



## Homework 2: Lightbot in Symbolic Form

**Goal:** The purpose of this assignment is to look at textual ways of programming the bot.

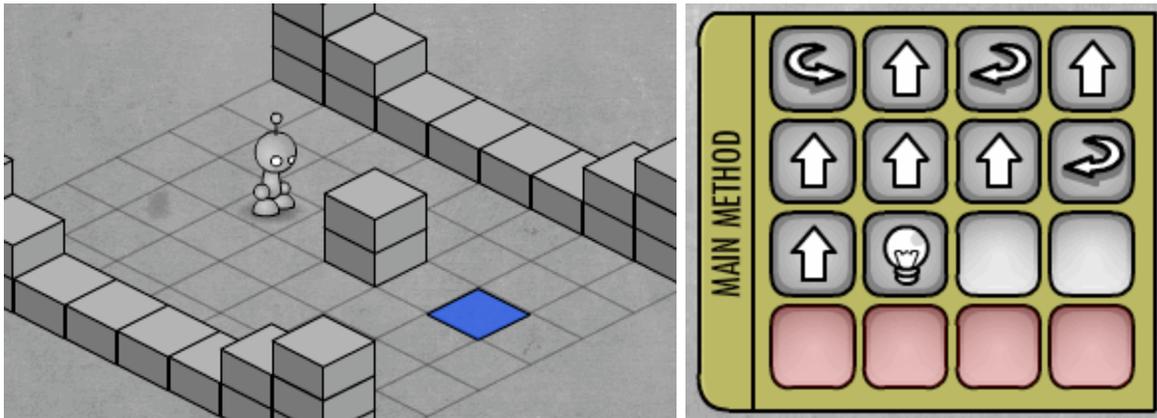
When we solved the Lightbot 2.0 exercises last time, we programmed the bot using a tiny list of instructions presented iconographically, that is, as pictures. But, these could just as easily be written symbolically, that is, as text. So, our instruction list



can be expressed symbolically,

Step Right Left Jump Power *F.name*

as shown. When we program symbolically, we don't have to call the functions F1 and F2. We can give them actual names like `F.turn_around` for a function that causes the bot to turn around. So, we can give the symbolic solution to



as

Left, Step, Right, Step, Step, Step, Step, Right, Step, Power.

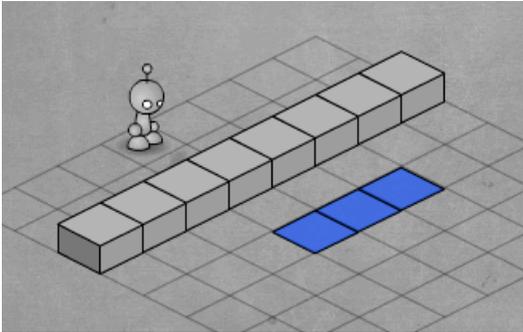
or more succinctly, `LSRSSSRSP`. Symbolic expression is the same thing, just a different form with slightly different properties as we now see.

### **Iteration**

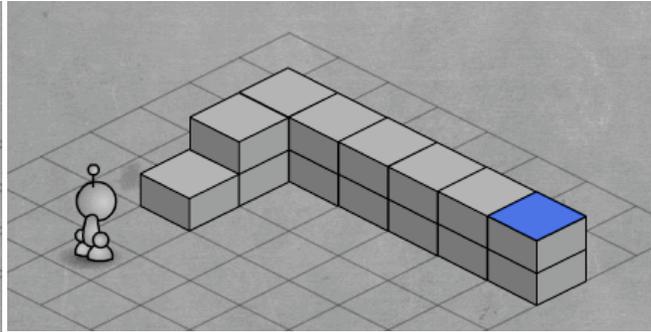
We notice that often in programming the bot we need to repeat operations, such as the four steps in the example. (We previously used recursion to repeat instructions, but there is another way.) Wouldn't it be easier if instead of all of the dragging or typing, we just wrote `4Step` or `Step4` or some other similar form? Yes, of course. So, we will use the

form **4:Step** to mean to do the **Step** operation 4 times; more generally we write  $\langle \text{number} \rangle : \langle \text{operation} \rangle$ , where the operation is one of our basic instructions given above like **Step**, or perhaps a list of them grouped inside of a parenthesis pair, as in **3:(Jump, Power, Step, Step)**, which will do the four-instruction *sequence* 3 times.

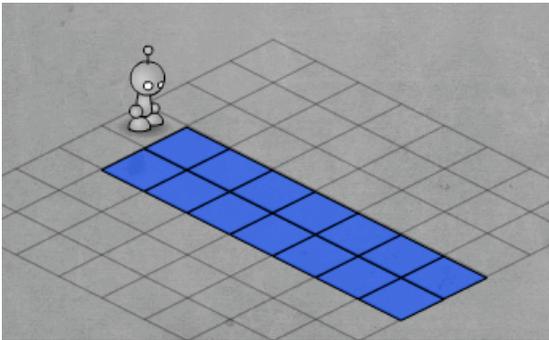
**Assignment.** Give symbolic programs for the Lightbot's problems 2a, 2b and 2c, writing them with a word processor (Word?). If iteration can be profitably used, use it. Caution: Check your work to be sure you've got it right.



(2a)



(2b)



(2c)

### **Wrap Up**

In this assignment you learned about iteration and the symbolic representation of instructions. You will use both extensively in the future.

### **Submit**

Deposit your word processing file (with your name as part of the file name) in the course assignment drop box; see calendar page.