

Logo++

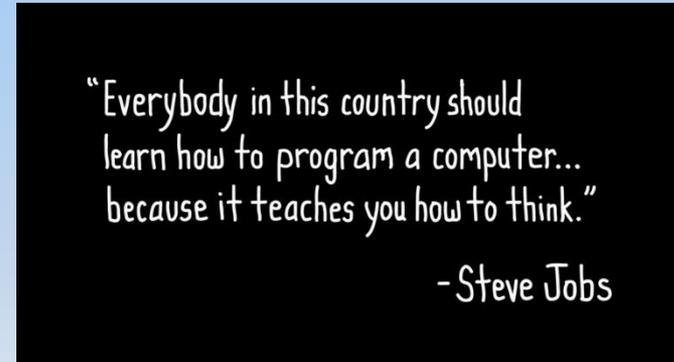
An educational language

Project Manager: Kam Lai
Language Guru: Yi-Yin Chang
System Architect: Jiao Li
System Integrator: Xinyuan Wang
System Tester: Bohong Zhao

Motivation

- Students should learn to code.

<http://www.youtube.com/watch?v=nKlu9yen5nc>



Problems of the current languages

- C – too much
- Scratch – not easy
- Traditional Logo – not motivating

Student-friendly programming language needs to be:

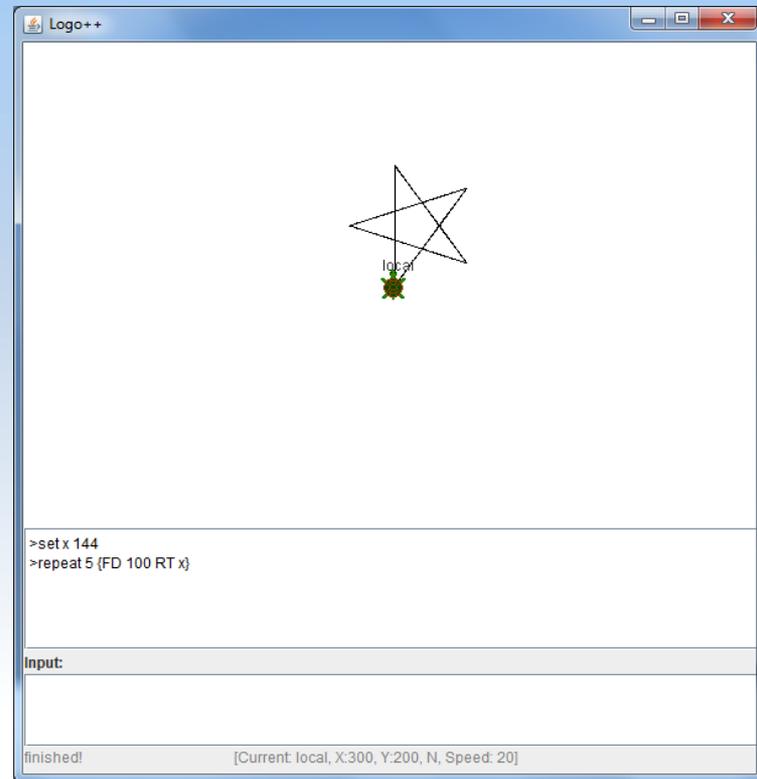
- Feedback-driven
- Easy to write/read
- Progressive learning
- Motivating



