CSCI 120
Introduction to CompSci and Programming I
Lec 3: File IO & Error Handling

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Overview

- Focus: Python Programming
- Architecture: von Neumann
- Core Ideas:
    1. File IO

File I/O

Reading and Writing to file

Summary

P1
File I/O

Computer I/O

- Keyboard/Onscreen
  - `input` / `print` functions in python
- Modern Computers store files on storage devices
  - Programmes access files on these devices through File I/O

Review

Opening/Closing a File

- Python provides basic functions and methods necessary to manipulate files through **file** objects

- `open(fileName, [, access_mode])`

  - Before you can read or write a file, you have to **open** it. This creates a file object

- Example:

  - `myFile = open("foo.txt", "r")`
    This opens the file `foo.txt` in **read** mode

  - When you are done, close it
    `myFile.close()`

Concept

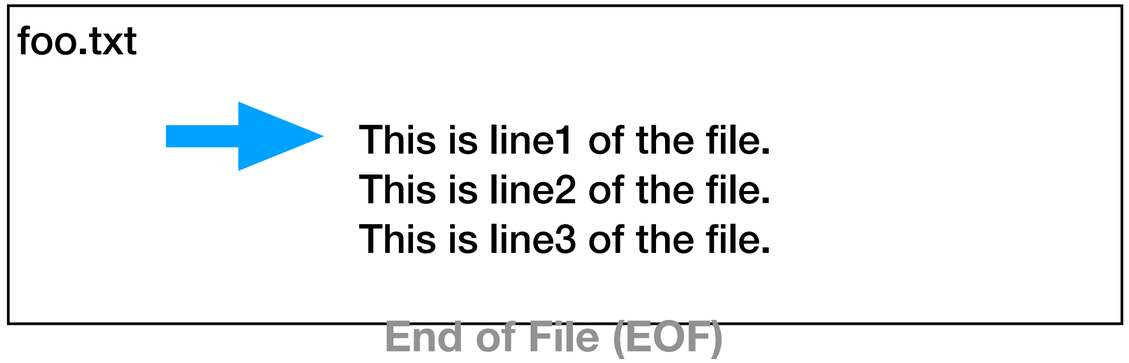
Opening/Closing a File

- A better way:
  - **`with open("foo.txt", "r") as myFile:`**
    `# do stuff here`
  - This way, the programme closes the file as soon as you exit the subroutine

Tech Tip

Reading a File

- file pointer
  - a file is like a map
  - the file pointer points to the place you are currently at
  - when you read a line
    the pointer will move forward
  - you can also reset the pointer




```
> f = open("foo.txt", "r")
> print(f.readline())
> print(f.readline())
> print(f.readline())
> f.seek(0)
  # reset pointer to position 0
  # which is the very beginning
```

Example

Reading a File

- Let's say you want to read the file `shakespeare-hamlet.txt` https://raw.githubusercontent.com/teropa/nlp/master/resources/corpora/gutenberg/shakespeare-hamlet.txt

- `myFile = open("Hamlet.txt", "r")`

- Iterating

  - ```
    for line in myFile:
        print(line)
    # prints each line
    # each line is already ending with '\n', so if you do it this way, there will be empty lines
    ```

Example

1. Link also on the course website
    ```

Reading a File

- Read all-in-one
  - `content = myFile.read()`
    `# this returns the whole file as a single string`
  - `list_content = list(myFile)`
    `# this returns the whole file as a list`
    `# each element is a single line string ending with '\n'`

Example

P1
File I/O

Access Modes (Short)

Modes	Description
r	Opens a file for reading only. The file pointer is placed at the beginning of the file. This is the default mode.
r+	Opens a file for both reading and writing. The file pointer will be at the beginning of the file.
w	Opens a file for writing only. Overwrites the file if the file exists. If the file does not exist, creates a new file for writing.
w+	Opens a file for both writing and reading. Overwrites the existing file if the file exists. If the file does not exist, creates a new file for reading and writing.
a	Opens a file for appending. The file pointer is at the end of the file if the file exists. That is, the file is in the append mode. If the file does not exist, it creates a new file for writing.
a+	Opens a file for both appending and reading. The file pointer is at the end of the file if the file exists. The file opens in the append mode. If the file does not exist, it creates a new file for reading and writing.

1. We don’t discuss binary files here

`file` Object

- attributes
  - `myFile.closed`
    Returns true if file is closed, false otherwise.
  - `myFile.mode`
    Returns access mode with which file was opened.
  - `myFile.name`
    Returns name of the file.
  - `myFile.softspace`
    Returns false if space explicitly required with print, true otherwise.

`file` Object

- Example:

```
fo = open("foo.txt", "wb")
print("Name of the file: ", fo.name)
print("Closed or not : ", fo.closed)
print("Opening mode : ", fo.mode)
print("Softspace flag : ", fo.softspace)
```

- This would produce following result:

```
Name of the file: foo.txt
Closed or not : False
Opening mode : wb
Softspace flag : 0
```

Example

Writing to File

The `write()` Method:

- The `write()` method writes any string to an open file
- The `write()` method does not add a newline character (`'\n'`) to the end of the string

Example:

```
with open("output.txt", "w") as f:
    # file opened in write mode
    f.write("I like cheese")
```

Concept

Writing to File

- Example:

```
> f = open("foo.txt", "wb")
> f.write("Python is a great language.\r\nYeah its great!!
  \r\n");
> f.close()
```

- The above method would create `foo.txt` file and write the following in it

```
Python is a great language.
Yeah its great!!
```

Example

File System Management

- `os`
  provides file-processing operations, such as **renaming** and **deleting** files.

- The `rename()` method takes two arguments, the current filename and the new filename.

- Syntax:
  ```
  os.rename(current_file_name, new_file_name)
  ```

- Example:
  ```
  import os
  os.rename( "test1.txt", "test2.txt" )
  ```

Concept

File System Management

- You can use the *delete()* method to delete files by supplying the name of the file to be deleted as the argument

- Syntax:

```
os.remove(file_name)
```

- Example:

```
import os
os.remove("test2.txt")
```

Concept

Directories in Python

- Use the `mkdir()` method of the os module to create directories in the current directory. You need to supply an argument to this method, which contains the name of the directory to be created.

- Syntax:

```
os.mkdir("newdir")
```

- Example:

```
import os
os.mkdir("test") # Create a directory "test"
```

Concept

Directories in Python

- Use the `chdir()` method to change the current directory. The `chdir()` method takes an argument, which is the name of the directory that you want to make the current directory.

- Syntax:

```
os.chdir("newdir")
```

- Example:

```
import os
os.chdir("test")
```

Concept

Directories in Python

- The `getcwd()` method displays the current working directory
- Syntax:

```
os.getcwd()
```

- Example:

```
import os
os.getcwd()
```

Concept

Directories in Python

- The `rmdir()` method deletes the directory, which is passed as an argument in the method. Before removing a directory, all the contents in it MUST be removed.

- Syntax:

```
os.rmdir('dirname')
```

- Example:

```
import os
os.rmdir( "/tmp/test" )
```

Concept