Scripting Tutorial - Lesson 2

Download supporting files for this tutorial

Texas Instruments TI-Nspire Scripting Support Page

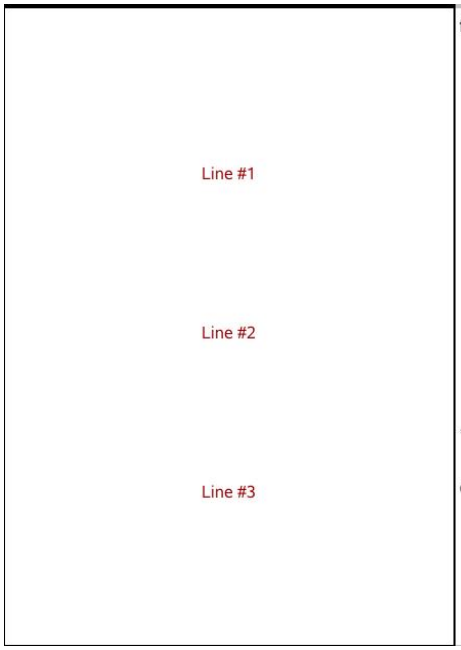
In this lesson, we introduce two very important and useful Lua tools: creating a table, and grabbing a variable from TI-Nspire's symbols table to use within your Lua script. We also make use of the key structure of "For" loops. If you are new to programming, it is strongly recommended that, before attempting these Lua tutorials, you should work through the two levels in the OnLine Authoring Classroom. Here you will learn how to write simple programs within TI-Nspire, and what you learn will form the foundation of most of what we will cover in our treatment of Lua.

We will again use Oclua to create and test the scripts described here. This is for convenience only. Lua scripts can be written in any text editor (from NotePad to Word). For Windows users, the free utility NotePad++ is very well suited for this kind of work, since it helps you to keep organized by assisting with the layout of your script. For Mac users, xCode comes on your install DVD under Developer Tools, and will do nicely. If you are willing to spend a few dollars, TextMate is excellent (and even "knows" Lua so can help with syntax and bugs).

Why not just keep using Oclua? Well, I might be missing something, but the file appears to be read-only. When you create a Lua page by pasting your script - everything looks fine. But close and re-open the document (even after saving) and you are back to the "Paste your script here" empty page. So this looks great for learning and testing, but if you want something that you can actually use elsewhere, you need to go to the Scripting Tools, which will be introduced in the next lesson. For now, though, we will stick with Oclua.

Lesson 2.1: Lua Tables

Central to the way that Lua




```
function on.paint(gc)
   local h=platform.window:height()
   local w=platform.window:width()
   local table = {}
   local linecount = 3
    gc:setFont("sansserif", "r", 10)
    gc:setColorRGB(158, 5, 8)

for k = 1, linecount do
    table[k] = "Line #"..k
    strwidth = gc:getStringWidth(table[k])
    strheight = gc:getStringHeight(table[k])
    gc:drawString(table[k], w/2 - strwidth/2
,h*k/(linecount + 1) + strheight/2)
 end
end
```

organizes its variables and works with its data is the table. Think of a table as an organized list of entries, which can be indexed. This means that for a table called, say, **my_table**, which consists of entries 1, "two" and "mine", we can refer to each entry easily: **my_table[1]** will give us 1. **my_table[2]** = **"two"** and **my_table[3]** will return the string "mine". This is exactly the way that TI-Nspire deals with **lists**. While there are some very powerful table management features within Lua, at this point, I want to show how similar Lua's treatment of tables can be to that of TI-Nspire programming.

For this example, we wish to set up our display page with multiple lines of text. Clearly this could be done just by using repeated drawString commands, at different height positions. But by being a little more systematic about it, we can gain many benefits - and you can learn a little about using tables along the way!

In the last lesson, we introduced the idea of local variables, creating w and h to represent the window width and height respectively. These adjust dynamically, and so if you switch views between handheld and computer view, or simply resize the computer view - or split a window, as in the example shown here - using these rather than static values will mean that your page will look equally effective in either view.

For our example, we will define two new local variables: (1) The table itself, defined with a pair of empty braces (the same way that a list is defined in TI-Nspire). We call it, unimaginatively, "table"; and (2) We also define the value for the number of lines we wish to display - "linecount".

Lesson 2.2: For Loops in Lua

I assume some familiarity with the standard "for..end" structure (in TI-Nspire, this is "For.. EndFor". In Lua, each structure ends, simply, with "End", rather than "EndFor" or "EndIf").

