Announcements

- The surveys are important, please fill them out. Doing so is worth points.
- Assignment 2 due today … all assignments are due before class.

Functions – The Punchline

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It's BIG!

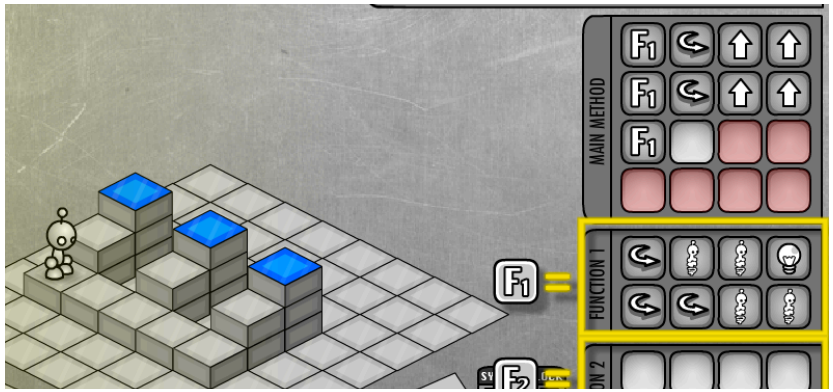
- Functions may seem "obvious" but they are a HUGE idea …
- They allow us to solve problems by first creating some useful instructions, and then using them to simplify our work
- Let's review how they work …

Just Do It!

The Function Becomes A Concept

- Because F1( ) "processes a riser," we think of the programming task as

Process a riser( )	F1( )
Move to next riser	
Process a riser( )	F1( )
Move to next riser	
Process a riser( )	F1( )



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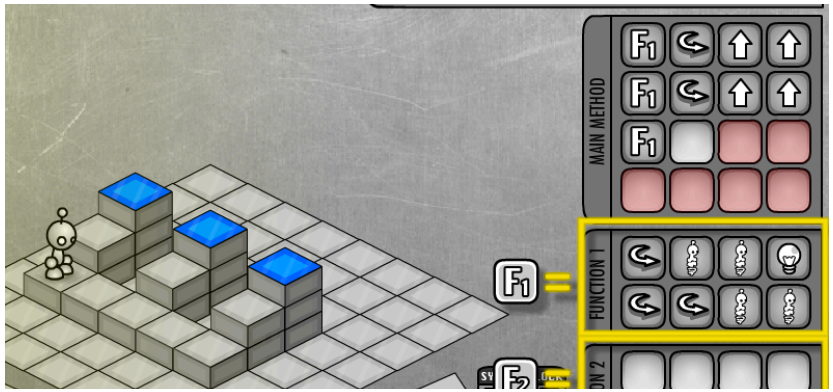

