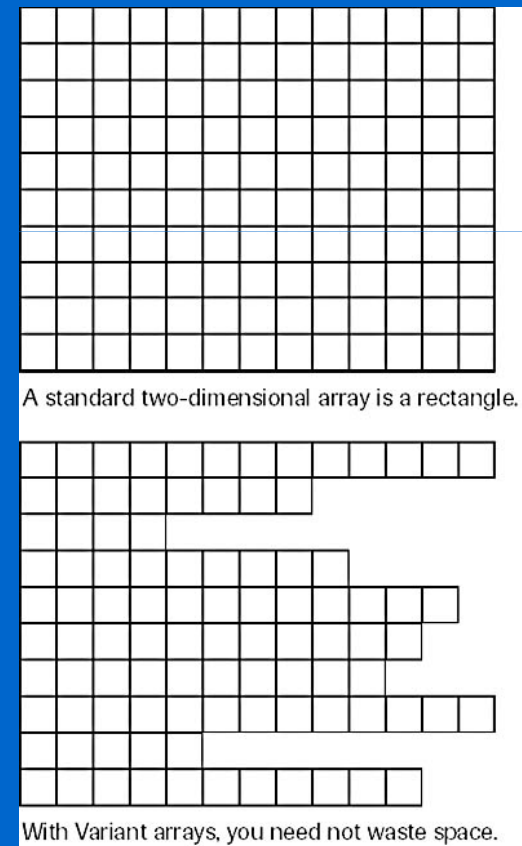


Lecture 4 (tentative – 24/09/12)

- Array



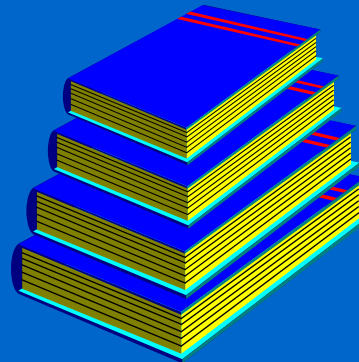
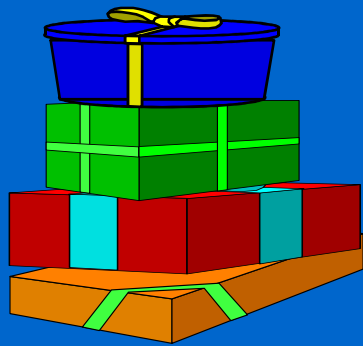
array-based



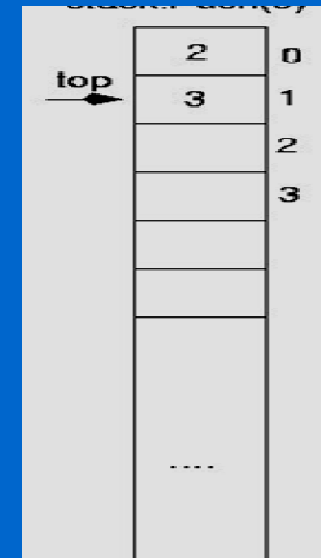
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Lecture 5 (tentative – 1/10/12)