Quick example

```
set x 144
```

```
repeat 5 { FD 100 RT x }
```



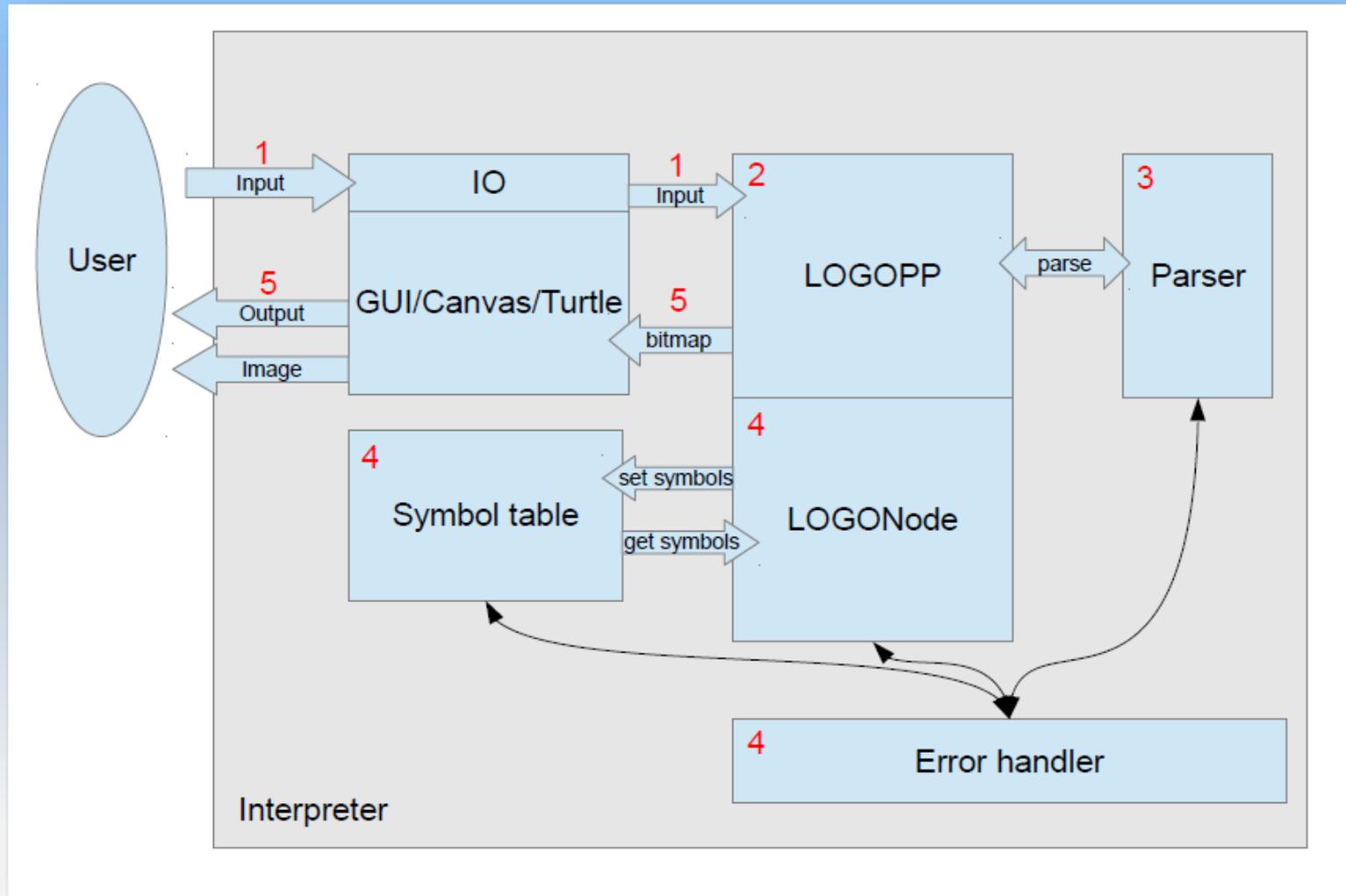
Syntactic constructs

- Easy to start with:
 - Simple syntax
 - Default data type
 - No semicolon
- Positive transfer for learning other programming languages:
 - Conditional, iteration and recursion statement
 - Function definition

Syntactic Definitions

Format	Alias	Functionality	Example
Forward number	FD	Moves forward by given distance	Forward 100
Back number	BK	Moves backward by given distance	Back 80
Left number	LT	Turns left by given angle	Left 50
Right number	RT	Turns right by given angle	Right 90
SetSpeed number	SS	Sets speed to given value	SetSpeed 10
Teleport (X,Y)	TP	Teleports to the target location	Teleport (100, 300)
GPS	/	Prints the current location	GPS
Print "word"	/	Prints content of given argument	Print "Hello"
Color "color"	/	Sets the color of the current pen	Color "red"
Origin	Home	Returns current turtle to the center (home)	Home
ClearScreen	CS	Clears the canvas and returns all turtles back home	ClearScreen
Wrap	/	Turtle(s) could warp to the other side when reaching border	Wrap
Fence	/	Turtle(s) will stop once reaching border	Fence
PenUp	PU	Turtle(s) won't draw when moving	PenUp
PenDown	PD	Turtle(s) will draw when moving	PenDown
ShowTurtle	ST	Displays turtle on GUI	ShowTurtle
HideTurtle	HT	Hides turtle on GUI	HideTurtle
Fill	/	Fills current enclosure area with pen color	Fill
Reset	/	Clears the symbol table and ClearScreen	Reset

