



Introduction to Programming

CS101

Spring 2012

Lecture #9



Last week we learned

- Objects
 - object creation
 - object attributes

This week we will learn

- Files
 - reading from a file
 - writing to a file
- break
- continue



We have a file "C:/CS101/planets.txt" on our hard disk with this contents:

Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune

`f` is a file object (of type `<type 'file'>`), not the contents of the file.

mode: "r" for reading

```
>>> f = open("C:/CS101/planets.txt", "r")
>>> s = f.readline()
>>> s, len(s)
('Mercury\n', 8)
```

line separator in file



We typically use `strip()` or at least `rstrip()` for the lines we read from a file to get rid of white space.

```
>>> for l in f:  
...     s = l.strip()  
...     print s,
```

Venus Earth Mars Jupiter Saturn Uranus Neptune

`for`-loop with a file object calls `readline()` automatically for each element, and stops after reading the last line.

Call `f.close()` when finished with the file object.



A typical program for reading the contents of an entire file and storing it in a list:

```
planets = []

f = open("C:/CS101/planets.txt", "r")
for line in f:
    planets.append(line.strip())
f.close()

print planets
```

In fact, file objects provide a method to do this (but then you get all the white space):

```
planets = f.readlines()
```



We want to find the line in the file containing earth:

```
f = open("C:/CS101/planets.txt", "r")
current = 0
earth = 0
for line in f:
    current += 1
    planet = line.strip().lower()
    if planet == "earth":
        earth = current
print "Earth is planet #%d" % earth
```

The program reads the entire file, even if earth is right at the beginning. After having found earth, there is no need to continue the loop.



The keyword **break** terminates the current loop:

```
f = open("C:/CS101/planets.txt", "r")
earth = 0
for line in f:
    earth += 1
    planet = line.strip().lower()
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```

break breaks out of the innermost loop only:

```
>>> for x in range(10):
...     for y in range(10):
...         print y,
...         if y == 5: break
```



Some data files contain useful comments, let's say starting with a **#** sign.

```
f = open("C:/CS101/planet.sc.txt", "r")
earth = 0
for line in f:
    planet = line.strip().lower()
    if planet[0] == "#":
        continue
    earth += 1
    if planet == "earth":
        break
print "Earth is planet #%d" % earth
```

continue makes the loop move to the next element immediately



Let's do some word games. We use a file `words.txt` with 113809 English words (<http://icon.shef.ac.uk/Moby/>).

Let's print all English words longer than 18 letters:

```
f = open("C:/CS101/words.txt", "r")
```

```
for line in f:
    word = line.strip()
    if len(word) > 18:
        print word
```

```
f.close()
```



Count all the words without the letter 'e':

```
f = open("C:/CS101/words.txt", "r")
```

```
count = 0
```

```
for line in f:
```

```
    word = line.strip()
```

```
    if not "e" in word:
```

```
        count += 1
```

```
print "%d words have no 'e'" % count
```

```
f.close()
```



Let's find all words whose letters are sorted:

```
def is_abecedarian(word):  
    for i in range(1, len(word)):  
        if word[i-1] > word[i]:  
            return False  
    return True  
  
f = open("C:/CS101/words.txt", "r")  
  
for line in f:  
    word = line.strip()  
    if is_abecedarian(word):  
        print word  
  
f.close()
```



Three double letters in a row?

Is there a word that has three double letters in a row?

Committee and Mississippi are close...

```
def three_doubles(word):  
    s = ""  
    for i in range(1, len(word)):  
        if word[i-1] == word[i]:  
            s = s + "*"  
        else:  
            s = s + " "  
    return "* * *" in s
```



We can also create and write to files:

```
f = open("C:/CS101/test.txt", "w")  
f.write("CS101 is fantastic\n")  
f.close()
```

Use mode `"w"` to open a file for writing.

The file object has a method `write(text)` to write to the file. Unlike `print`, this does not start a new line after the `text`, not even a single space. Use `\n` to include a line break.

Do not forget to `close()` the file—otherwise, the file contents may be incomplete.

Let's exercise with a currency exchange rate data set. We use files `1994.txt ... 2009.txt` with the KRW-USD exchange rate for every day. (www.oanda.com)

```
2009/05/11          0.00080110
```

We first read the entire data set (16 files) into a long list of pairs:

```
[... (20091227, 1154), (20091228, 1154),  
(20091229, 1167), (20091230, 1167),  
(20091231, 1163)]
```

Let's find the maximum, minimum, and average for each year.