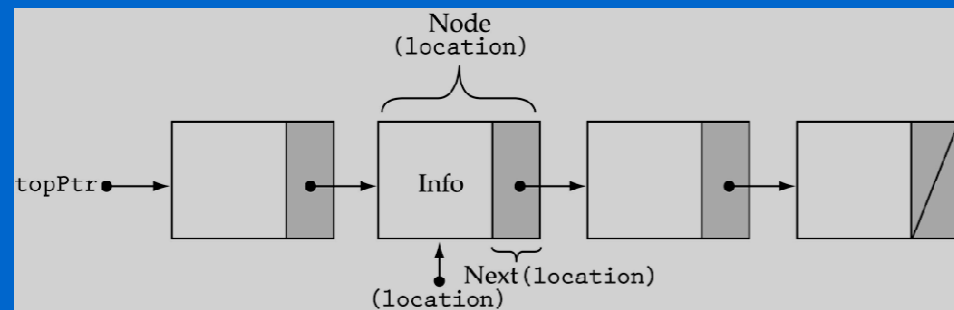
- Stacks



array-based

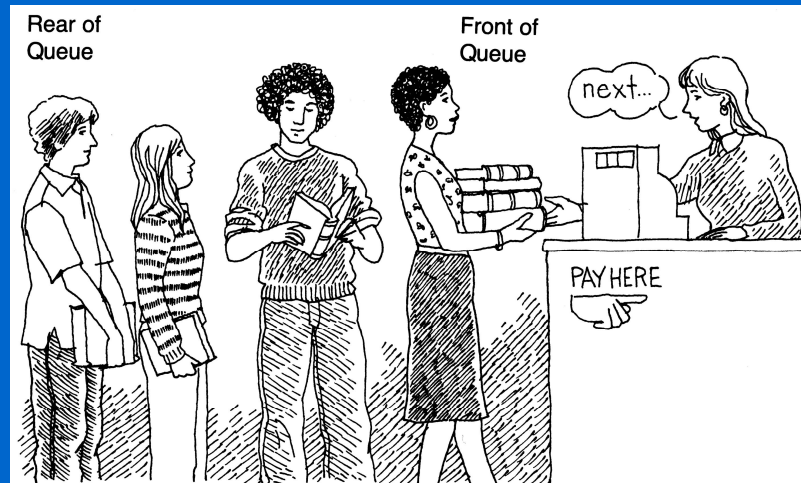


linked-list-based

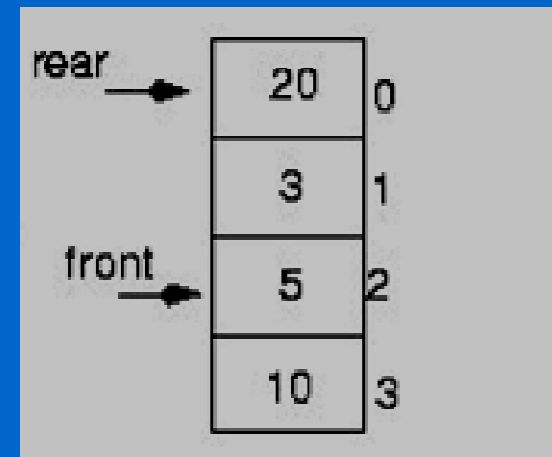


Lecture 6 (tentative – 08/10/12)

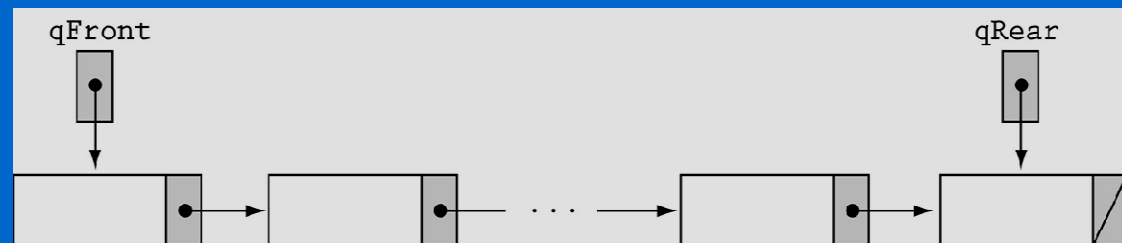
- Queues



array-based



linked-list-based



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Week 8 (tentative)

- Mid - Semester
- 15th October 2012

Lecture 7 (tentative – 22/10/12)

- Unsorted Lists
 - array-based
- Sorted Lists
 - array-based
 - **Binary search**: very efficient search when using arrays!

Unsorted List		Sorted List	
22		12	
12		14	
46		22	
35		35	
14		46	
...		...	
...		...	
...		...	
...		...	

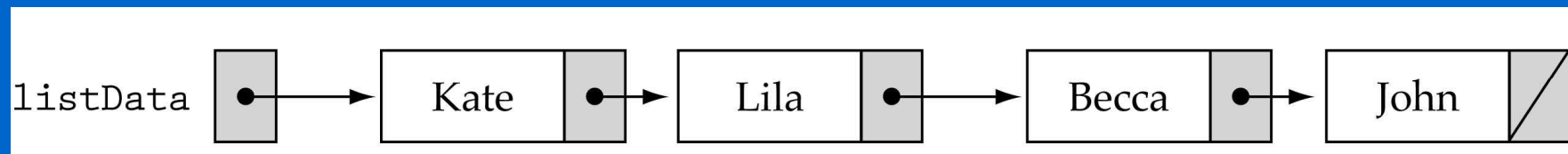
ID	Name	Address
22	John Black	120 S. Virginia Str

key

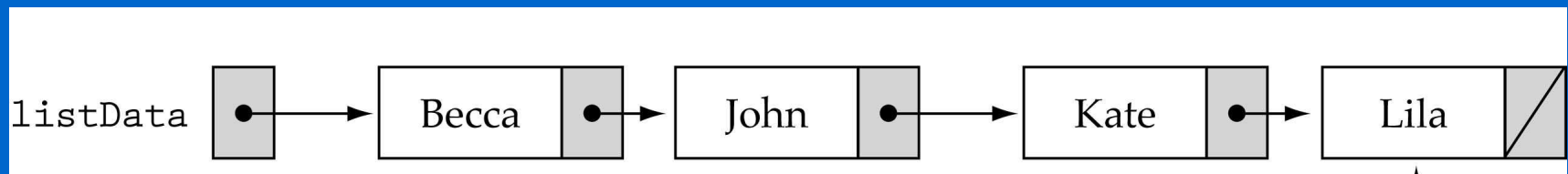
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Lecture 8 (tentative – 29/10/12)