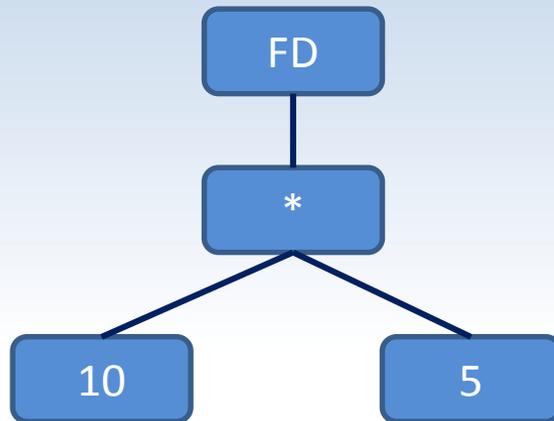
Architecture



Workflow of the interpreter

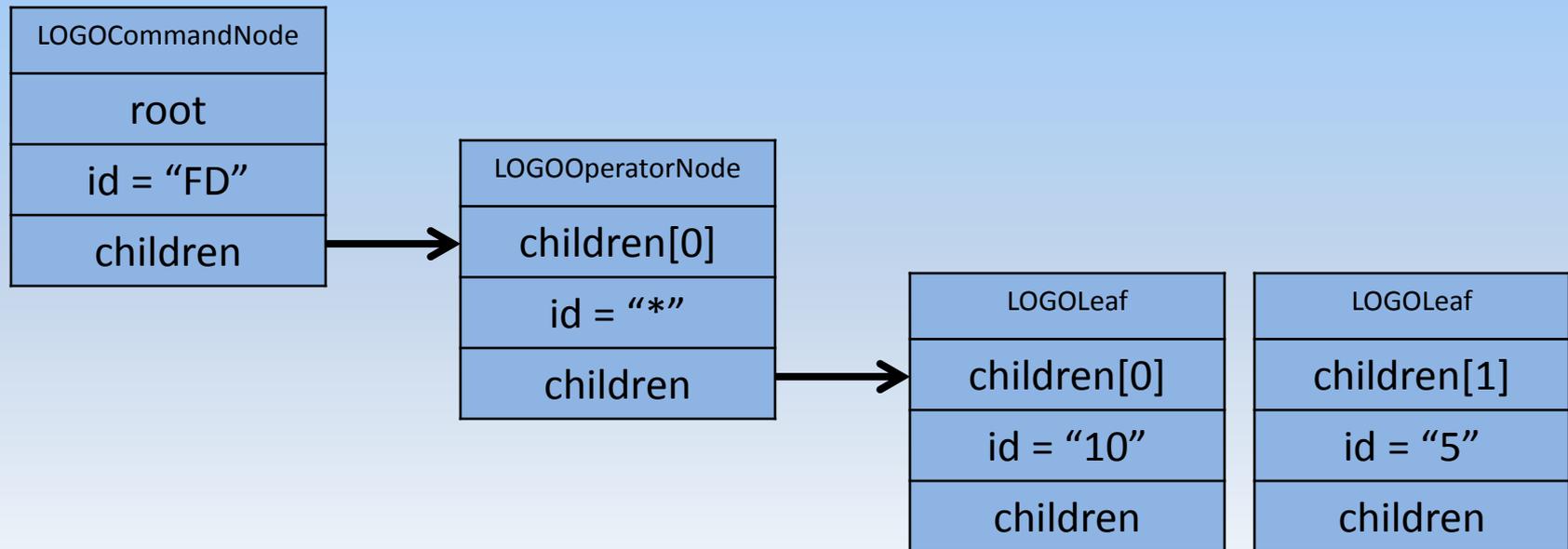
1. A user enters a command `FD 10*5` into the GUI.
2. The string `FD 10*5` is received by LOGOPP class, and it is sent to LOGOInterpreter.

3. Parse



Workflow of the Interpreter (cont.)

Internal structure:



Workflow of the Interpreter (cont.)

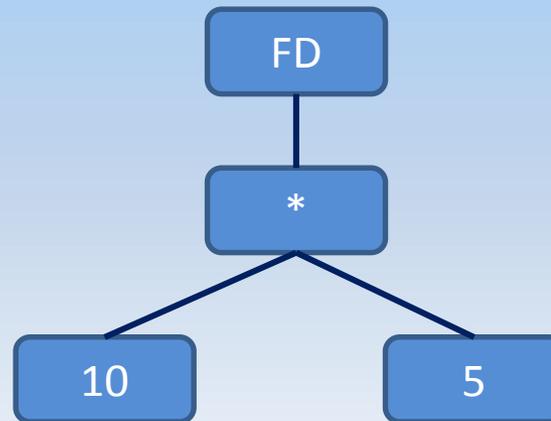
4. The `root.run()` is called, which recursively evaluates the nodes in the tree in postorder:

Leaf = Double 10

Leaf = Double 5

Operator = $10 * 5 = 50$

Command = FD 50



The FD command will call a static method `LOGOBasic.forward()` to modify the canvas.

