CS10 : The Beauty & Joy of Computing

Lecture #9 : Recursion

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LSO PLAYS IAMUS

Program written at University of Malaga (Study Group on Biomimicry) generated the entire piece – CD coming out in September.

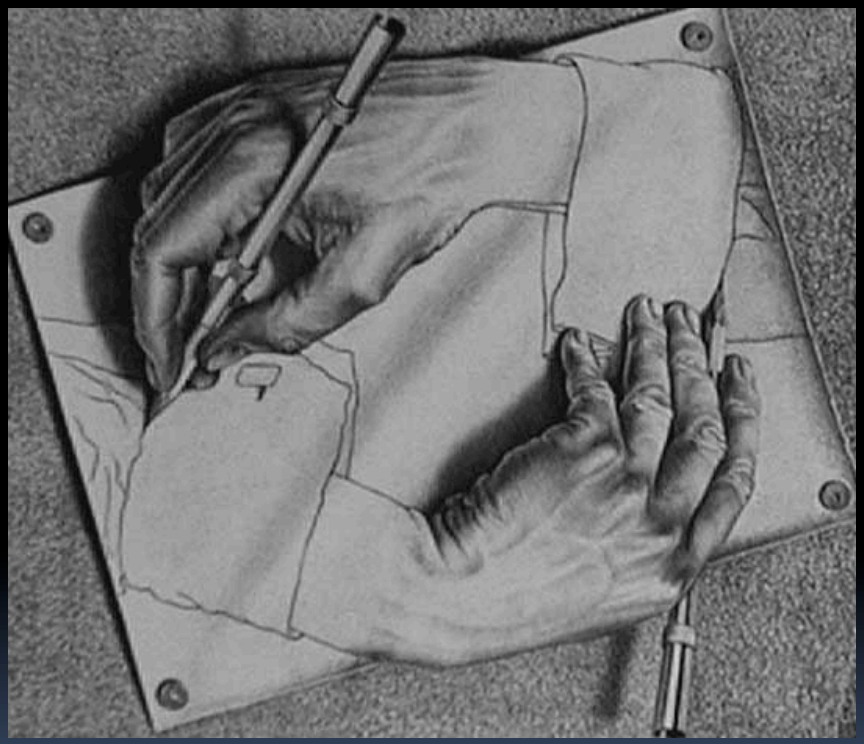
http://bit.ly/OT9Alx

www.worldofescher.com/gallery/A13.html

Overview

- **Recursion**
  - Demo
    - Vee example & analysis
    - Downup
  - You already know it
  - Definition
  - Trust the Recursion!
  - Conclusion

M. C. Escher : *Drawing Hands*



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"I understood Vee & Downup"

a) Strongly disagree
b) Disagree
c) Neutral
d) Agree
e) Strongly agree

M. C. Escher : *Fish and Scales*

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Definition

www.catb.org/~esr/jargon/html/R/recursion.html
www.nist.gov/dads/HTML/recursion.html

- **Recursion: (noun) See recursion.** ☺
- ***An algorithmic technique where a function, in order to accomplish a task, calls itself with some part of the task***
- **Recursive solutions involve two major parts:**
  - Base case(s), the problem is simple enough to be solved directly
  - Recursive case(s). A recursive case has three components:
    - Divide the problem into one or more simpler or smaller parts
    - Invoke the function (recursively) on each part, and
    - Combine the solutions of the parts into a solution for the problem.
- **Depending on the problem, any of these may be trivial or complex.**

