Welcome back!

Data structures lab – week 2
Wake-up quiz

● How many answered last week's survey?
  a) 5
  b) 6
  c) 7
  d) 8

● Silly question, but we need to get that blood flowing
  - I'll show the answer in a moment.
Outline

- Last week
- How a lab lecture works
- Basics elaborated
- A note on lists
- Assignment questions and guidelines
Week 1 recap

- C++ compiler installation (MinGW)
- Eclipse installation
- CDT plugin installation
- Hello, World in C++
- From Java to C++
- Assignment 0 and 1 walkthrough
Week 1 class evaluation

- 7 respondents / 50 students = 14 %
- 6 was in class, 1 was not
- Overall satisfaction: 6 "yes"
- Speed: 6 "ok"
- Difficulty: 3 "ok", 3 "a bit easy"
Week 1 class evaluation - cont.

• Contents
  – 3 "interesting"
  – 1 "ok"
  – 1 "uninteresting"
  – 1 "very uninteresting"
    • What does this show?
How lab lectures work

● This is a computer science "lab"
● But a lab with lectures?
  – Why lectures?
  – Do you need to attend class?
  – Why am I asking this question now?
How lab lectures work

- This is not optimal
- Scenario:
  - I show you a neat trick
  - You write it down
  - You forget how it works after class
  - You send me countless emails
  - I get tired
    - Does it have to be like this?
    - Did you still learn something?
**Wake-up quiz – Master method**

- Algorithm running time:
  \[ T(n) = aT\left( \frac{n}{b} \right) + f(n) \]

- If
  \[ f(n) = \theta(n^{\log_b a}) \]

- Then
  a) \[ T(n) = \theta(f(n)) \]
  b) \[ T(n) = \theta(n^{(\log_b a) \lg n}) \] \(\text{b is correct!}\)
  c) \[ T(n) = \theta(n^{(\log_b a)}) \]
  d) None of the above
How lab lectures work

-Hopefully, you didn't all answer b :-)

- Different needs
  - That's why I have office hours
    - Please come
  - That's why I have email
    - Please ask

- Your opinion matters
  - Give feedback (weekly)
Basics elaborated - Eclipse

- My situation
  - Eclipse, CDT and C++ works ”out of the box” on Linux, Mac OS and Windows.
  - Hello World program in 30 seconds on IX.

- Could have been
  - ”Launch failed. Binary not found.”
  - Hello World program not immediately possible.
Eclipse

- Eclipse is not always the answer to your problems.
- I am not always the answer to your problems.
- The terminal is (even in Windows).
  - Yes, a CS major will eventually have to use the terminal
    - Always
      - No, you cannot run away from this fact
Basic unix terminal stuff

- You should be able to pick this up by yourself. But a quick intro to commands:
  - "cd dir" - changes directory to dir
    - "cd .." navigates up one level
  - "ls" - lists contents of current directory
    - Windows: "dir"
- That's all you need for basic navigation
  - Unix experts, please don't kill me.
Compiling in terminal

- Navigate to your source file. Or create it.
  - e.g. HelloWorld.cpp

- Compile it with a c++ compiler, often g++
  - g++ HelloWorld.cpp -o hw
    - -o hw means "output to a file called hw"

- Run it:
  - Windows: hw.exe
  - Mac/Linux: ./hw
Controlling standard in/out

• Normal behavior for cout in hw program
  – cout << "Hello World" outputs Hello World to screen

• How do we write it to a file? Easiest with our new friend: command-line
  – Windows: hw.exe > outputFile
  – Mac/Linux: ./hw > outputFile

• Similar for reading files except > is replaced with < and they can be used at the same time
Wake-up quiz – IO

• I want to read contents of a file through standard input and write to another file using standard output. Which command do I use:

  a) ./myProgram < input > output
  b) ./myProgram > output < input
  c) I can use both

• The answer is c.
More information

Google
Linked Lists

- Objects arranged in linear order
- An object has a key and one or two pointers, next and prev
  - Singly linked
  - Doubly linked
  - Circular
  - Sorted/unsorted
Linked Lists

• What are they good for?
  – Stacks (LIFO)
  – Queues (FIFO)
  – Disjoint sets
Linked Lists versus Array

- Consider a version of the Josephus problem (assignment 1)
  - $n$ persons in a circle.
  - Count $n$ times around the circle to find the person to be killed.
  - Continue until one remains.
Wake-up quiz – LL vs Arrays

- How long does it take to find the person to be killed, using a Linked List?
  - a) $O(1)$
  - b) $O(\log n)$
  - c) $O(n)$
  - d) None of the above

- The answer is c.

- How about for an array implementation?
Linked Lists

- Linked List versus Array
  - Linked List: Fast insert/delete, slow lookup
  - Array: Slow insert/delete, fast lookup
- Linked Lists can be implemented using arrays
  - For older programming languages.
  - For the heck of it.
Assignments

- Questions
  - Send me an email before class.
  - I only got one question this time.
- Be a problem solver
- Don't start too late!
- Remember to conform to the output format.
- Remember the running time!
Assignments – expectations

• Programming style
  – We are all individuals
  – There is no right or wrong
  – Common sense guidelines

• Documentation
  – Important!
  – You might write some code I don't immediately understand.
    • But I understand English
Coding guidelines

• Or: How to not frustrate your colleagues, teachers (and yourself?).
  – Partial topic for next week's lecture
  – But might as well show you now.
Thank you

Questions?