Tools and Environment We Used

GitHub



Dropbox



Java™

Google docs



 **Clover**



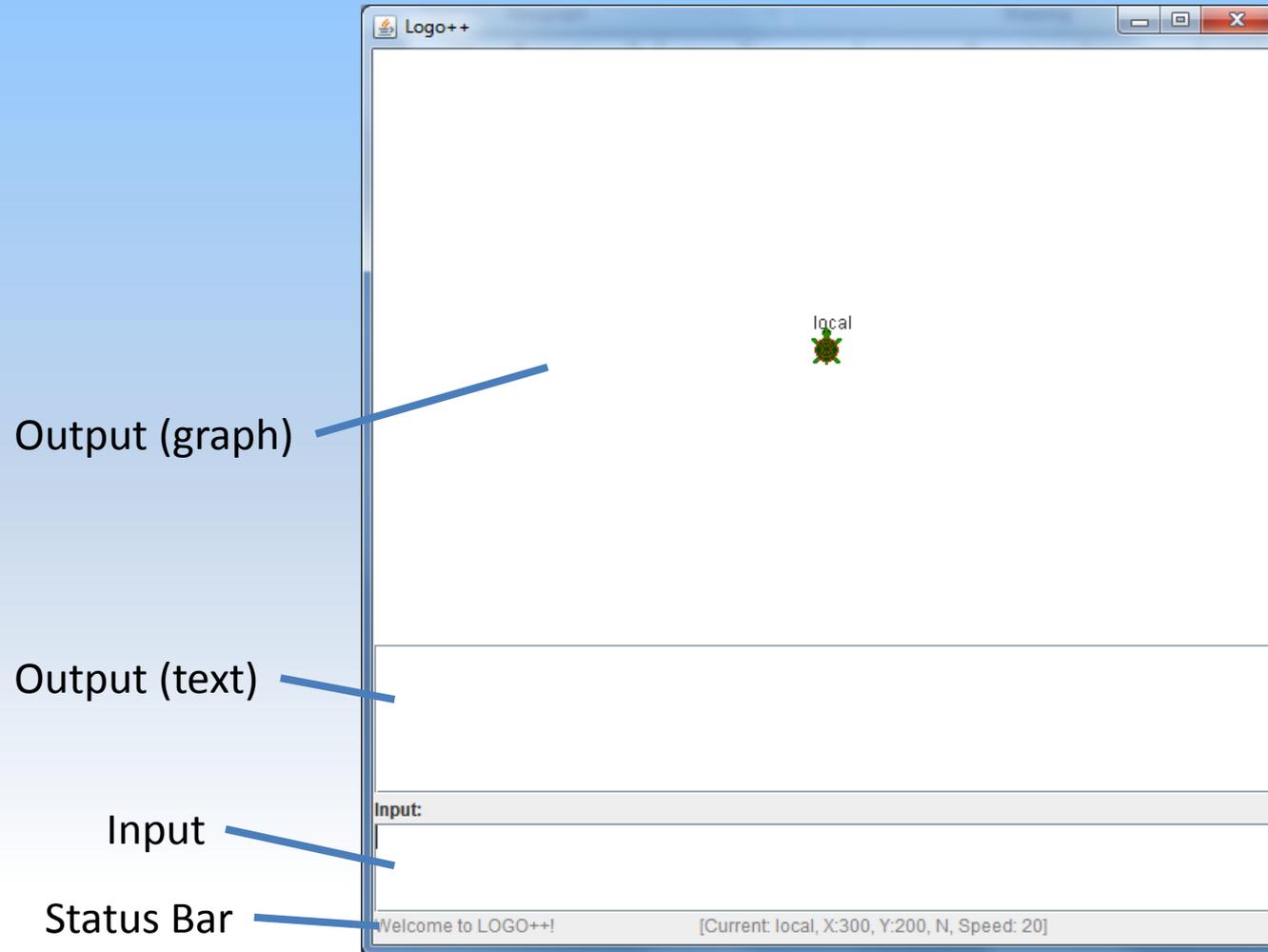
ANTLR



Run-time Environment

- Need to install latest Java Runtime Environment (JRE)
- Run the Java Archive (Logo++.jar) directly or compile from source code

