

Objectives

- Picasso Design/Parsing

Nov 30, 2009 Sprenkle - CS209 1

Project Deliverables Timeline

Deliverable	Who	Weight	Due Date
Preparation	Individual	8%	12/2
Preliminary Implementation	Team	37%	12/7
Final Implementation	Team	40%	You decide → latest 12/18
Analysis	Individual	15%	12/18

Nov 30, 2009 Sprenkle - CS209 2

Picasso Project Overview

- Goal: Generate images from expressions
- Every pixel gets assigned a color, computed from its x and y coordinate and the given expression
- Colors are RGB values
 - Range [-1, 1]
 - Black is [-1,-1,-1]
 - Red is [1,-1,-1]
 - Yellow is [1, 1,-1]

Nov 30, 2009 Sprenkle - CS209 3

Examples

[-1, 1, -1] x x*y

```
For all x:
  For all y:
    pixels[x][y] = expression.evaluate(x, y)
```

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Specification

- User can enter expressions
 - Interactively or from file
 - Language is defined in specification
- Lots of possible extensions

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Programming Language Syntax

- What does an identifier look like in Java?
- What does an assignment statement look like in Java?
- What can be on the left hand side?
- What can be on the right hand side?
- What does a multiplication look like?
- How do we evaluate arithmetic expressions?

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Programming Language Design

- Must be unambiguous
 - Programming Language defines a syntax and semantics
- Interpreting programming languages
 - Parse program into tokens
 - Example: $x = 4 * 3;$ →

```
<id> <assignment> <num> <mult> <num> <endofstmt>
```

- Verify that tokens are in a valid form
- Generate executable code

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Interpreting User's Input

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Interpreting User's Input

`y + x * floor(x)`

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What We Need to Do/Represent

- Lexical Analysis
- Semantic Analysis
- Evaluation

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What We Need to Do/Represent

- Lexical Analysis
 - Recognize/create tokens
 - Report errors in creating tokens
- Semantic Analysis
 - Convert infix tokens into postfix
 - Report errors
 - Parse tokens into *expressions*
 - Report errors
- Evaluation
 - Evaluate expressions with respect to x and y

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Picasso Starting Code

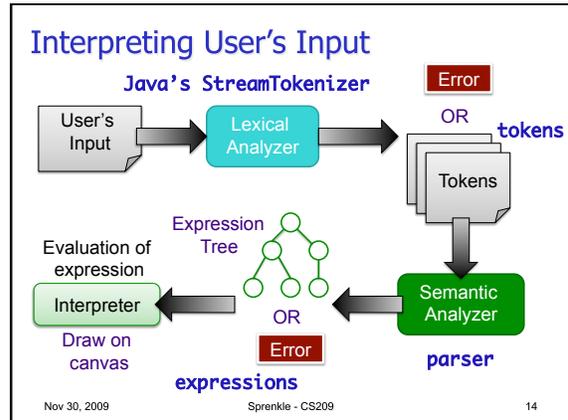
- Import an existing project from
 - `/home/courses/cs209/handouts/picasso.tar`
- Code has been updated since previous version
- Some errors in giving testing code. Most will be fixed by end of today.

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Understanding the Code

- What are the different parts of the code?

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Understanding the Code

- Lexical analysis
 - `picasso.parser.Tokenizer`
 - `picasso.parser.tokens.TokenFactory`
 - Output: `picasso.parser.tokens.*`

FloorToken

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Understanding the Code

- Semantic analysis
 - `picasso.parser.ExpressionTreeGenerator` or
 - `picasso.parser.SemanticAnalyzer`
 - `picasso.parser.*Analyzer`
 - Output: `picasso.parser.language.expressions.*`

FloorAnalyzer

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Understanding the Code

- Evaluation
 - Base class: `picasso.parser.language.ExpressionTreeNode`
 - Output: `RGBColor`

Floor

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Practice Adding Functions

- Create a token for the sine function
 - Same prefix as new function, e.g., `SinToken.java`
 - Needs to be added to `functions.conf`
- Create a semantic analyzer for the function with same prefix as function, e.g., `SinAnalyzer.java`
 - `Analyzer` class (presumably implementing `SemanticAnalyzerInterface`) returns an instance of `ExpressionTreeNode`
- Create an `ExpressionTreeNode` for function `Sine.java`

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What Do You Think You'll Need To Do About Binary Operators?

Nov 30, 2009

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19

For Wednesday: Project Preparation

- Read over the Picasso (Final Project) specifications again
- 1st deliverable is a text document that answers
 - What needs to be completed?
 - What is your plan for completing those tasks?
 - What tasks are you most interested in working on?
 -
- Wednesday
 - Discuss your plans, questions
 - Discuss tools to help collaboration

Nov 30, 2009

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20