ORF 201

COMPUTER METHODS FOR PROBLEM SOLVING

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Lecture 11

Review

"But Boss, I just left out a decimal point. Don't I at least get partial credit?"

Loops and Ifs

- `for (i=0; i<n; i++) {…}`
- `while (!done) {…}`
- `do {…} while (!done);`
- `if (doit) {…}`
- `if (doit) {…} else {…}`

Operators and Expressions

- Arithmetic: `+`, `-`, `*`, `/`
- Logical: `||`, `&&`, `!` , `==`, `<`, `<=`, `>`, `>=`, `!=`
- Assignment: `=`, `+=`, `-=`, `*=`, `/=`
- Unary: `++`, `--`, `-`

Comments

Comments are notes to the human reader of the code.

Two types:

- `/*` ... `*/` - good for spanning several lines
- `//` - good for short comments

Operators and Expressions

- Types:
  - **`double`**
  - **`int`**
  - **`boolean`**
- Declare, initialize, use
- Scope: A variable exists everywhere between the nearest set of enclosing braces, even within further nested braces unless it is hidden by another variable of the same name.

Arrays

- Declaration: `double[] x;`
- Instantiation: `x = new double[43];`
- Usage: `x[23]`
- Pointer: `x` alone is a pointer

Classes

- Definition: `class Foo {int v1; int v2; ...}`
- Declaration: `Foo f;`
- Instantiation: `f = new Foo();`
- Initialization: `f.v1 = m1;`
- Access: `v = f.v1;`
- Pointer: `f` alone is a pointer
- Class methods: classes can contain methods

Strings

String constants are enclosed in quotes: **`"this is a string"`**
String variables:

- Declaration: **`String s;`**
- Instantiation: **`s = new String("Hello there");`**
  `s = "Hello there";`
- Concatenation: **`s1 + s2`**
- Comparison: **`if (s.equals("Hi")) {…}`**
- Pointer: **`s`** alone is a pointer
- **`String`** is an example of a *derived class*

Methods

- Definition: **`double foo(int x, double y, ...) {...}`**
- Argument list: zero or more inputs
- Return value: if non-void, must **`return`** something
- Usage: **`z = foo(xx, yy);`**
- Methods are *call by value*
- Arguments that are pointers (arrays and derived classes) pass the value of the pointer -- things to which it points can be changed in the calling method.
- Recursion: a method can call itself -- sometimes convenient (see **`Factorial.java`**)

Algorithms

- Searching
  - Binary
  - Sequential (brutesearch)
- Sorting
  - Bubble sort
  - Quick sort
  - Insertion sort
- Newton's method (sqrt)

Complexity

- Difference between log n, n, n^2, n^3, and 2^n
- worst case vs. average case