Fully Integrated Interface



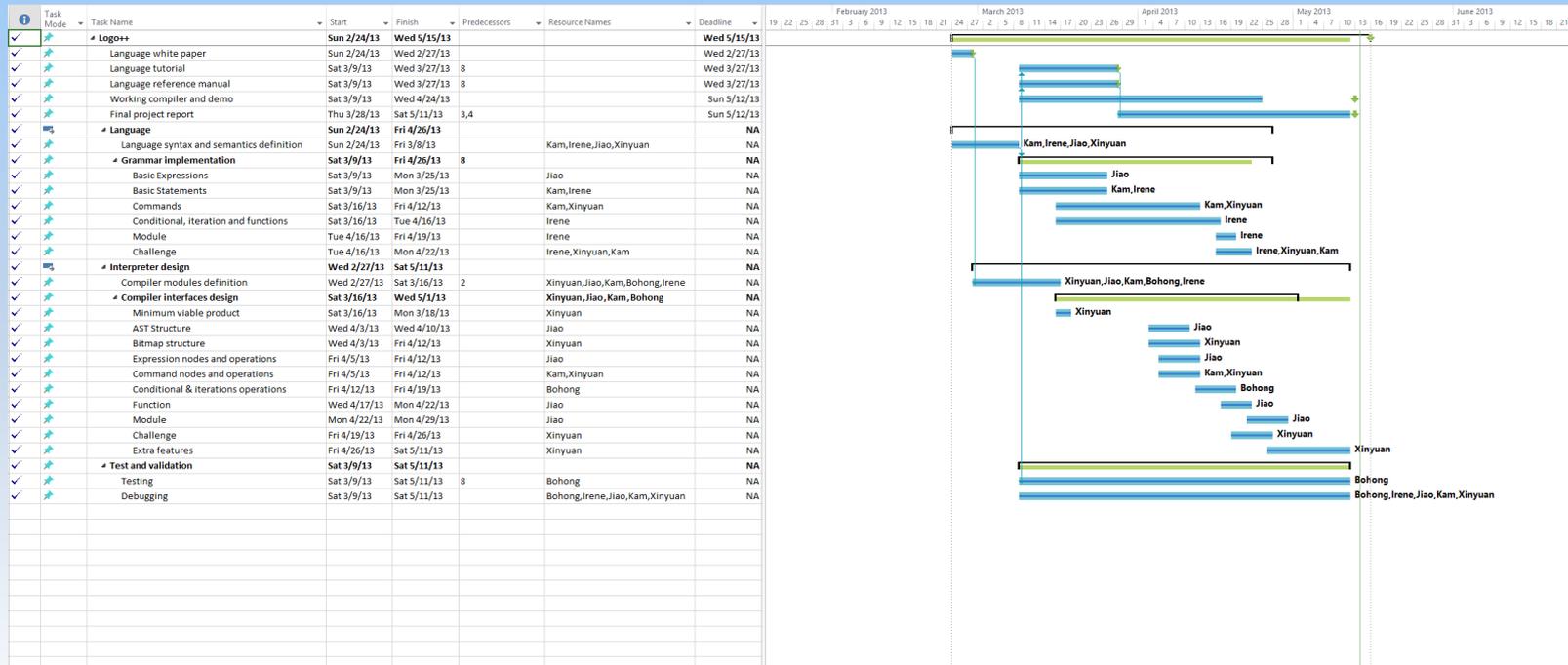
Testing

1. Regression test
2. Trace the error-causing code from the output and report to the responsible person

Elem	Cov%
LogoPP	74.2%
(default package)	74.2%
LOGOPP.java	96.3%
BMPIO.java	95.7%
LOGOChallengeNode.java	94.4%
LOGOIO.java	94.2%
LOGOStatementNode.java	92.9%
LOGOEventQueue.java	91.9%
LOGOCommandNode.java	91.5%
LOGOCanvas.java	90.4%
LOGOTurtle.java	89.7%
LOGOErrorHandler.java	88.2%
LOGOHintList.java	88.0%
LOGOFunctionNode.java	84.1%
LOGOOperatorNode.java	82.8%
LOGOSymbolTable.java	81.8%
LOGOIterationNode.java	78.9%
LOGONode.java	77.8%
LOGOBasic.java	76.7%
LOGOChallenge.java	74.8%
GrammarLexer.java	69.7%
LOGOConditionalNode.java	67.9%
GrammarParser.java	63.2%
LOGOSetNode.java	62.2%
GrammarBaseListener.java	0.0%
expressionLexer.java	0.0%

Team Management

- Timeline



- Communicate is the key!

Lessons learned

- A team, not a collection of parts
- Collaborate and cooperate
- Speak up and participate
- Learn from your fellow team members

Conclusion

- An updated version of Logo tailored for elementary and secondary education
- Simple and clear syntax, easy to get started and transferable
- Progressive and expandable to complicated programs

- Logo++: should be the first programming language schools teach students