

CS116 – Iterating through all of a list - Part 1

Purpose: Data in computer science often comes in the form of a list of values. This could be a list of characters that make up a text, or a list of pixels that make up a picture, or a list of sound samples that make up a digital sound. The purpose of this module is to learn how to process each element of a list to perform a task.

Skills: After completion of this module you should be able to

1. Write definite loops
2. Write conditionals
3. Modify or process each element of a list

Knowledge: This module will help you become familiar with the following content knowledge:

1. Iterating through a list
2. Testing an item for a property

Schema:

Process each item in a list

```
for item in list:  
    process item
```

Conditionally process each item in a list

```
for item in list:  
    if item has property:  
        process item
```

Activity: With your group perform the following tasks and answer the questions. You will be reporting your answers back to the class in 30 minutes.

1. We will start by applying the list processing schema to a list of pixels that make up a Picture object with a picture method to change all the pixels to a color that is provided as a parameter.

```
def setToColor(self,color):  
    for pixel in self.getPixels():  
        pixel.setColor(color)
```

Try this out by creating a Picture object and using this method with a color like red, white, or blue.

How is the method getting the list of pixels from your Picture object?

Which variable in the method refers to an individual item in the list?

What type of value is each individual item in the list?

What processing are we doing with each individual item in the list?

2. The following is a method for the Sound class which changes the volume of the sound by a factor provided as a parameter.

```
def changeVolume(self, factor):  
    for s in self.getSamples():  
        value = s.getValue()  
        s.setValue(value*factor)
```

What list is being processed?

Which variable in the method refers to an individual item in the list?

What type of value is each individual item in the list?

What processing are we doing with each individual item in the list?

3. The following is a method in the Text class which prints the words in the text which are small words.

```
def printSmallWords(self):  
    for word in self.getWords():  
        if (len(word)<3):  
            print(word)
```

What list is being processed?

Which variable in the method refers to an individual item in the list?

What type of value is each individual item in the list?

How is the method defining a "small" word?

What processing are we doing with each individual item in the list?

4. You can get a list of number with the `range` function. The following gives you a list `[0,1,2,3]`.

```
range(0,4)
```

Consider this new version of the `drawSquare` method for the `Turtle` class.

```
def drawSquareLoop(self,width):  
    for i in range(0,4):  
        self.forward(width)  
        self.right(90)
```

What list is being processed?

Which variable in the method refers to an individual item in the list?

What type of value is each individual item in the list?

What processing are we doing with each individual item in the list?

Complete each of the following assignments to be submitted for grading. Each should be done individually but you can consult with a classmate to discuss your strategies or if you get an error message that you do not understand.

For each of these problems it will help if you ask yourself the following questions:

1. What is the list I am processing?
2. What type of value is each individual item in the list?
3. What processing needs to be done for each individual item in the list?

Assignment 1:

Write a method `printBlankLines(self,n)` in the `Text` class which prints n blank lines to the console.

Criteria for Success: Your method should work for any positive n value and print that many blank lines.

Assignment 2:

You have written an essay for school, and it has to be at least five pages long. But your essay is only 4.5 pages long! You use your python skills to insert blank lines by writing a method `increasePaperLength(self,n)` in the `Text`. For every line of text in your paper the method will add an additional n blank lines.

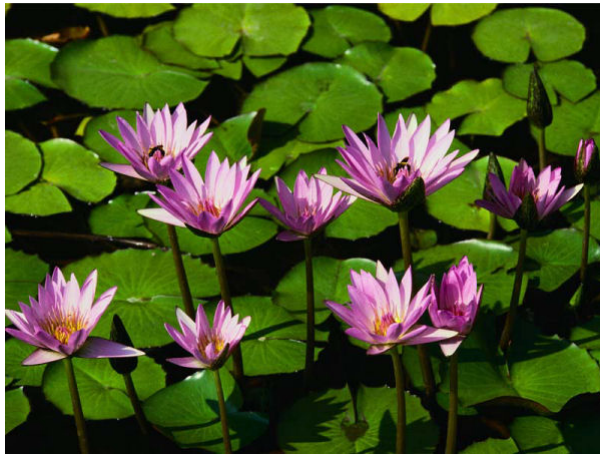
Criteria for Success: This method should invoke the `printBlankLines` method from the previous assignment for each line in your text.

Assignment 3:

Write a method `keepBlue(self)` in the `Picture` class that modifies all the pixels in the picture to keep just the blue value. This means that you will need to set the green and red values to zero.

Criteria for Success: If you show your picture after applying your method, you will observe that your picture is all in shades of blue as shown below:

Original:



Modified:



Assignment 4:

Solarization is an effect from chemical photography caused by vast amounts of over-exposure to film. It results in the reversal of some tones in a photograph; that is, it is a partial negation of the image. The same effect can be achieved in digital image processing by negating those pixels whose intensity lies below a certain threshold.

We can measure the intensity or luminance of a pixel by taking

$$(redValue + greenValue + blueValue)/3$$

If that luminance value is less than 128 we can negate the value by changing the redValue to $255 - redValue$, the greenValue to $255 - greenValue$, and the blueValue to $255 - blueValue$.

Write a method `solarize(self)` in the `Picture` class that modifies the image as described.

Criteria for Success: The solarized waterlilies is shown below:



Submit your python files with your methods in Canvas for grading.