COMP 111

Introduction to Computer Science and Object-Oriented Programming

Week 1

Tonight

• Orientation
• Introductions
• An Exercise
• Computers and Programming
• BlueJ Activities
• Looking Ahead
• More Demos

Week 1
**Learning Objectives**

- Basics of computer science
- Fundamental programming skills
- A mindset about developing software
  - Object-oriented programming
  - Test-driven development
  - Use of supporting technology

**Key Elements**

- **Java** - the programming language
  - facilitates
    - Object-oriented programming
    - Test driven development
  - popular
  - good basis for learning other languages
- **BlueJ** - an IDE
  - *easy-to-use technology to aid programmers*
- **Web-CAT** - a web-based grading tool
  - *gives you feedback on your lab programs*
You and Your Learning

- Requires **considerable time and effort**
- **Success** corresponds with
  - being motivated, mature & and independent
  - identifying what you need to learn
  - then asking, seeking, & exploring to learn
  - reflecting on not only what, but how you learned

Resources

- **Textbook**
  Big Java 3rd Edition by Cay Horstman
- the **MyFranklin site** for course (also course CD)
  - software
  - key points
  - multi-media presentations
  - reading guide
  - assignments
- **My companion website**
  cs.franklin.edu/~perryd
Week 1

When It’s Important, I Will …

• Post an announcement
• Send you email

When You Need Help …

• Send me email
  If needed, we can arrange a call, Franklin Live! session, etc.
• Seek help from Student Learning Center
  ▪ tutoring
  ▪ workshops
Deliverables

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Count</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10</td>
<td>150</td>
</tr>
<tr>
<td>Labs</td>
<td>5</td>
<td>350</td>
</tr>
<tr>
<td>Tests</td>
<td>3</td>
<td>450</td>
</tr>
<tr>
<td>Reflection</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>1000</strong></td>
</tr>
</tbody>
</table>

- There are also guided learning activities important, but no points
- Continual reflection - but one final reflection paper

Submitting Your Work

- Homework - submitted to **DropBox**
- Labs - submitted through **Web-CAT**

- Late submittals
  - up to one week - **max of 75%** of total points
  - more than 1 week - **no credit**
Attendance Policy

If you miss more than three classes you receive a failing grade

Academic Integrity

Academic integrity is submitting one’s own work

In COMP 111 the work you submit is to be your own

Does plagiarism apply to programming?
Introductions

• I am Doyt Perry
  ▪ Undergrad at BGSU, Masters & PhD from OSU
  ▪ Retired from Bell Labs (AT&T and later Lucent)

• Tell us about you
  ▪ The name you prefer
  ▪ Your Franklin experience
  ▪ Why are you in COMP 111
  ▪ What else should we know about you?

The Robot World

Robot lives on a grid

Grid extends in all directions

Robot can turn at right angles

Robot moves forward in grid units!

Robot leaves a visible trail

Week 1
Programming the Robot

- Three simple, primitive operations
- Program instruction are encoded

<table>
<thead>
<tr>
<th>Code</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Forward one unit</td>
</tr>
<tr>
<td>01</td>
<td>Turn right (90 degrees)</td>
</tr>
<tr>
<td>00</td>
<td>Turn left (90 degree)</td>
</tr>
</tbody>
</table>

Control Code Example

- Assume the robot starts out facing right
- Anywhere in the grid
- Instructions are carried out in order

What does the robot trace out when it carries out the control code at the left?

<table>
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<th>Action</th>
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</tbody>
</table>

Can you write the control code to trace out a 2x2 square?
Symbolic Language

- Writing control code is error-prone. **Why?**
- A symbolic “programming language” helps

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>tnr</td>
<td>Turn right (90 degrees)</td>
<td>fwd tnr</td>
</tr>
<tr>
<td>tnl</td>
<td>Turn left (90 degrees)</td>
<td>fwd tnl</td>
</tr>
<tr>
<td>fwd</td>
<td>Forward one unit</td>
<td>fwd</td>
</tr>
</tbody>
</table>

*Example*

Can you write the symbolic program to trace out a 2x2 square?

