PolyGo

POLYNOMIAL MANIPULATION LANGUAGE

Project Presentation

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PRESENTATION OVERVIEW

- Introduction
- Language Features
- Architecture
- Conclusion

ABOUT POLYNOMIALS

- What is A Polynomial?
  - Mathematical expression written as the sum of products of numbers and variables
- Practical Applications
  - Model the projection of jet rockets
  - Market pattern forecasting
  - Drug Effectiveness
  - Physical equation
  - …

INTRODUCTION TO POLYGO

- What is PolyGo?

  - A Symbolic Polynomial Manipulation Language

- Why is PolyGo?

  - Flexible Manipulation of Polynomials
  - Algorithmic Customization
  - Light-weighted and easy applicable

LANGUAGE FEATURES

- Ability to solve polynomial problems
  - Arithmetic operation
  - Evaluate, Find root…
- Supports for complex number $3 + 5i$
  - Modulo, conjugation, and equation solving.
- Loops & Breaks:
  - ‘for' and 'while' loops supported
  - Body enclosed within a block
  - Break for jump out of the loop

DECONSTRUCTION OF POLYNOMIAL

x^2+7x-3

$4a^3+7a^2+a$

nm^2-m

$3x-2$

5

- Coefficient → Float
- Exponent → Indices
- Polynomial → List of float number
- Therefore, for single variable poly type
  - record the length and the coefficient comes the solution.

poly[2] p = {2.0,1.0,3.0}= $2 + x + 3x^2$

POLYGO DATA TYPES

- Int, Float, String, Bool, Complex
  - Basic data types, complex stores as <1, 2.3>

- Intarr, Floatarr, Boolarr
  - Array list for int, float and bool,

  e.g. int [2]a = [1, 2]

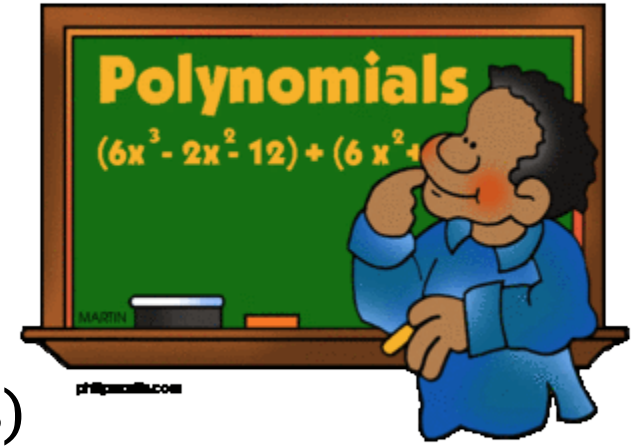
- Poly
  - Store polynomial coefficient,
  - poly [2]a = {3.0, 2.0, 5.0} as $3.0+ 2.0X +5.0X^2$

LANGUAGE FEATURES

- Declaration:
  - All local variables must be declared prior to any statements
  - Variables can be initialized when it is declared. E.g. int a = 1;

- Strict type system:
  - No automatic type conversion

LANGUAGE FEATURES



- Functions
  - <return type> fname (formals)
    {locals; statement lists}
  - Mathematical Driven
  - Static scoping, Variable redefinable
  - Built-in functions such as:
    print, print_n, order