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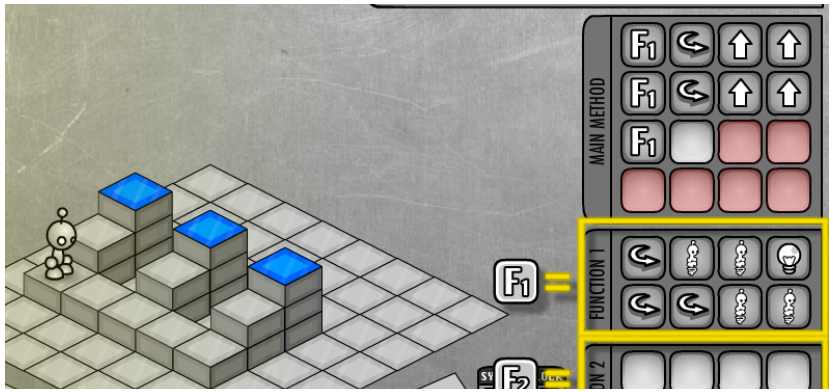
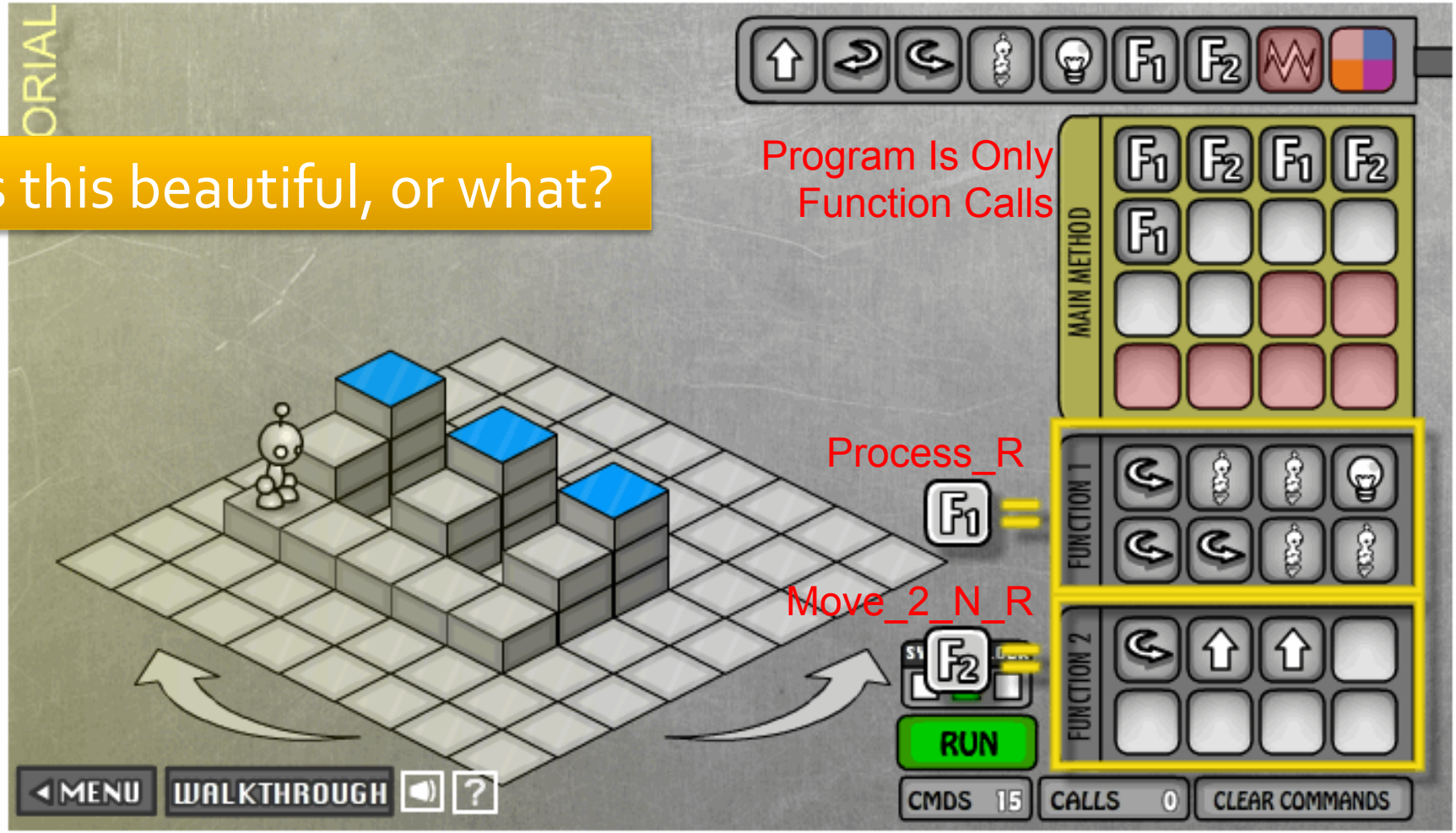


- With F1( ), we simplify the programming to just 5 conceptual steps rather than 21
- But, WAIT! What is "Move to next riser"?
  - It's a concept … make it a function!
  - Move_to_ next_ riser ( )

A Five Instruction Program



Abstraction …

- Formulating blocks of computation as a "concept" is **functional abstraction** [A better definition in a moment]
- What we did just now is important …
  - We spotted a coherent (to us) part of the task
  - We solved it using a sequence of instructions
  - We put the solution into a function "package", gave it a name, "process a riser," and thus created a new thing, a concept, something we can talk about & use
  - Then we used it to solve something more complicated … and then we did it again!