---

Other Languages

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>tnr</td>
<td>Turn right (90 degrees)</td>
<td>fwd</td>
</tr>
<tr>
<td>tnl</td>
<td>Turn left (90 degrees)</td>
<td>rep 3 tnr</td>
</tr>
<tr>
<td>fwd</td>
<td>Forward one unit</td>
<td>fwd tnl</td>
</tr>
<tr>
<td>rep n stmts</td>
<td>* n is 1 through 7</td>
<td>rep 3</td>
</tr>
<tr>
<td></td>
<td>* stmts are tnr, tnl and fwd</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* repeat the stmts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* n times</td>
<td></td>
</tr>
</tbody>
</table>

*Example*

Can you write the symbolic program to trace out a 2x2 square?
Translation is Needed

- Programmers like writing symbolic programs
- The robot still executes numeric control code
- Translation is needed!

<table>
<thead>
<tr>
<th></th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>fwd</td>
<td>11</td>
</tr>
<tr>
<td>rep 3</td>
<td>01</td>
</tr>
<tr>
<td>tnr</td>
<td>11</td>
</tr>
<tr>
<td>fwd</td>
<td>00</td>
</tr>
<tr>
<td>tnl</td>
<td>11</td>
</tr>
<tr>
<td>fwd</td>
<td>01</td>
</tr>
<tr>
<td>---</td>
<td>11</td>
</tr>
<tr>
<td>00</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
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<tr>
<td>01</td>
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<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>00</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

The Process

1. Write Source Program
2. Translate
3. Control Code
4. Write Source Program
5. Translate

for one symbolic language

for another symbolic language
Programming

• **Program**
  - sequence of simple instructions
  - to perform a task on a computer

• **Note**
  - Different tasks require different programs
  - The same task
    - needs a different program on different computers
    - may be performed by different programs

Simplicity Supports Complexity

• the instructions are very primitive
  - Put a red dot onto this screen position
  - Send the letter A to the printer
  - Get a number from this location in memory
  - Add up two numbers
    - If this value is negative, continue the program at that instruction

• but complex tasks can be performed
  - executing primitive instructions
  - at ultra high speeds
Programming

• Programmer
  ▪ designs solutions to real world problems
  ▪ mapping real world data & behavior
  ▪ to computer data and tasks
  ▪ by writing programs
    to input, process & output data

• Sophisticated applications need
  ▪ a team of programmers
  ▪ and other professionals

Week 1

Anatomy of a Computer

PC Block Diagram
Anatomy of a Computer

Keeping it simple
what are the key within a computer?
A Question?

Is this a computer?

Labs in 111

Start Project

Your Project

Compile

Edit

Run

Test & Grade

Week 1

syntax errors

logic errors

testing results
Week 1

Labs in 111

Starter Project

my website

BlueJ

Your Project

Compile

Edit

Run

Test & Grade

Web-CAT

your computer

Week 4

Demos

Week 1
Two Types of Errors

• Syntax Errors
  • Found by compiler (violation of rules of Java programming language)
    • Misspelled or missing words
    • Undeclared variables
    • Misuse of operators
    • Data mismatches

• Logic Errors
  • Found by running the program and testing the results

Displaying Data

System.out.println is method from the Java library.

Method call:
System.out.println ("Java is a wonderful language!");

Can also specify numeric values as method parameters with the println( ) method:
System.out.println ( 3.2 - 2.1 );

The print( ) method allows you to display a line without a newline:
System.out.print ("The number is: ");
System.out.println ( 22 );
Next Week

- Read in *Big Java*
  - Sections 2.1 to 2.5 and 2.10
  - Appendix A
- View *Object Basics* multimedia presentation
- Read Appendix A of online material
  “How do I submit an assignment for automatic grading and why am I losing points?”

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Next Week

- Complete Assignment 1-1
  - Install Required Software
  - Nothing to submit
- Complete Assignment 1-2
  - Guided Learning Activities and Reflection
  - *May not be able to submit to Web-CAT*
  - Nothing to submit
- Submit homework from Assignment 1-3
  - *Submit before class*
  - Into Course Drop Box
  - Worth 15 points
More on Homework

Homework
- Format is a Word document
- Save it and add your answers
- Use courier 10 point font for any Java code in your answers
- All coding answers should be a self contained program that
  - that can be pasted into BlueJ
  - can be compiled, run and executed
- Submit your homework via the Drop Box

What Do You Need to Know?

Knowledge of the problem
- Syntax of Java statements & constructs
- What Java statements do when are run
- Design of Java programs
- Java conventions
- Style guidelines
- And … how to use the tools