```
Minimum: (19950705, 755)
```

```
Maximum: (19971223, 1960)
```

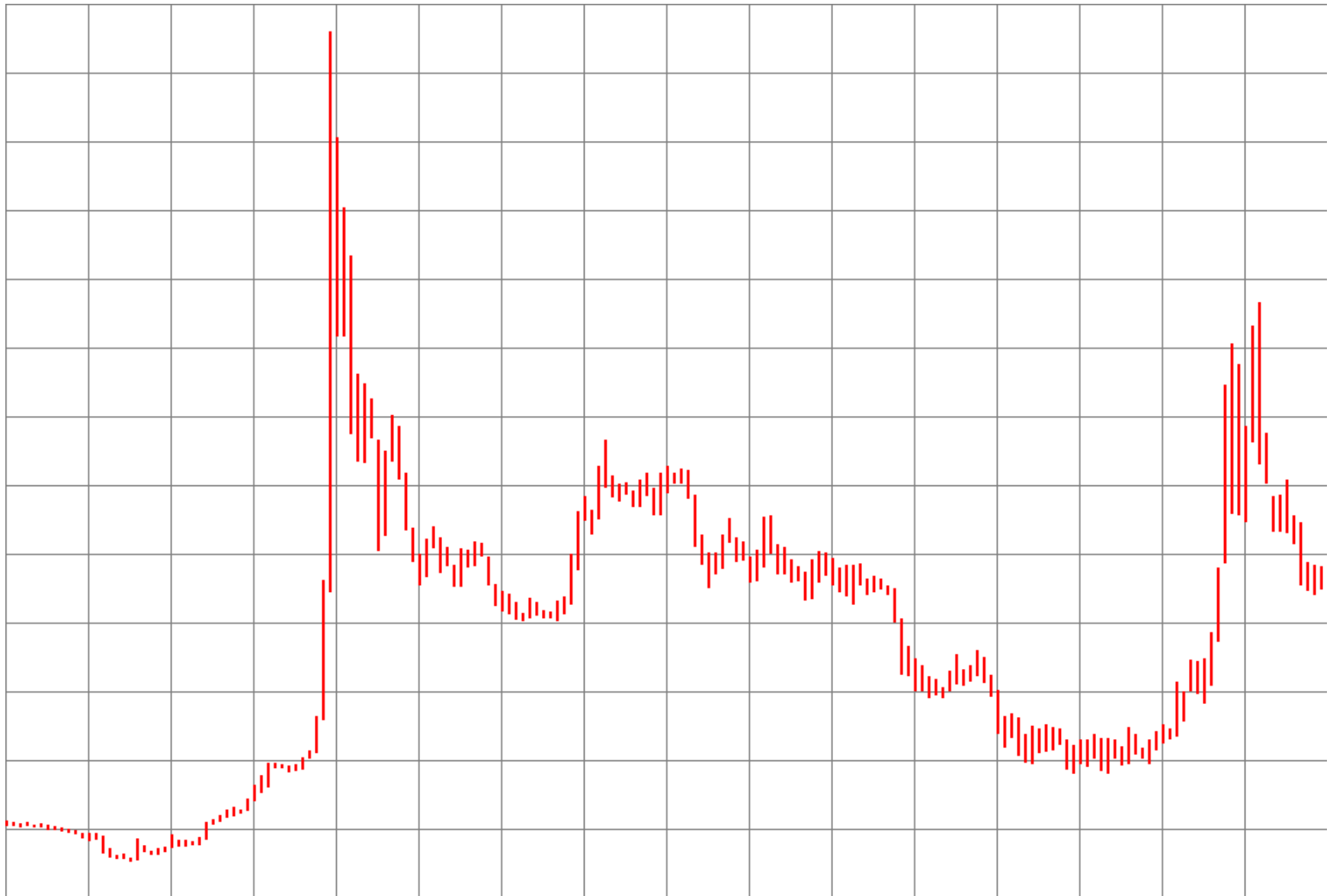


Minimum and maximum for every month of a year:

```
def find_minmax(yr):  
    minmax = [ (9999, 0) ] * 12  
    data = read_year(yr)  
    for d, v in data:  
        # make month 0 .. 11  
        month = (d / 100) % 100 - 1  
        minr, maxr = minmax[month]  
        if v < minr:  
            minr = v  
        if v > maxr:  
            maxr = v  
        minmax[month] = minr, maxr  
    return minmax
```



Let's use `cs1media` to create a nice plot of the exchange rate.



Let's write software for a vegetable and fruit shop. We keep a file with the current stock and prices. We should be able to sell items, list the current stock, and report all sales done during the day.

File format `stock.txt`:

```
190,apple,900  
30,orange,1300
```

Main menu:

What would you like to do:

- S) Sell item
- P) Print stock
- R) Report sales
- E) Exit

Enter your choice>



If possible, we test each function after writing it. In the Wing IDE, pressing **Run** executes your current file. You can then use the functions inside the file from the Python shell. (From the command line, use `python -i script.py`)

Testing `load_stock("stock.txt")`:

```
>>> load_stock("stock.txt")
[(190, 'apple', 900), (30, 'orange', 1300),
(13, 'pineapple', 5500), (60, 'carrot', 600),
(30, 'cucumber', 900), (20, 'egg plant', 1100),
(10, 'zucchini', 1300), (70, 'garlic', 300)]
```



We can test code before having written all the functions called:

```
def main():  
    stock = load_stock(stock_file_name)  
    sales = []  
    while True:  
        s = show_menu()  
        if s == 'e':  
            break  
        elif s == 's':  
            sell(stock, sales)  
        elif s == 'p':  
            print_stock(stock)  
        elif s == 'r':  
            print_sales(sales)
```

need these functions to test

needed only when selected