Abstracting

- Collecting operations together and giving them a name is *functional abstraction*
  - The operations perform a coherent activity or action – they become a *concept* in our thinking
  - The operations accomplish a goal that is useful – and typically – is needed over and over again
  - *Functions* implement functional abstraction: 3 parts
    - A name
    - A definition (instruction seq), frequently called a "body"
    - Parameters –stuff inside the parentheses, covered later

People Abstract All The Time

- Functional abstractions in which you are the agent, but someone taught you:
  - Parallel parking
  - Backstroke in swimming
- Functional abstractions you recognized and in which you are the agent
  - Doing a load of laundry
  - Making your favorite {sandwich, pizza, cookies, …}
- Others?

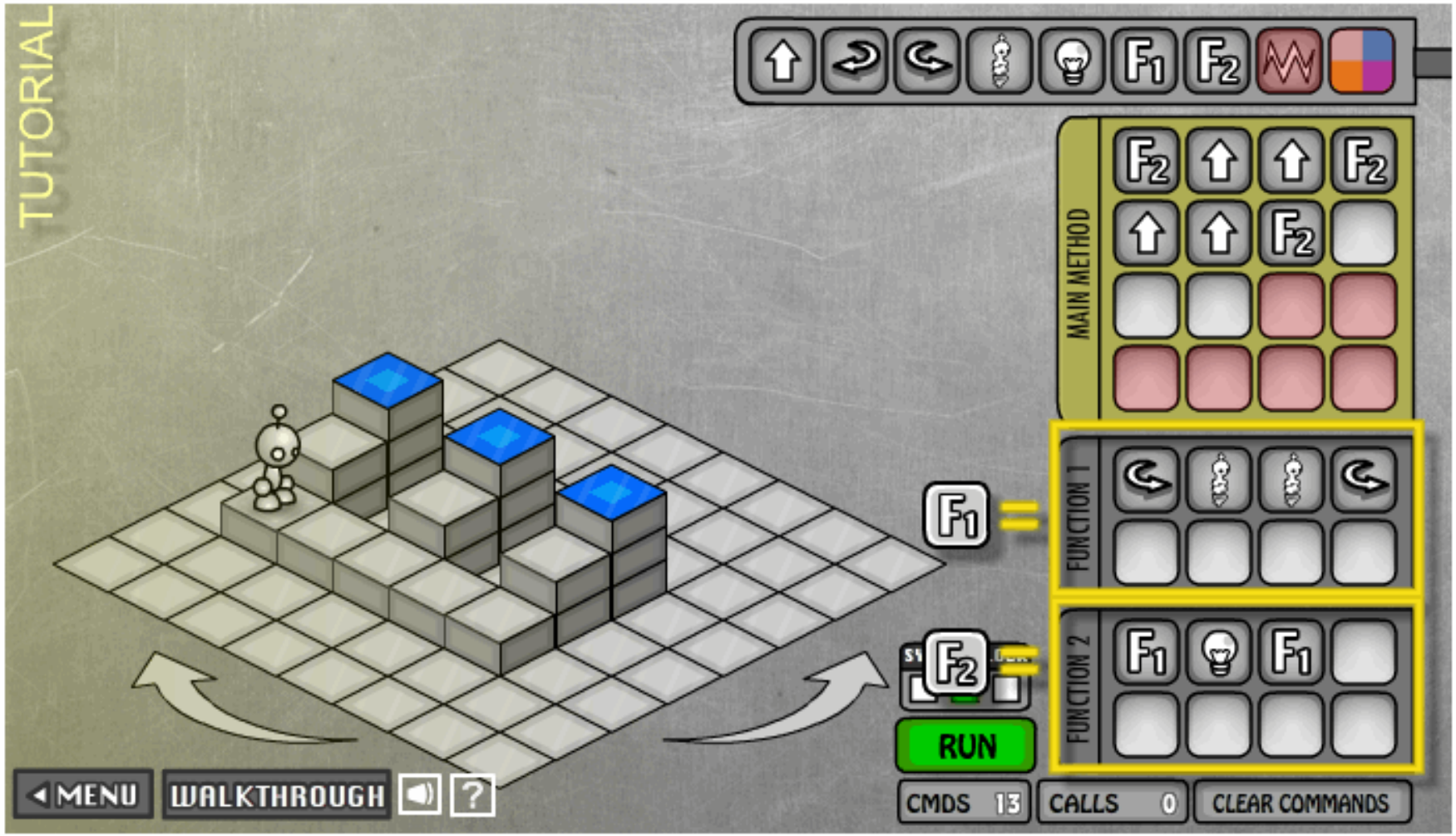
No "Correct" Way To Abstract

- We have abstracted "process a riser" and "move to the next riser" as components of a solution
- As concepts, they are packaged into functions
- Maybe you thought of this in a different way
- That is, there can be other "coherent" parts of a solution

Just Do It!

