Recursion

Ch 14

Recursion

There are two important parts of recursion:

-A stopping case that ends the recursion

-A reduction case that reduces the problem

What are the base and stopping cases for the Fibonacci numbers?

$$F_n = F_{n-1} + F_{n-2},$$

$$0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, \ldots$$

(sum of the previous two numbers)

(see last time: fibonacciRecursion.cpp)

Recursion

What if we defined tangent recursively as:

$$tan(x) = \cfrac{x}{1 - \cfrac{x^2}{3 - \cfrac{x^2}{5 - \cfrac{x^2}{7 - \ldots}}}}$$

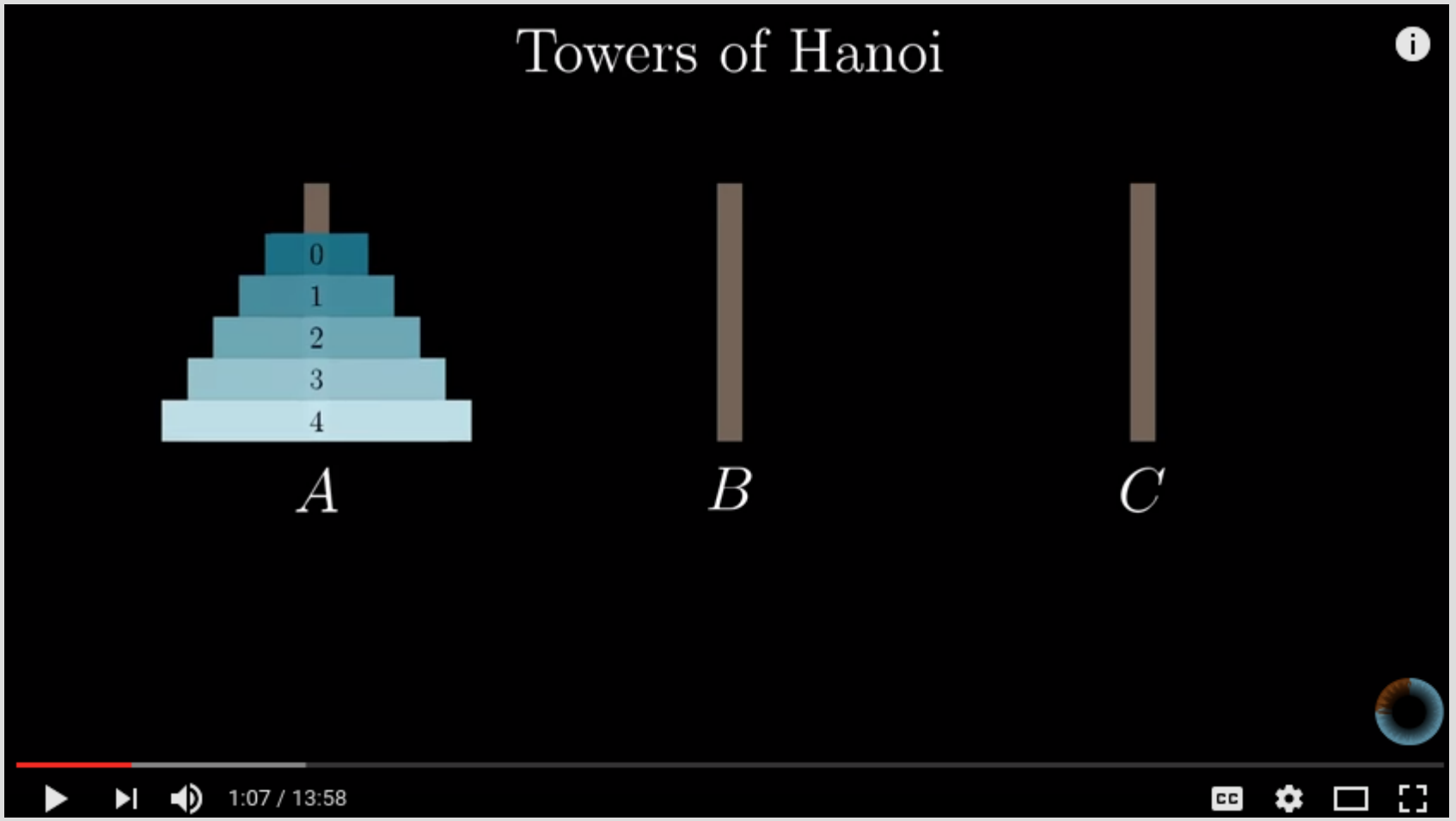
Assume we take an input for how many times to do this recursion

What is the pattern? What is the stopping case?

