CS 3110

Interpreters

Nate Foster
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Review: Interpreters

- Lexer

- Parser

- (Type checker)
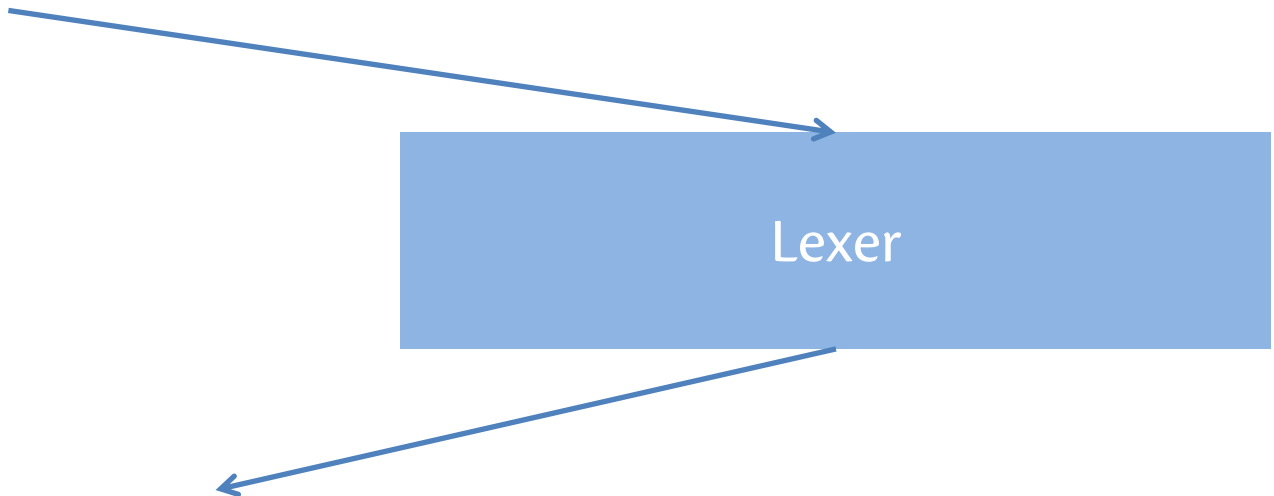
- Evaluator

Today: Extended Interpreter

- 22
- 11 + 11
- (10 + 1) + (5 + 6)
- 2 * 11
- **3 – 2**
- **ifzero 0 then 1 else 2**

- Integers
- Addition
- Multiplication
- Parentheses
- Whitespace
- **Subtraction**
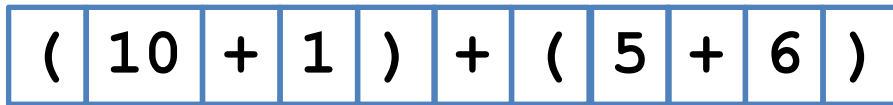- **Conditionals**

Lexer

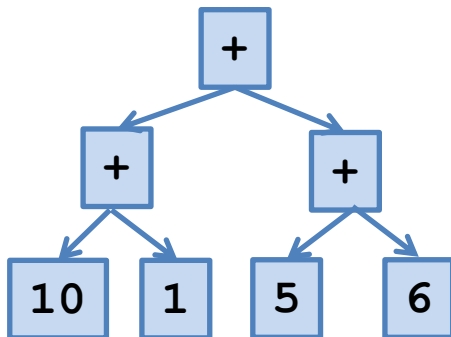Character stream:

`(10 + 1) + (5 + 6)`

Lexer

Token stream:

(	10	+	1	)	+	(	5	+	6	)

Parser

Token stream:

| (| 10 | + | 1 |) | + | (| 5 | + | 6 |) |

Parser

Abstract syntax tree:

```
          +
         / \
        +   +
       / \ / \
      10 1 5  6
```
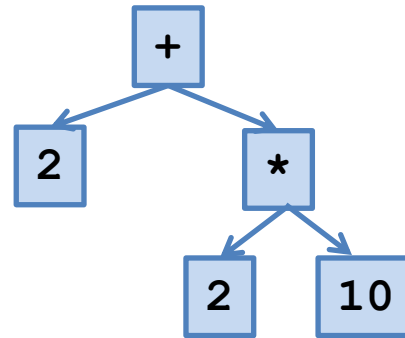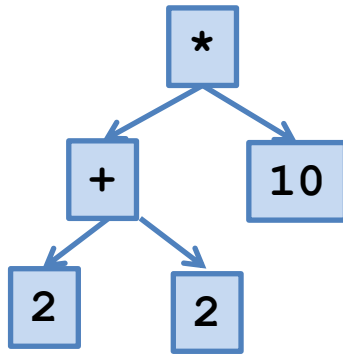
Concrete vs. abstract syntax

```
2 + 2 * 10
```

```
(((2) + 2)) * 10          2 + (2 * 10)
```

Evaluation strategy

- An expression e takes a single *step* to a new expression e' by simplifying some subexpression

- Expression keeps stepping until it reaches a *value*

- Values never step further