Debugging

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ComS 207: Programming I (in Java)
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Quick review of last lecture

The do Statement

• A do statement has the following syntax:

```java
    do
    {
        statement;
    }
    while ( condition )
```

• The statement is executed once initially, and then the condition is evaluated

• The statement is executed repeatedly until the condition becomes false

Logic of a do Loop

Comparing while and do
The do Statement

- An example of a do loop:
  ```java
  int count = 0;
  do {
    count++;
    System.out.println (count);
  } while (count < 5);
  ```
- The body of a do loop executes at least once
- See `ReverseNumber.java` (page 244)

The for Statement

- A for statement has the following syntax:
  ```java
  for (initialization; condition; increment) statement;
  ```
  * The initialization is executed once before the loop begins
  * The statement is executed until the condition becomes false
  * The increment portion is executed at the end of each iteration

Logic of a for loop

```
Initialization
```

```
condition evaluated
```

```
true
```

```
false
```

```
increment
```

```
statement
```

The for Statement

- An example of a for loop:
  ```java
  for (int count=1; count <= 5; count++)
    System.out.println (count);
  ```
- The initialization section can be used to declare a variable
- Like a while loop, the condition of a for loop is tested prior to executing the loop body
- Therefore, the body of a for loop will execute zero or more times

The for Statement

- The increment section can perform any calculation
  ```java
  for (int num=100; num > 0; num -= 5)
    System.out.println (num);
  ```
- A for loop is well suited for executing statements a specific number of times that can be calculated or determined in advance
- See `Multiples.java` (page 248)
- See `Stars.java` (page 250)
The for Statement

- Each expression in the header of a for loop is optional
- If the initialization is left out, no initialization is performed
- If the condition is left out, it is always considered to be true, and therefore creates an infinite loop
- If the increment is left out, no increment operation is performed

Note: This material is not from the textbook. It is from the jGRASP manual.

How to use the jGRASP Debugger

The jGRASP Tutorials
2.10 Using the Debugger

JGRASP provides an easy-to-use visual Debugger that allows you to set one or more breakpoints, then step through a program statement by statement. To set a breakpoint, left-click on the statement where you want your program to stop, then right-click and select Toggle Breakpoint (Figure 2.17). You should see the red octagonal breakpoint symbol appear to the left of the line. The statement you select must be an executable statement (i.e., one that causes the program to do something). You can also set a breakpoint by hovering the mouse over the leftmost column of the line where you want to set the breakpoint. When you see the red breakpoint symbol, left-click the mouse to set the breakpoint.

In the Hello2 program below, a breakpoint has been set on the first of the two System.out.println statements, which are the only statements in this program that allow a breakpoint.

After setting the breakpoint, click Run → Debug (Figure 2.18). This should raise the Debug tab pane (in place of the Browse tab pane), and your program should stop at the breakpoint. The highlighted statement is the one about to be executed.

To step the program, click on the “down-arrow” at the top of the Debug pane. Each time you click on the “down-arrow”, your program should advance to the next statement. After stepping all the way through your program, the Debug tab pane will go blank to signal the debug session has ended.

In the example below, the program has stopped at the first output statement. When the step button (down-arrow) is clicked, this statement will be executed and “Hello world!” will be printed-standard out and shown in the Run I/O tab pane. Clicking the stop button again will output “Welcome to JGRASP” on the next line. The third click on the stop button will end the program, and the Debug tab pane should go blank as indicated above.

If you want to step through your program automatically, turn on AutoStep by clicking the button with multiple “down-arrowsheads.” With this feature turned ON, after your program stops at a first breakpoint and you click the Stop button the first time, the debugger will step through your program at the rate indicated. For more details see the tutorial on the Integrated Debugger.

![Figure 2.17. Setting a breakpoint](image1)

![Figure 2.18. Starting the Debugger](image2)
Debugging Examples and Demos

Example: Multiples.java (page 248)

Example: Stars.java (page 250)

Other Things About Loops
- ‘Break’ Statement
- ‘Continue’ Statement
- Empty Statement - ‘;’

The for Statement
- A for statement has the following syntax:
  ```java
  for (initialization; condition; increment)
  statement;
  ```
  - The initialization is executed once before the loop begins.
  - The condition is executed until the condition becomes false.
  - The increment portion is executed at the end of each iteration.
- Each expression in the header of a for loop is optional.
- If the initialization is left out, no initialization is performed.
- If the condition is left out, it is always considered to be true, and therefore creates an infinite loop.
- If the increment is left out, no increment operation is performed.
THE END