

Comparing Languages

COMP360

*“ Java is to JavaScript what Car is
to Carpet. ”*

Chris Heilmann

Course Evaluation

- Please complete the course evaluations for all classes
- You can find a link to the course evaluations on Blackboard
- So far only one person has completed the evaluation

Recursion

- A slide I copied from the textbook last week said


Recursion is equally powerful to iteration

- Actually recursion is more powerful than iteration
- Any iteration can be solved with recursion
- Not every recursive algorithm can be solved with iteration

Ackermann function

- The Ackermann function cannot be solved by iteration

$$A(m, n) = \begin{cases} n + 1 & \text{if } m = 0 \\ A(m - 1, 1) & \text{if } m > 0 \text{ and } n = 0 \\ A(m - 1, A(m, n - 1)) & \text{if } m > 0 \text{ and } n > 0. \end{cases}$$



$$2^{(n+3)} - 3$$

$$n + 3$$

It Gets Big Fast

$m \backslash n$	0	1	2	3	4	n
0	1	2	3	4	5	$n + 1$
1	2	3	4	5	6	$n + 2 = 2 + (n + 3) - 3$
2	3	5	7	9	11	$2n + 3 = 2 \cdot (n + 3) - 3$
3	5	13	29	61	125	$2^{(n+3)} - 3$
4	13 $= 2^{2^2} - 3$	65533 $= 2^{2^{2^2}} - 3$	$2^{65536} - 3$ $= 2^{2^{2^{2^2}}} - 3$	$2^{2^{65536}} - 3$ $= 2^{2^{2^{2^{2^2}}}} - 3$	$2^{2^{2^{65536}}} - 3$ $= 2^{2^{2^{2^{2^{2^2}}}}} - 3$	$2^{2^{\dots^2}} - 3$ $n + 3$

Comparing Languages

- Today I would like to discuss the difference between programming languages that we know

Java

C++

JavaScript

Haskell

Overview of C++ and Java

C++

- An object-oriented extension of C leaving all old C features (and warts)
- Little inheritance in the standard library

Java

- Strongly influenced by C++
- Everything inherits from a single parent class, Object

Connection to the Hardware

C++

- Compiles to native machine language
- Length of data values dependent on implementation
- Supports unsigned numbers

Java

- Compiles to byte codes
- Standardized data length
- All numbers are signed

Programming Paradigms

C++

- Procedural
- Object-Oriented
- Generic
- Functional

Java

- Procedural
- Object-Oriented
- Generic
- Functional
- MapReduce

Program Safety

C++

- No bounds checking
- Dynamic memory released via delete
- Allow operator overloading
- Supports goto

Java

- Bounds checking on all array access
- Garbage collection
- Operator overloading is not allowed
- goto is not allowed
(reserved word)

Object Instantiation

C++

- Widget cat; creates a Widget object
- Supports pointers

Java

- Widget cat; creates a reference to a Widget object
- Reference variables are pointers, but pointer manipulation is not allowed

Comparison on Wikipedia

https://en.wikipedia.org/wiki/Comparison_of_Java_and_C%2B%2B

Third Exam

- When should we have another exam in COMP360?

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