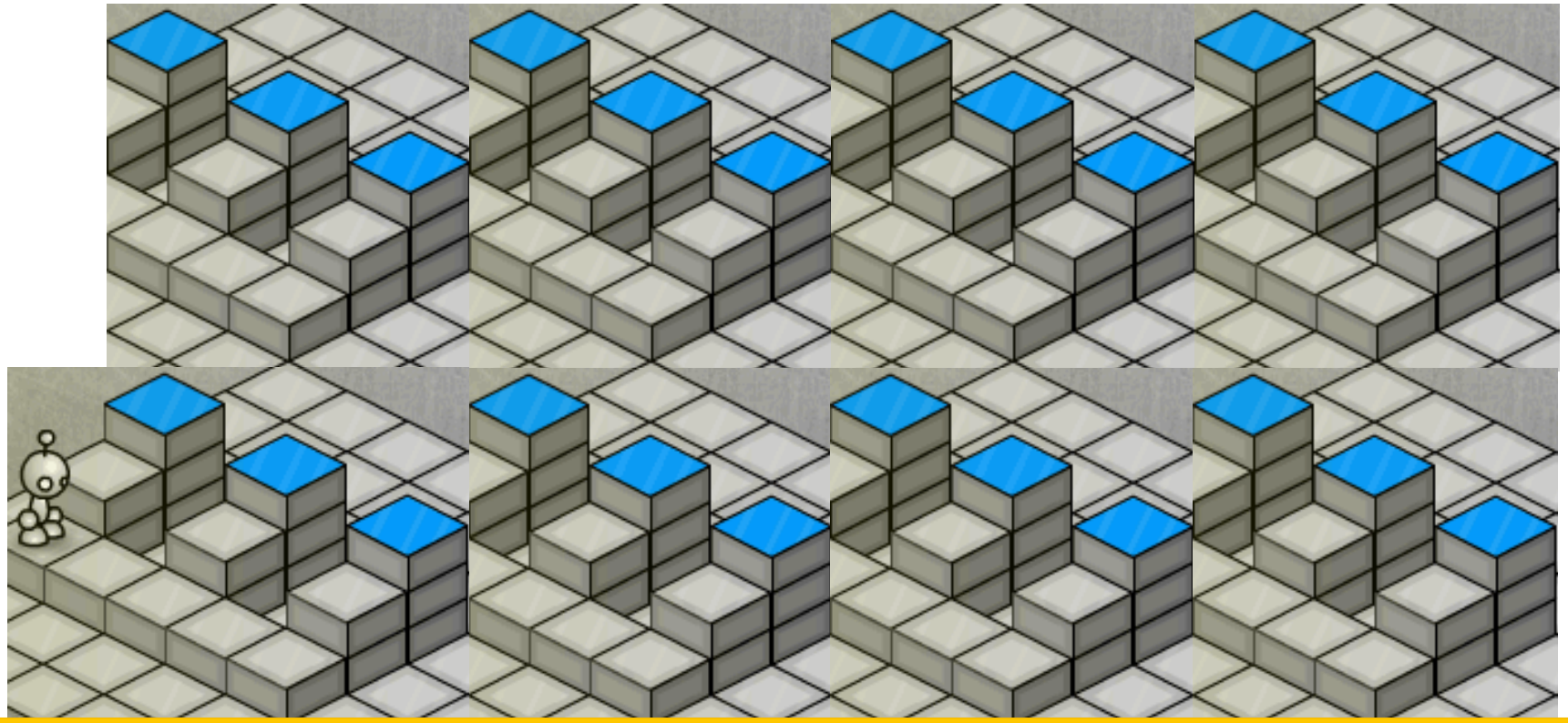
The Function Is Just The Packaging

- Another way to use a function for the risers