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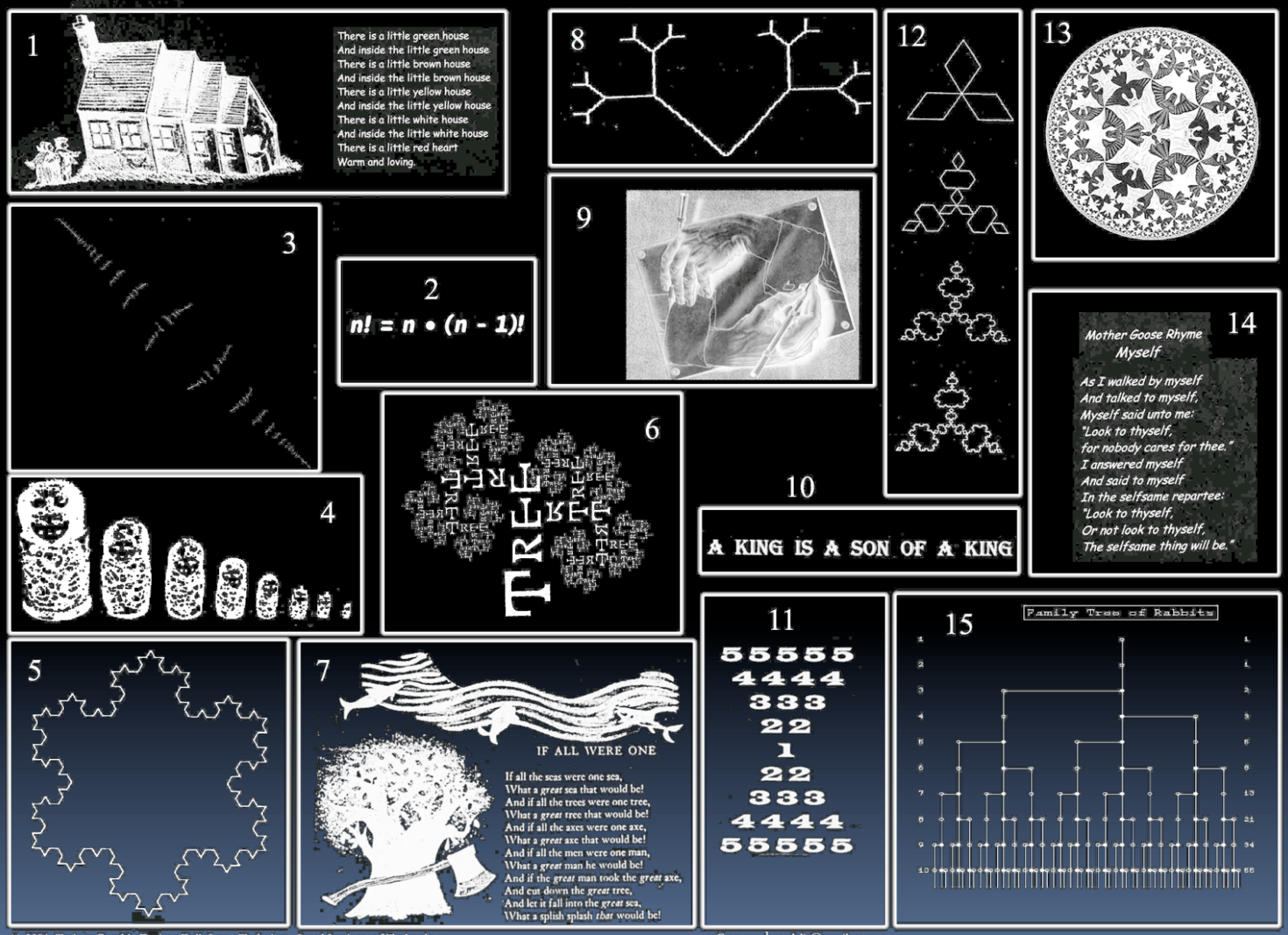
You already know it!



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Trust the Recursion

- **When authoring recursive code:**
  - The base is usually easy: "when to stop?"
  - In the recursive step
    - How can we break the problem down into two:
      - A piece I can handle right now
      - The answer from a smaller piece of the problem
    - Assume your self-call does the right thing on a smaller piece of the problem
    - How to combine parts to get the overall answer?
- **Practice will make it easier to see idea**

