

File I/O

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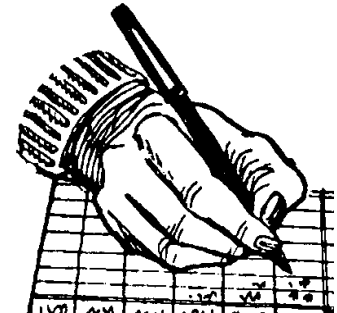
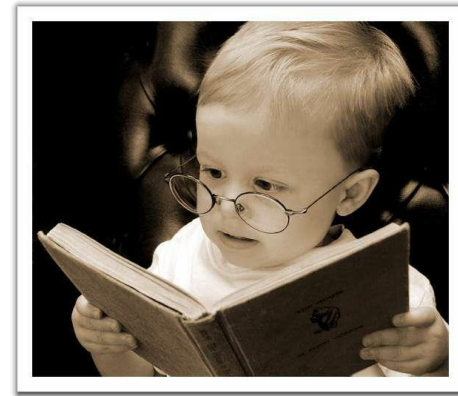
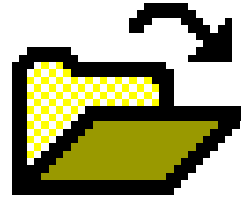
File Input and Output

- As a programmer, when would one use a file?
- As a programmer, what does one do with a file?

Files store information when a program is not running

Important operations:

- open a file
- close a file
- read data
- write data



Files and filenames

- A **file** object represents data on your disk drive
 - Can read from it and write to it
- A **filename** (usually a string) states where to find the data on your disk drive
 - Can be used to find/create a file
 - Examples:
 - Linux/Mac: `"/home/rea/class/140/lectures/file_io.pptx"`
 - Windows: `"C:\Users\rea\My Documents\cute_dog.jpg"`
 - Linux/Mac: `"homework3/images/Husky.png"`
 - `"Husky.png"`

Two types of filenames

- An **Absolute** filename gives a specific location on disk:
`"/home/rea/class/140/14wi/lectures/file_io.pptx"` Or
`"C:\Users\rea\My Documents\homework3\images\Husky.png"`
 - Starts with `"/` (Unix) or `"C:\` (Windows)
 - Warning: code will fail to find the file if you move/rename files or run your program on a different computer
- A **Relative** filename gives a location relative to the *current working directory*:
`"lectures/file_io.pptx"` Or `" images\Husky.png"`
 - Warning: code will fail to find the file unless you run your program from a directory that contains the given contents
- *A relative filename is usually a better choice*

Examples

Linux/Mac: These could all refer to the same file:

```
"/home/rea/class/140/homework3/images/Husky.png"
```

```
"homework3/images/Husky.png"
```

```
"images/Husky.png"
```

```
"Husky.png"
```

Windows: These could all refer to the same file:

```
"C:\Users\rea\My Documents\class\140\homework3\images\Husky.png"
```

```
"homework3\images\Husky.png"
```

```
"images\Husky.png"
```

```
"Husky.png"
```

“Current Working Directory” in Python

The directory from which you ran Python

To determine it from a Python program:

```
>>> import os    # "os" stands for "operating system"  
>>> os.getcwd()  
' /Users/johndoe/Documents '
```

Can be the source of confusion: where are my files?

Reading a file in python

```
# Open takes a filename and returns a file.  
# This fails if the file cannot be found & opened.  
myfile = open("datafile.dat")
```

```
# Approach 1:  
for line_of_text in myfile:  
    ... process line_of_text
```

```
# Approach 2:  
all_data_as_a_big_string = myfile.read()
```

```
myfile.close() # close the file when done reading
```

Assumption: file is a sequence of lines

Where does Python expect to find this file (note the relative pathname)?

Reading a file Example

```
# Count the number of words in a text file
in_file = "thesis.txt"
myfile = open(in_file)
num_words = 0
for line_of_text in myfile:
    word_list = line_of_text.split()
    num_words += len(word_list)
myfile.close()

print "Total words in file: ", num_words
```

Reading a file multiple times

You can iterate over a **list** as many times as you like:

```
mylist = [ 3, 1, 4, 1, 5, 9 ]
for elt in mylist:
    ... process elt
for elt in mylist:
    ... process elt
```

Iterating over a **file** uses it up:

```
myfile = open("datafile.dat")
for line_of_text in myfile:
    ... process line_of_text
for line_of_text in myfile:
    ... process line_of_text
```

This loop body will never be executed!

How to read a **file** multiple times?

Solution 1: Read into a list, then iterate over it

```
myfile = open("datafile.dat")
mylines = []
for line_of_text in myfile:
    mylines.append(line_of_text)
... use mylines
```

Solution 2: Re-create the file object (slower, but a better choice if the file does not fit in memory)

```
myfile = open("datafile.dat")
for line_of_text in myfile:
    ... process line_of_text
myfile = open("datafile.dat")
for line_of_text in myfile:
    ... process line_of_text
```

Writing to a file in python

Replaces any existing file of this name

```
myfile = open("output.dat", "w")
```

open for **Writing**
(no argument, or
"r", for **Reading**)

Just like printing output

```
myfile.write("a bunch of data")
```

```
myfile.write("a line of text\n")
```

"\n" means
end of line
(Newline)

Wrong; results in:

TypeError: expected a character buffer object

```
myfile.write(4)
```

```
myfile.write(str(4))
```

Right. Argument
must be a string

```
myfile.close()
```

close when done
with all writing