Keep On Using Abstraction …

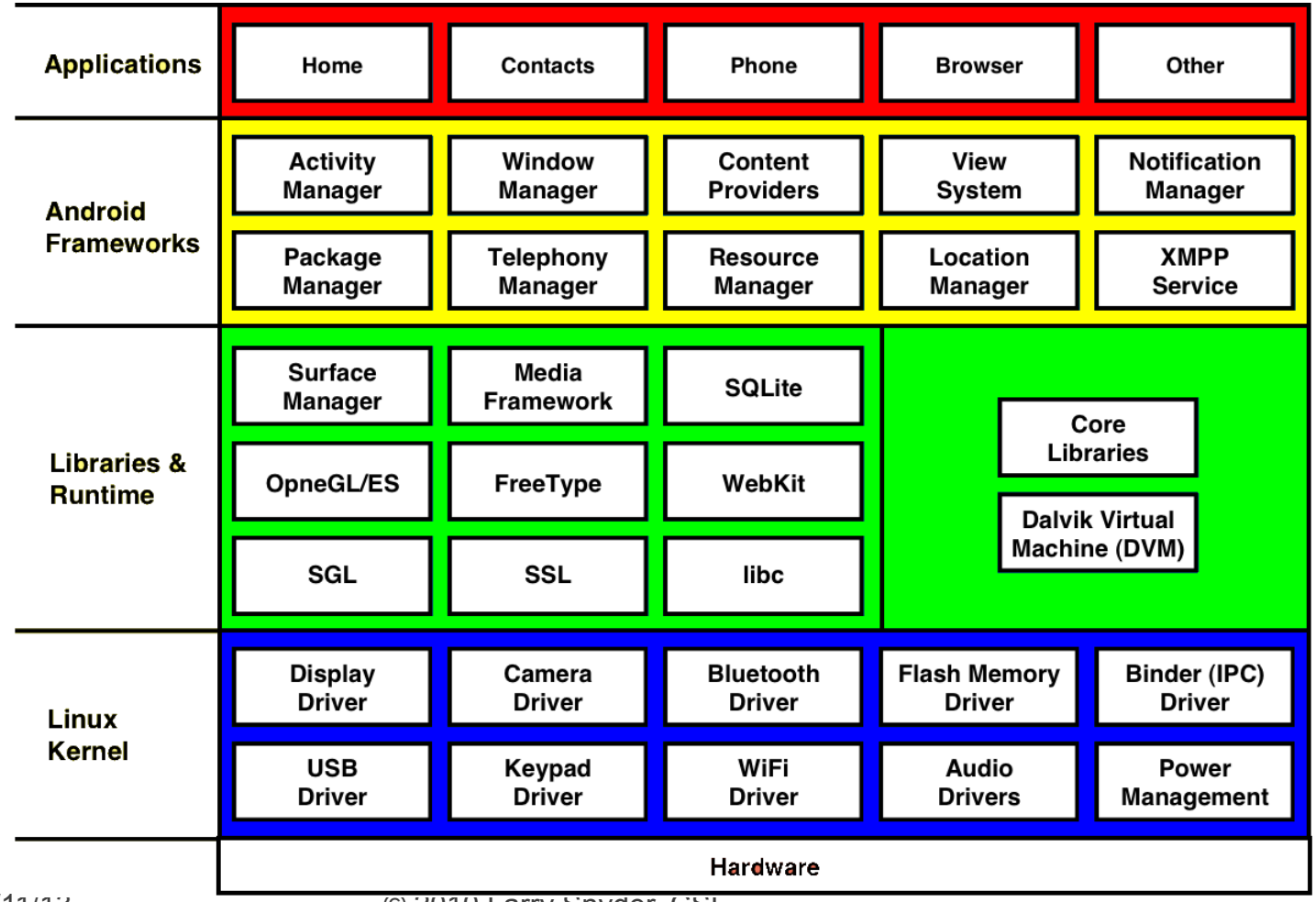
- If M.C. Escher handed us a problem … what would we do?



