COMP 141

Using Loops to Read Files

Rhodes College

Practice From Last Time

- Write a program that writes a series of random numbers to a file. Each random number should be in the range of 1 through 100. Write at least 5 random numbers to the file – 1 number/line.
- Call your output file **`randomNums.txt`**

Step 1: Open the file

- Uses the open() function.
- Always done the same way no matter how the file is organized.

```
file = open("filename.txt", "r")
```

open() returns a "file object," which is a data type like int, float, or string.

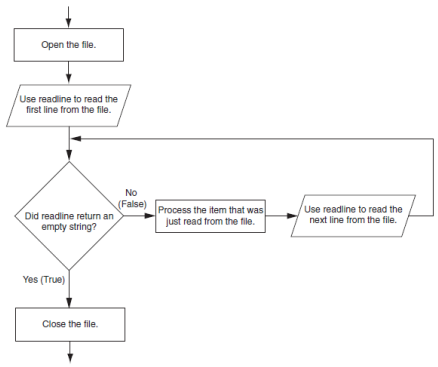
Replace this string with the real name of your file (don't forget the quotes!)

The "r" means open the file for reading.

Using Loops to Read Files

- **Files typically used to hold large amounts of data**
  - Loop typically involved in reading from and writing to a file
- **Often the number of items stored in file is unknown**
  - The `readline` method uses an empty string as a sentinel when end of file is reached
    - Can write a while loop with the condition `while line != ''`

Figure 7-17 General logic for detecting the end of a file



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Program 7-9 (read_sales.py)

```
# This program reads all of the values in
# the sales.txt file.

def main():
    # Open the sales.txt file for reading.
    sales_file = open('sales.txt', 'r')

    # Read the first line from the file, but
    # don't convert to a number yet. We still
    # need to test for an empty string.
    line = sales_file.readline()

    # As long as an empty string is not returned
    # from readline, continue processing.
    while line != '':
        # Convert line to a float.
        amount = float(line)

        # Format and display the amount.
        print(format(amount, '.2f'))

        # Read the next line.
        line = sales_file.readline()

    # Close the file.
    sales_file.close()

# Call the main function.
main()
```

sales.txt - Notepad

File Edit Format View Help

```
1000
2000
3000
4000
5000
```

Program Output

```
1000.00
2000.00
3000.00
4000.00
5000.00
```

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Using Python's `for` Loop to Read Lines

- **Python allows programmer to write a `for` loop that automatically reads lines in a file and stops when end of file is reached**
  - Format: `for` *`line`* `in` *`file_object`*`:`
    `statements`
  - The loop iterates once over each line in the file

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Program 7-10 (read_sales2.py)

```
# This program uses the for loop to read
# all of the values in the sales.txt file.

def main():
    # Open the sales.txt file for reading.
    sales_file = open('sales.txt', 'r')

    # Read all the lines from the file.
    for line in sales_file:
        # Convert line to a float.
        amount = float(line)
        # Format and display the amount.
        print(format(amount, '.2f'))

    # Close the file.
    sales_file.close()

# Call the main function.
main()
```

sales.txt - Notepad

File Edit Format View Help

```
1000
2000
3000
4000
5000
```

Program Output

```
1000.00
2000.00
3000.00
4000.00
5000.00
```

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Step 2: Loop over the file

```
file = open("filename.txt", "r")
while [there are more lines in the
       file that we haven't read]:
  line = [read the next line
          from the file]
```

You only have access to one line of the file at a time.

Step 2: Loop over the file

```
file = open("filename.txt", "r")
for line in file:
```

line can be any string variable you want. This variable will store each line of the file as it is read.

Step 3: Process each line

- Do whatever you need to do with the string variable (usually called line).

```
file = open("filename.txt", "r")
for line in file:
  print(line)
```

Step 3: Process each line

- Usually a good idea to "strip" the newline character from the line before processing:

```
file = open("filename.txt", "r")
for line in file:
  line = line.rstrip()
  print(line)
```

Step 4: Close the file

- After you are done reading from the file, you should close the file:

```
file = open("filename.txt", "r")
for line in file:
  line = line.rstrip()
  print(line)
file.close()
```

Complete file-reading loop

- Use this as a template for file reading:

```
file = open("filename.txt", "r")
for line in file:
  line = line.rstrip()
  [process a line]
file.close()
```

Good Practice Tip

- When you are first reading from a file, you should **print** out each line as you get it so that you can see what is going on.
- When trying to debug your code, it's a good idea to add print statements so that you can understand what your program is doing at various steps.

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Practice

Open your **randomNums.txt** file that you created last class and read in each number.

1. Write a program that outputs the sum and average of the numbers in your file**.**
2. Write a program that calculates the consecutive differences between numbers in the file
   (**Hint:** use the sliding window technique)
3. **Challenge**: Write a program to print out the smallest and largest values in the file.

- If you need a randomNums.txt file, I put mine in my Box.com code directory.
- Remember that the randomNums.txt file and your Python file need to reside in the same folder!

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- Problem that re-occurs often in CS:
- Finding the largest item in a set of things where you can only look at each thing once.

- Pseudocode for finding the largest number in a collection of numbers:

- **`largest`** = [smallest possible number that you could ever see]
- look at each number once:
  if the current number > **`largest`**, then
  `largest` = current number

- after this loop, **`largest`** will have the largest number in it!