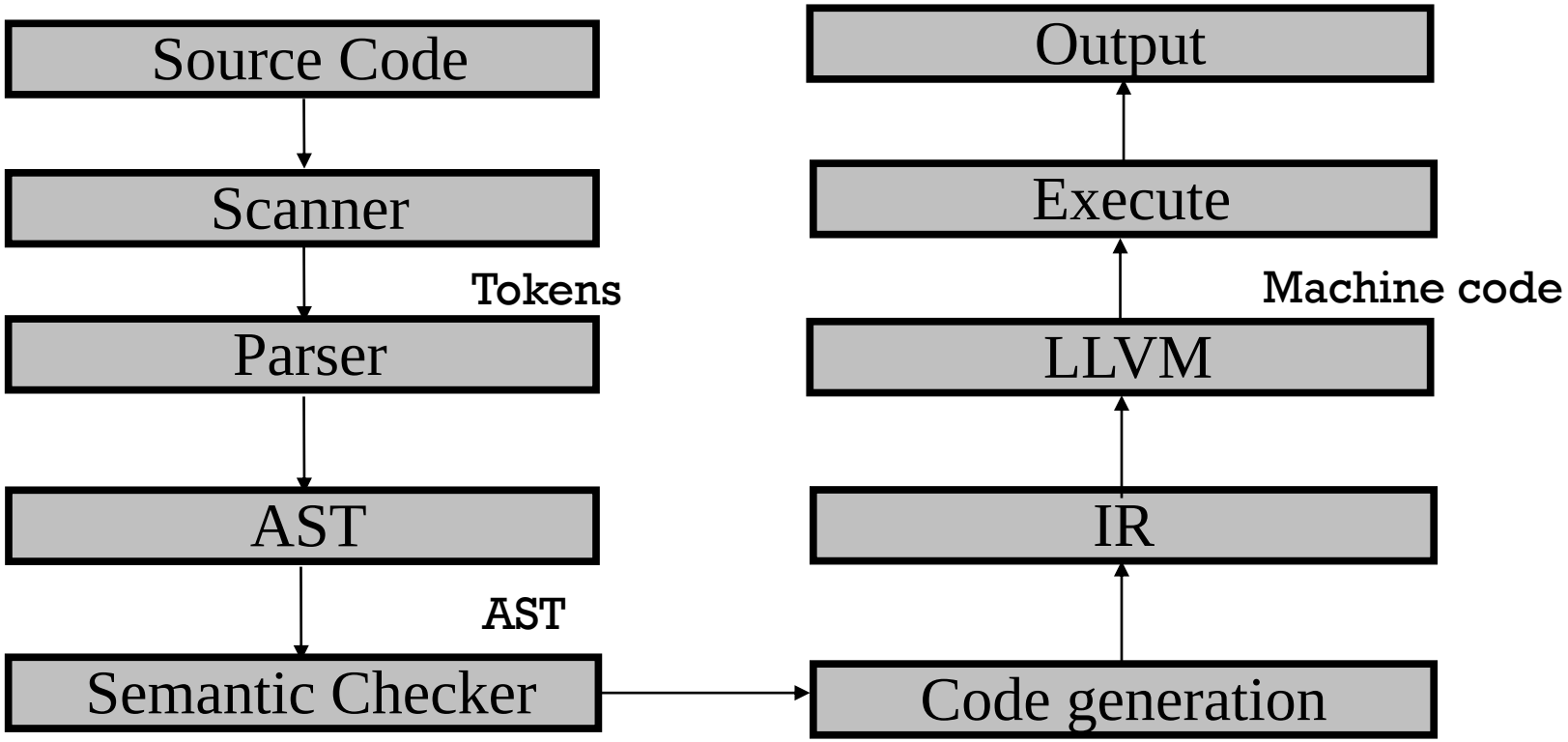
SEMANTIC CHECKING

- Function declarations
- Global, formal and local declarations
- Variable initialization
- Type of operands
- Predicate of for and while loop
- Function calls
- Return and break statement

TESTING

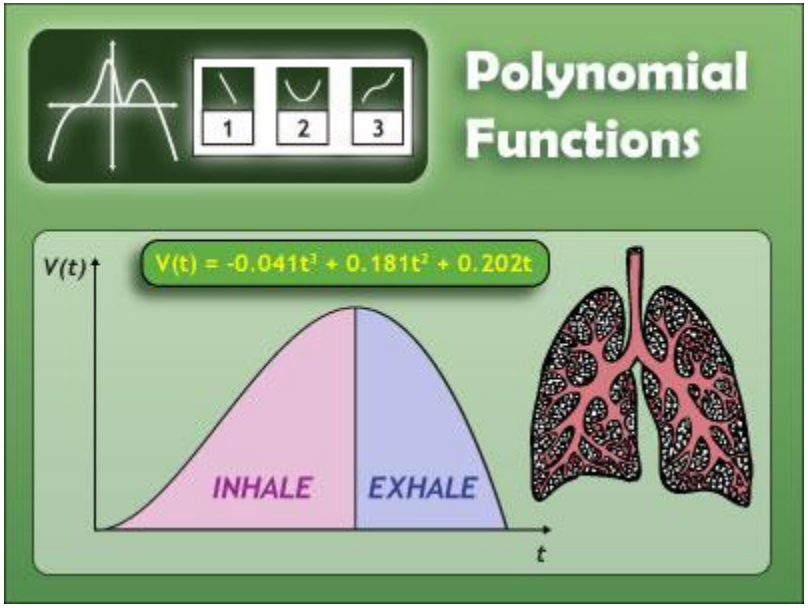
- Unit Testing
  - Test for parser, AST and semantic checker
- Integrated Testing
  - Test complete flow once integrated
- Regression Testing
  - Make sure new features don't introduce bugs

ARCHITECTURE




End
Demo

APPLICATION EXAMPLE



The volume of air flowing into the lungs during a breath can be represented by the polynomial function

$V(t) = -0.041t^3 + 0.181t^2 + 0.202t$,

where V is the volume in liters and t is the time in seconds.

- What is the maximum volume of air inhaled into the lung?
  - Derivation
  - Zero point
  - Evaluate

$t=3.43$

$V(t)=1.17$

APPLICATION EXAMPLE2

- Velocity(t)
- Distance(t)
- Accelerated speed(t)

THANKS FOR YOUR ATTENTION!