How do we move towards the stopping case

(see: tangent.cpp)

Recursion: Tower or Hanoi

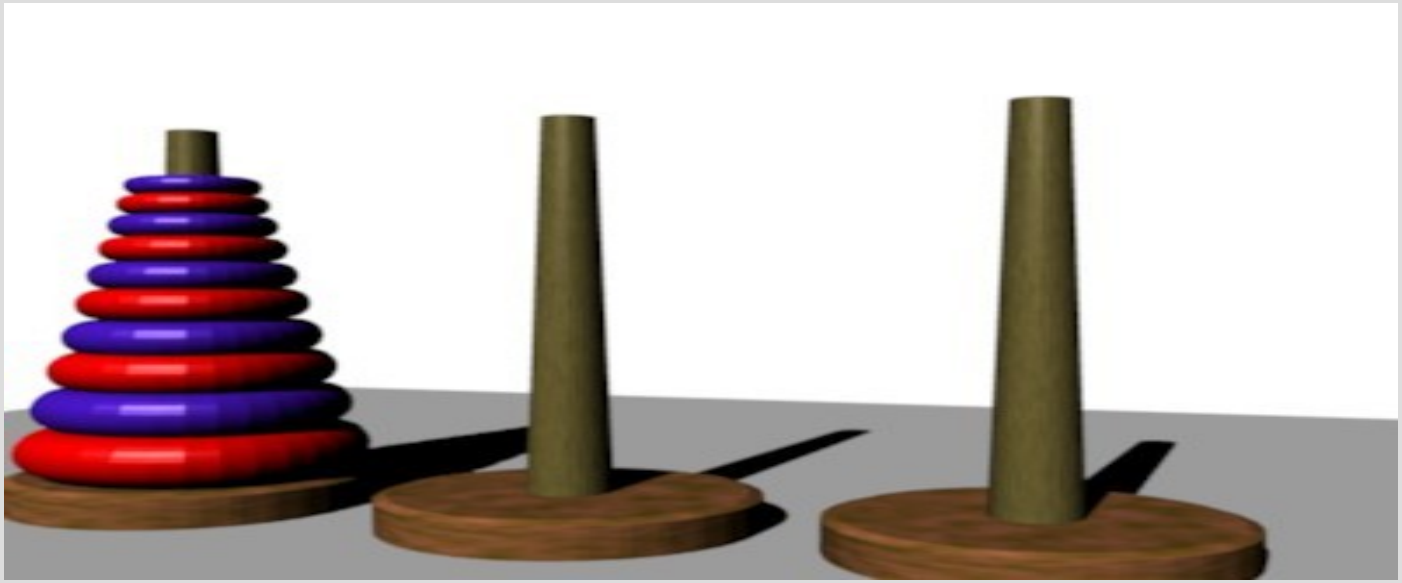


https://www.youtube.com/watch?v=2SUvWfNJSsM

Recursion: Tower or Hanoi

The tower of Hanoi is played by:

1. Moving a single ring to another stack
2. Smaller rings cannot have larger rings on top of them



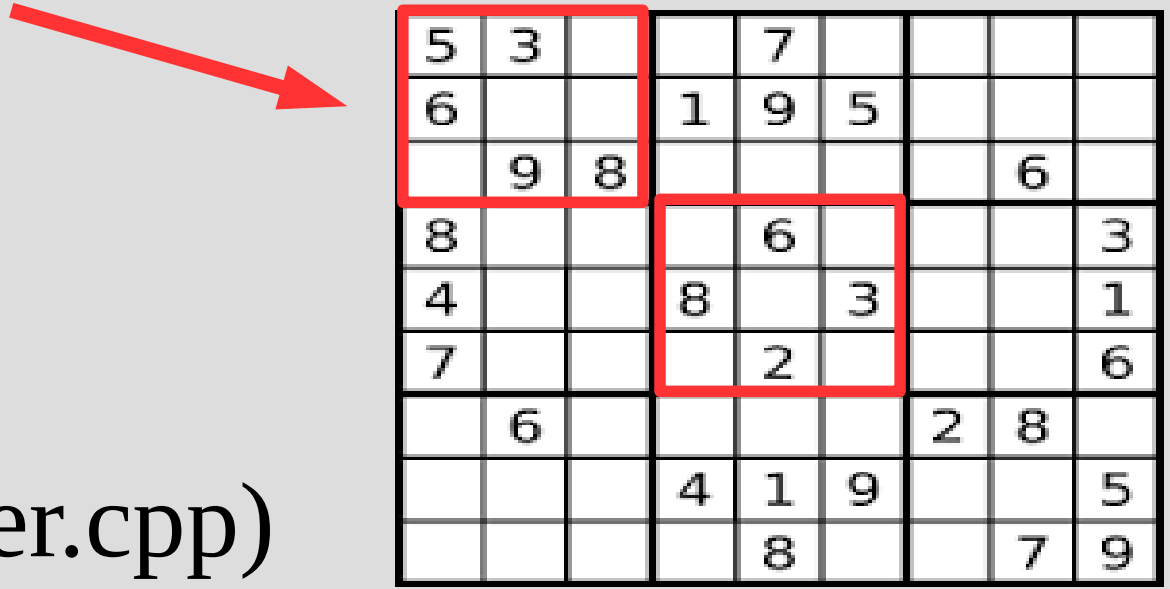
(see: towerHanoi.cpp)

Recursion

How would you solve a sudoku problem?

Rules:

1. Every row has numbers 1-9
2. Every column has numbers 1-9
3. The nine 3x3 boxes have numbers 1-9



5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

Reduce problem?

Stopping case?

(see: sudokuSolver.cpp)

Recursion

Do not try to solve chess in this manner!

You will segfault
(you will also not finish computing before the sun burns the earth to a crisp)

Miscellaneous notes

Try googling “recursion” and click on the spelling suggestion

Recursion is very powerful and used in many advanced algorithms

It will give you a headache for a while...
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