TI-Nspire Loop

```
For k, 1, 10
    temp := k*
    (k+1)
EndFor
```

Lua Loop

```
for k = 1, 10 do
    temp = k*
    (k+1)
end
```

The result for both is the same: the variable temp, at the end, will be equal to 110. The syntax in Lua, similar to TI-Nspire: Lua uses for k = from, to [,steps] do. TI-Nspire uses For k, from, to [,steps]. Note the differences with TI-Nspire: the equals sign, the word "do" at the end of this definition line, and the requirement that all should be in lowercase. You will note the [optional] step size included for both. Note, too, that lua uses all lowercase commands here.

In our scripting example shown in the image above and contained in this lesson's documents, we will run from k = 1 to k = 3, creating and placing each line of our display as we go. the power of this structure should be obvious - we can just as easily display 10 lines, or whatever number we desire (within reason).

You will recognise the few lines from the previous (simpler) example: lines which define the font, the color, string width and height, and draw the string. Here we add a line that creates each line of our "table". Here the syntax, table[k] refers to the k-th element of table. So table[1] is the first "line", or "row" or however you want to visualize this table. This is exactly the same way that TI-Nspire defines elements of a list.

Lesson 2.3: Creating Lines for our Table

Suppose in TI-Nspire, we defined the list table := {"one", "two", 7} and then displayed table[1] (you would get "one"), table[3] would display the value 7. In Lua, exactly the same would happen. In fact, Lua is a little more flexible than TI-Nspire in how it handles variables. In TI-Nspire, we need to be careful to distinguish the string "7" from the number, 7. They have a different data structure. In Lua, it does not matter, as long as they are used appropriately. So if you have defined the string "7" as num, then Lua will quite happily take 2*num and output 14. TI-Nspire would insist that it cannot perform such operations on strings.

So in our example, we are actually creating each line of our table as we go: when k = 1, table[1] is defined as the joining together (concatenation, for which we use the double dots "..") of the string "line #" and the value of k (1). So table[1] = "line #1". Easy!

Lesson 2.4: Placing our Displayed Lines

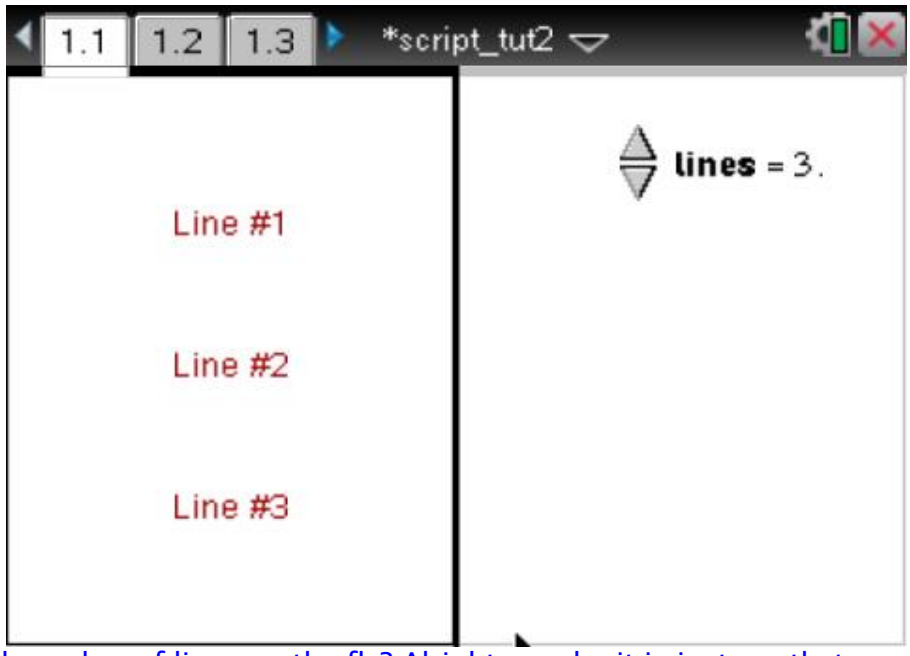
So creating each of the lines for our table is relatively easy. But to display then correctly requires a little thinking and calculation. As previously, we will place them horizontally in the center of the window. But vertically,we need to place them equally spaced - in other words, we need to divide our window height (h) by one more than the linecount (because we are actually placing the spaces between the lines!). Once this is realized, then the calculation for the vertical position of each line becomes quite simple: h * k/(linecount + 1). So if we are displaying 3 lines, the first will occur at 1*h/4, the next at 2*h/4 (h/2) and the third at 3*h/4. Adding half the string height will adjust for whatever height the string has.

