

LEC 09

CSE 123

Recursive Programming

Questions during Class?
Raise hand or send here

sli.do #cse123



BEFORE WE START

Talk to your neighbors:

*Any fun Winter plans once the
quarter is over?*

Instructor: James Wilcox

Announcements

- Resubmission Period 3 due tonight (10/25) at 11:59pm
 - Last opportunity for C0
- Quiz 1 Tuesday (10/29) in your registered section
- Programming Assignment 1 is due Wednesday (10/30) at 11:59pm
- Resubmission Period 4 opening tonight, due next Friday (11/1)
 - Assignments available: P0, C1

Recursive Methods [Review]

- 2 components of every recursive method:
- Recursive case
 - Decompose problem into subproblem
 - Make the actual recursive call
 - Combine results meaningfully
- Base case
 - Simplest version of the problem
 - No subproblems to break into
 - Return known answer



If decomposing moves you closer to the base, no infinite recursion!

Why Recursion?

- Generally, anything you can write iteratively you can write recursively
 - So why write anything recursively?

Recursion is particularly useful when dealing with something that's recursively defined

- Math examples:
 - Factorial: $n! = n * (n - 1)!$
 - Exponent: $x^n = x * x^{n-1}$
 - Fibonacci: $fib(n) = fib(n - 1) + fib(n - 2)$
- Non-math examples?
 - ListNodes (int data, ListNode next)
 - Other ideas?

Files

- We'll say that computer files fall into one of the following categories:



Standard file (.txt, .csv, .java)

```
f.isDirectory() -> false
```



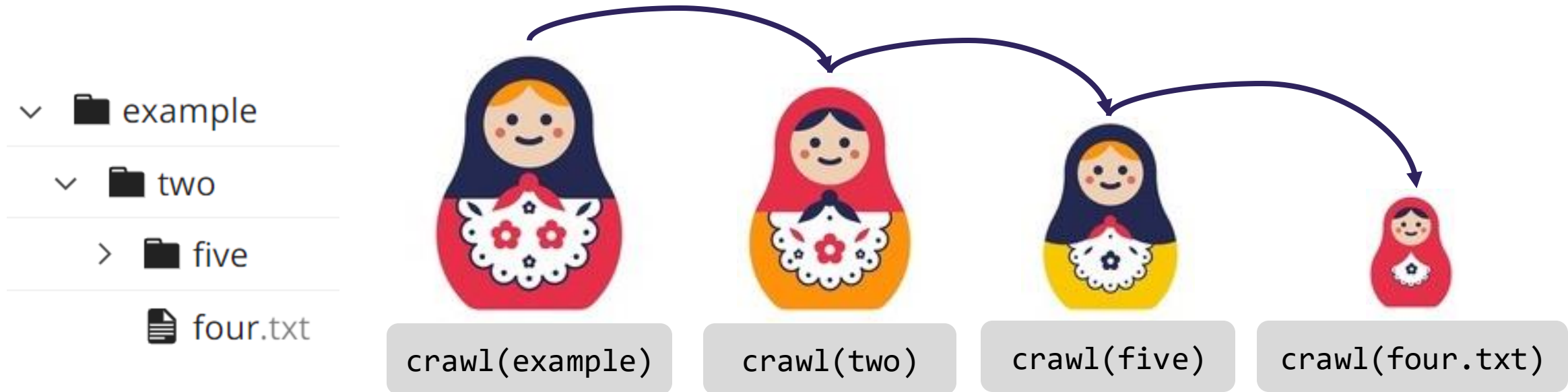
Directory w/ subfiles

```
f.isDirectory() -> true  
File[] subFiles = f.listFiles()
```

This is a recursive definition! A File is either normal, or a directory with a File[] of subFiles

Crawl w/ Indentation

- How can one of our files know what level it's on?



- What if a bigger doll told the next smaller doll the level?
 - So long as the first doll is told the right value, this will work!
- Remember, recursive method calls are still method calls
 - How can we pass information from a bigger doll to a smaller doll?

Public / Private Pairs

- Used when we need additional information between recursive calls
- Private helper method hides additional info
 - Clients shouldn't have to worry about it
- All public method does is kick-start the private one
 - What's the correct starting value(s) for additional param(s)?

Question to ask: "Do I need to keep track of any additional information?"