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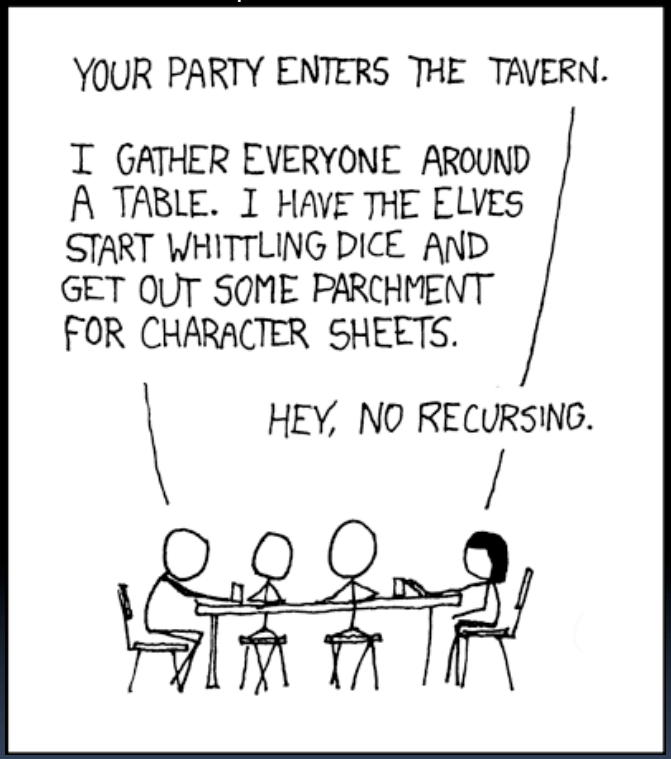
Sanity Check…

- Recursion is _____ Iteration (i.e., loops)
- Almost always, writing a recursive solution is _____ than an iterative one

a) more powerful than, easier
b) just as powerful as, easier
c) more powerful than, harder
d) just as powerful as, harder

http://xkcd.com/244/



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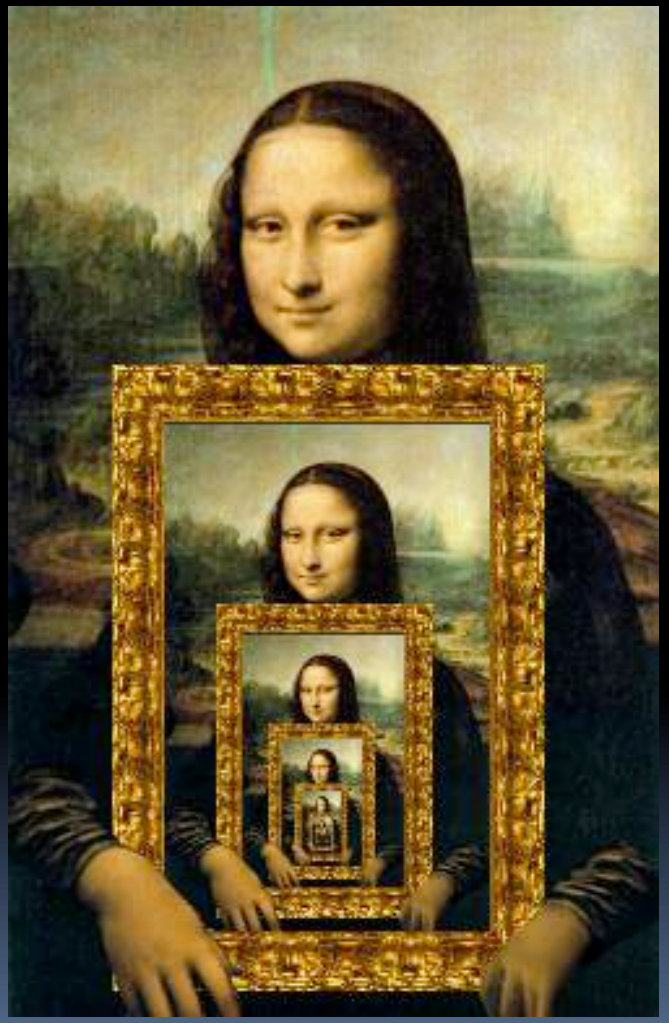
Summary

- Behind Abstraction, **Recursion is probably the 2nd biggest idea about programming in this course**
- It's tremendously useful when the problem is self-similar
- It's no more powerful than iteration, but **often leads to more concise & better code**



http://www.dominiek.eu/blog/?m=200711