Take a moment now and pause; take a breath, and go back and study the script displayed above. type it in and try it out. make sure you can understand what each part actually does.

Then you are ready for the last part of this lesson: making this process dynamic!

Lesson 2.5: Bringing it all to Life

How cool would it be if we could change the



displayed number of lines on the fly? Alright, maybe it is just me that thinks that would be cool, but we will learn something very important in the process, so bear with me!

We are going to add a slider to our TI-Nspire document. First, though, we need to split our page: go to the Page Layout menu (or on the handheld press DOCS and choose Page Layout) and choose the vertical split window. Select Geometry for the new window.

Now, choose **Graphs** > **menu** > **Actions** > **Add slider** and, after you drop it somewhere convenient, type to call it "lines". Right click on the slider and choose the following under Slider Settings: Variable: line; Value: 5 (What effect does this have?); Minimum : 1; Maximum: 10; Step size: 1; Style: Vertical.

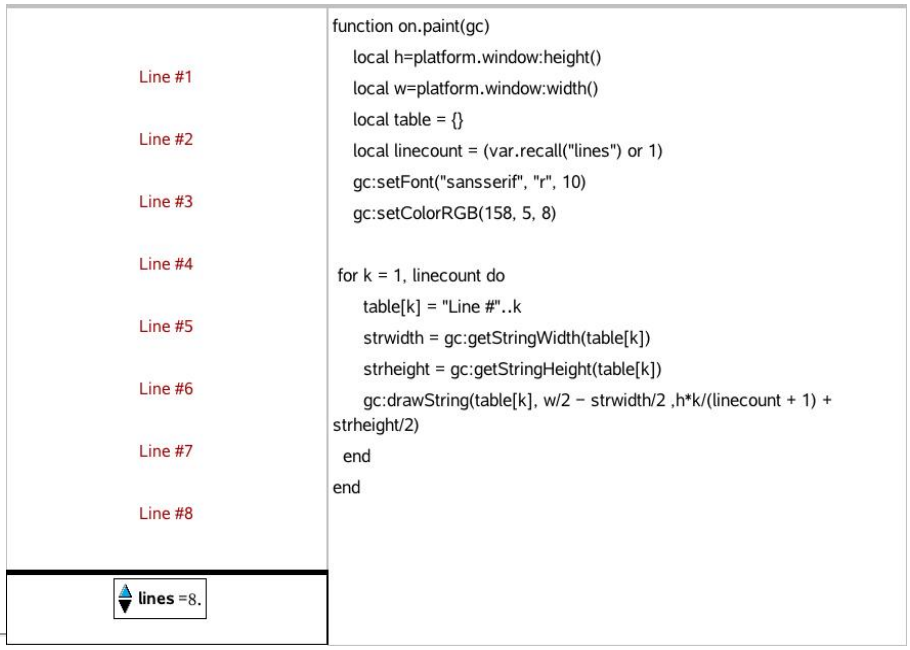
For an optional better appearance, right click on the slider, choose minimize, and set it to display vertically.

1. What we need to do is to somehow access the value of that slider within our Lua script. this is achieved very simply using the command **var.recall**. So instead of defining our local variable, **linecount** as a fixed value (like 3), we set

2. **local linecount = (var.recall("lines") or 1)**

3. Study the script here. **var.recall("lines")**

looks for an existing variable called "lines" and grabs its value, assigning it to **linecount**. What if your document does not have the variable **lines** defined? Look how neatly Lua deals with this: if **lines** is not found, then the instruction is to assign the value 1 (or anything else you choose). Nice.



What Now?

Launch Player

Well done! Another lesson complete. Take some time to try this out, varying different parameters so that you can understand the part that each plays. Don't forget to download the goodies for each of these tutorials. These include completed versions of the documents referred to in the lesson, so that you can play and experiment easily.

We can obviously make this document a lot more interesting and useful – and in the next lesson we will learn how to do just that – not a lot of use for a document that just displays "line #1", "line #2", etc, so we will see how to actually put whatever you want into each line on the fly, and using "If" statements how to present the whole display in a more interesting way.