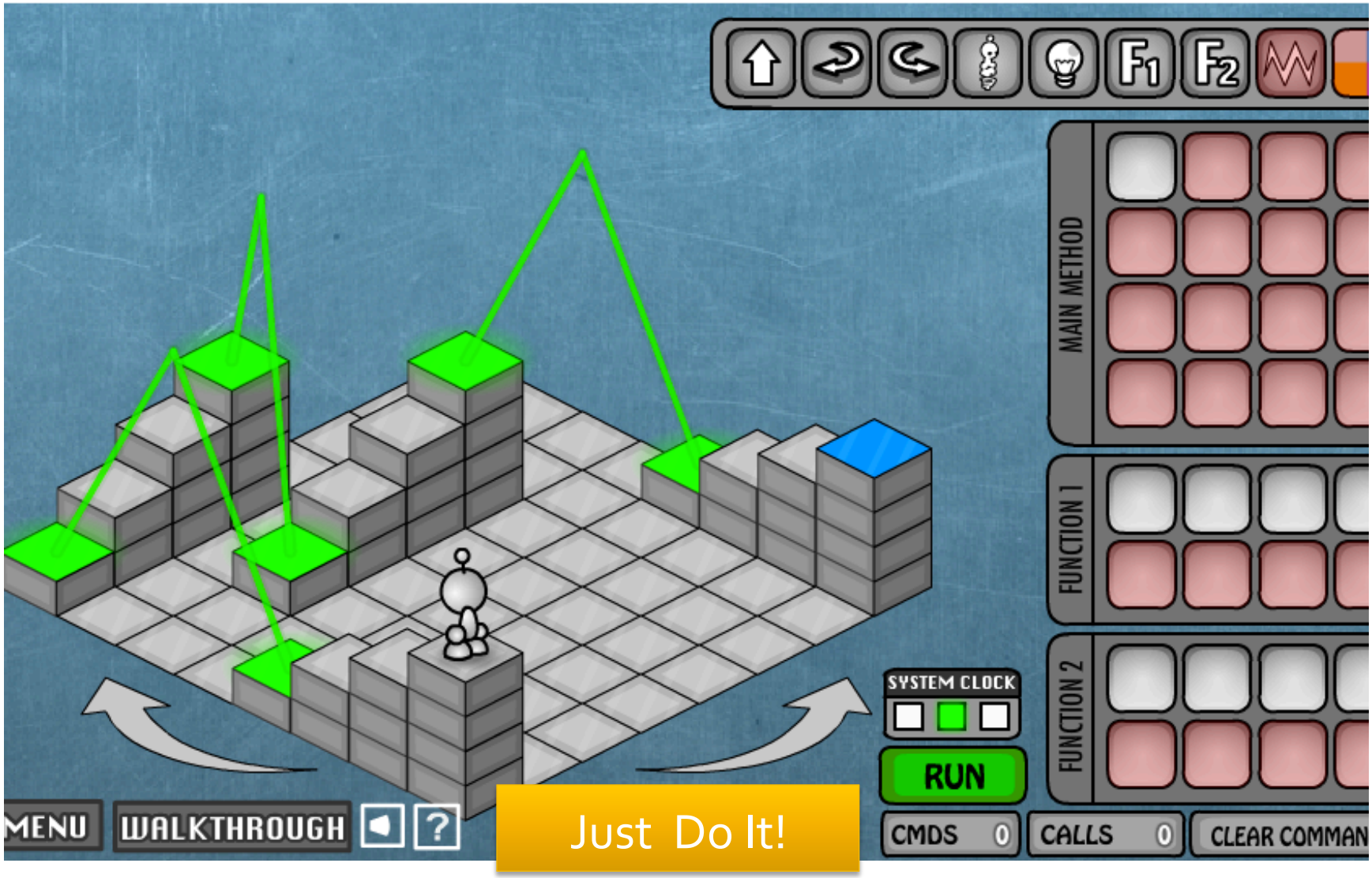
It only simplifies our **thinking**; the bot still does all the work

How Useful Is This Idea

- Say "Hi" to Android's Software Stack



And, By Request ...



Functions – They're Big

- Functions – the packages of computation – will be used everyday in this course

- Functional Abstraction – the process of spotting a concept, "packaging" it as a function (at least in your own mind) and using it to solve some tougher problem – will be used everyday for the rest of your life!