CS 8 Lab: pa07

December 2, 2014

1   Overview

Congrats on getting to this point in the course. It's almost over, I promise. You're pretty much a Python master now, so you at least have that going for you.

The assignment this week is a fun one. You get show your creative side by using Python's Turtle library.

2   Getting Set Up

Pull up the assignment description from `http://cs.ucsb.edu/~koc/cs8/hwexpa/pa07.pdf` and read through it. Think about how this mathematical conjecture would like like in Python code. You'd probably have to use an if statement to check if the value is even or odd, and so on.

Open up a new python file called `pa07.py` (use past handouts for help if needed). As the first three lines, type in comments containing your full name, lab section time, UCSB UMail email address, and perm number:

```
# Your name, Lab time
# Your UCSB email address
# Your perm number
```

In `pa07`.py, you have to write three things:

- a function called `f(x)` that takes in an integer `x`, and returns the next number defined by the $3x + 1$ Conjecture.

- a function called `draw(xs)` that takes in an integer `xs` and uses the turtle module to draw a visual representation of the $3x + 1$ Conjecture, starting at the first value xs. This will have some sort of a loop in it that will call `f(x)` to get the next number in the sequence and, based on that value, draws a picture.

- one call to your `draw(xs)` function with a number of your choice. Pick a number that produces a good picture.

Some sample code has been provided here: `http://cs.ucsb.edu/~koc/cs8/hwexpa/tx1.py` I suggest you copy and paste this sample code into your own `pa07.py` file to get started. I'm also including the sample code here:

```
import turtle
t = turtle.Turtle()

def f(x):
```

```
    if x%2 == 0:
        y = x//2
    else:
        y = 3*x+1
    return y

def draw(xs):
    x = xs
    t.up()
    t.goto(-250,0)
    t.setheading(0)
    t.down()
    while x > 1:
        t.left(90)
        t.forward(x)
        t. right(90)
        t.forward(5)
        t. right(90)
        t.forward(x)
        t.left(90)
        t.forward(5)
        y = f(x)
        x = y

draw(11)
```

Let's look at this code, and understand it before we move on. We first import the turtle module, and make a turtle, `t`, that we will use in our drawing. Next, we define the `f(x)` function. Read through this, and make sure it makes sense to you. **You do not need to change this function at all. Just make sure you understand it.**

We then have the `draw(xs)` function. This is a bit trickier to understand. It starts by moving the turtle over to the left of the window (you can play around with these values). It then goes into a while loop. This loop will execute as long as $x > 1$. In the loop, we draw something with our turtle `t` based on the current value of the number x, and then call our other function `f(x)` to get the next value of the number. Then, the next time we loop, it will use the new number.

Finally, we have one call to the `draw(xs)` function, where we pass in 11 as the initial integer. Go ahead and run the code and see what it makes.

3   Write your code

You only need to change the draw function in this programming assignment. Change it so it makes a different, cool looking patter, image, etc. based on the values in this sequence your `f(x)` function generates. Be creative. Those with more creative images will get more points on the assignment. Feel free to research the Turtle module to see what it is capable of. Just remember, **whatever pattern you decide to do, make sure it involves the value of the number generated in the sequence in a way that is clearly noticable. Also, you will not receive credit on the assignment if you use the pattern in the sample code. Please make up your own.** Call your `draw(xs)` function with various values, not just 11. Pick a value that you think results in the best picture, and leave this one function call in your code.

For more picture ideas, check out some past programs here: `http://www.cs.ucsb.edu/~koc/cs8/3x+1/`

3.1 Running on the command line

If you're on a computer without IDLE or just want to run this on the command line, open up a Terminal window and navigate into the directory where you saved your pa07.py file. Type `python3 pa07.py` to run your program. It should draw your picture in a turtle window.

3.2 Running in IDLE

If you're on a computer with IDLE, go to `Run→Run Module` where you have your file. The IDLE prompt window (the window with the `>>>`) should restart, and a turtle window will pop up. It should draw your picture.

4 Turnin

Ready to submit? Make sure you move your file over to CSIL first. **We only want you to turn in the python file. Do not turn in any screenshots.** Then, in a Terminal, navigate the the directory containing your file. To turn in, type the following command:

`turnin pa07@cs8 pa07.py`

and follow the on-screen directions. Remember, I will grade the last submission turned in before the deadline if you turn in multiple versions. **The deadline for this project is Friday, December 5th, 2014 at 11pm. We will not be accepting late submissions, so make sure you give yourself enough time to complete and turn in your project.**