Data structures lab – week 2

Welcome back!

Wake-up quiz

- How many answered last weeks 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:

$$T(n) = aT(n/b) + f(n)$$

- If

$$f(n) = \theta(n^{(\log_b a)})$$

- Then
  a) $T(n) = \theta(f(n))$
  b) $T(n) = \theta(n^{(\log_b a)} \lg n)$ 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(lg 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?