61A Lecture 27

Wednesday, October 31

Programming Languages

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Machine language	C

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Machine language	C	Python

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- An *interpreter* for a programming language is a function that, when applied to an expression of the language, performs the actions required to evaluate that expression.

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In computer science, languages can be *implemented*:

- An *interpreter* for a programming language is a function that, when applied to an expression of the language, performs the actions required to evaluate that expression.
- The *semantics* and *syntax* of a language must be specified precisely in order to build an interpreter.

The Scheme-Syntax Calculator Language

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A subset of Scheme that includes:

- Number primitives
- Built-in arithmetic operators: +, -, *, /
- Call expressions

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```
> (+ (* 3 5) (- 10 6))
19

> (+ (* 3
        (+ (* 2 4)
           (+ 3 5)))
     (+ (- 10 7)
        6))
57
```

Syntax and Semantics of Calculator

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  - the additive inverse of a single argument, or
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- The * operator returns the product of its arguments
- The / operator returns the real-valued quotient of a dividend and divisor (i.e., a numerator and denominator)

Expression Trees

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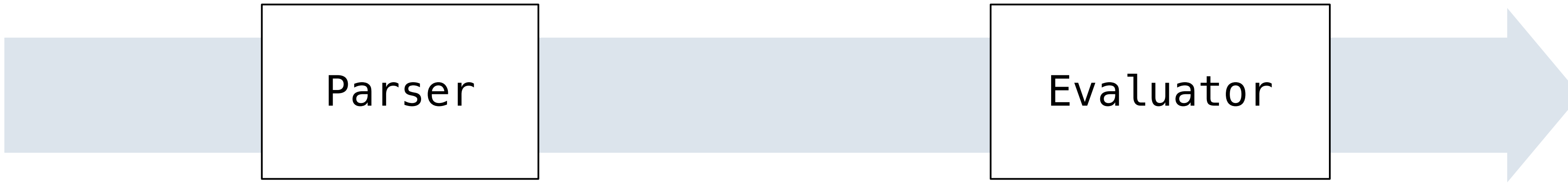

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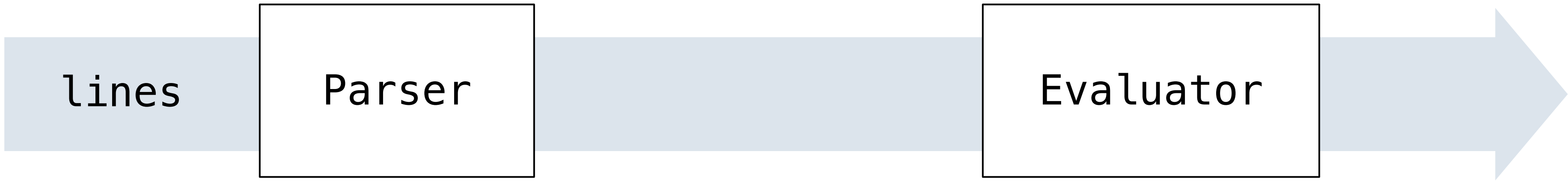

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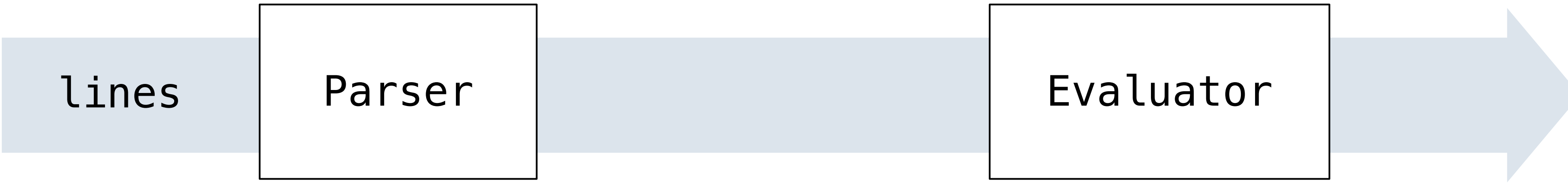

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'(+ 2 2)' **Pair('+', Pair(2, Pair(2, nil)))** **4**

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Lines forming a Scheme expression

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lines → **Parser** → expression → **Evaluator** → value

lines	expression	value
`'(+ 2 2)'`	`Pair('+', Pair(2, Pair(2, nil)))`	`4`

`'(* (+ 1'`
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Lines forming a Scheme expression	A number or a Pair with an operator as its first element	

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scheme_reader.py | **scalc.py**

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Demo (http://inst.eecs.berkeley.edu/~cs61a/fa12/projects/scalc/scheme_reader.py.html)

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