- Unsorted Lists
 - linked-list-based

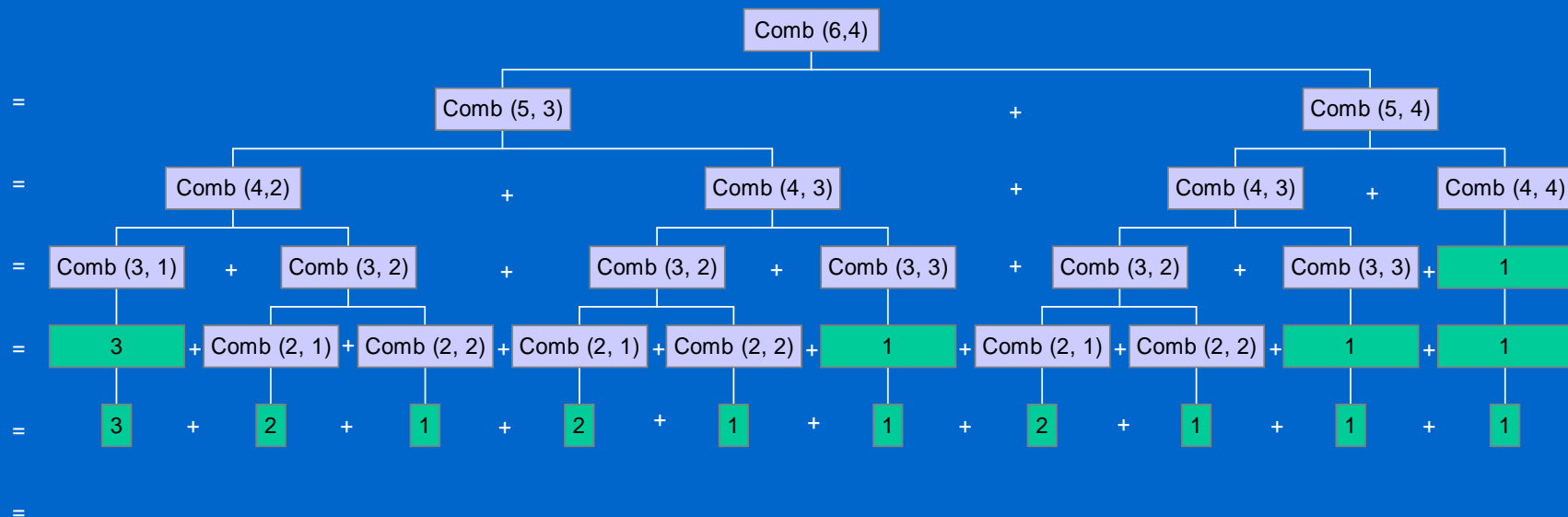


- Sorted Lists
 - linked-list-based



Lecture 9 (tentative – 05/11/12)

- Recursion



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Lecture 10 (tentative – 12/11/12)

- Introduction to Image Processing and Computer Vision
 - What are IP and CV?
 - Relation to other fields
 - Challenge
 - Image Representation
 - Applications



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Week 13 (Revision)

- 19th November 2012

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Exams and Assignments

- Two exams (mid semester – 10%, final – 70%)
 - Final will be comprehensive.
- 5 Quizzes – 10%
 - Will be given on Monday and due on Friday
- 4 Programming assignments – 10%
 - Will be done in teams of two students
- Fridays
 - Solutions to the quizzes
 - Programming exercise in the Computer lab.

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Programming Language/Environment

- We will be using C/C++
- Either Windows or Unix/Linux

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Course Policies

- Lecture slides, assignments, and other useful information will be made available after every lecture.
- If you miss a class, you are responsible for all material covered or assigned in class.
- A missed quiz/exam may be made up **only** if it was missed due to an extreme emergency.

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Course Policies

- Both team members are expected to fully understand the structure of the code and the implemented algorithms.
- Discussion of the programming assignments is allowed and encouraged.
- However, team members are expected to do their own work.

Assignments which are too similar will receive a zero.

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Course Policies (cont'd)

- **No** late programming assignments will be accepted unless there is an extreme emergency.

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Important Dates

- October 15, 2012 – Mid Semester exam
- November 19, 2012 – Revision Week
- November 26, 2012 - Final exam begins

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What is Data Structures?

- The primary purpose of most computer programs is not to perform calculations, but to store and retrieve information — usually as fast as possible.
- The study of data structures and the algorithms that manipulate them is at the heart of computer science.
- There are often many approaches to solving a problem. How do we choose between them?

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The Need for Data Structures

- Is program efficiency becoming less important?
 - Processor speed and memory size keeps improving
- Computer power increases with demand for more complex solutions.
- Today's computer scientists must be trained to have a thorough understanding of the principles behind efficient program design.

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Questions?