

PFTWeek 9/14-9/18

- **Incremental construction as design pattern**
 - Build programs: start small, add with confidence
 - Build new strings: append/concatenate values
 - Also use join to create a string from a list
 - Build lists: append values, alter existing values
 - Also use .split() to create list from a string
- **Compsci 101 specifics: Python -> Course**
 - APT Quiz and ensuring you do well

Software Dreams

- **Translating ideas into (Python) code**
 - Create interesting "heads", "totem poles" ?
 - Create software for face recognition? Gait?
 - Create "five four" from "four five"?
 - Create "SCUBA" from "self contained underwater breathing apparatus"
- **Master the syntax of the language?**
 - Organization of program constructs
 - Knowledge of libraries
 - Practice and experience!

Top 10 list for surviving in CompSci 101

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- 10 - Ask Questions
- 9 - Eat lots of pizza
- 8 - Learn how to spell Rodger/Astrachan
- 7 - Read the online textbook
- 6 - Do the reading quizzes
- 5 - Check Piazza every dat
- 4 - Visit your professors in their office hours
- 3 - Learn how to debug your programs
- 2 - Seek help (one hour rule!)
- 1 - Start programming assignments early!

Why is this person so important to this course?



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Why is this person so important to this course?



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- Brad Miller
- Have you donated yet?

Translating Ideas Into Code

<http://bit.ly/101fall15-0910-2>

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Incremental + : numbers and strings

- Wtht vwls cn y stll rd ths sntnc?
 - Create a no-vowel version of word
 - Examine each character, if it's not a vowel ...
 - Pattern of building a string

```
def noVowels(word):  
    ret = ""  
    for ch in word:  
        if not is_vowel(ch):  
            ret = ret + ch  
    return ret
```

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Counting vowels in a string

- Accumulating a count in an int is similar to accumulating characters in a string

```
def vowelCount(word):
    value = 0
    for ch in word:
        if is_vowel(ch):
            value = value + 1
    return value
```

- Alternative version of adding: `value += 1`

From high- to low-level Python

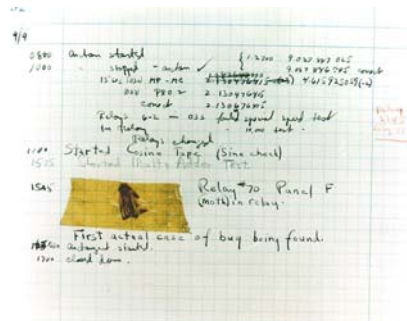
```
def reverse(s):
    r = ""
    for ch in s:
        r = ch + r
    return r
```

7	0	LOAD_CONST	1 ('')
	3	STORE_FAST	1 (r)
8	6	SETUP_LOOP	24 (to 33)
9	9	LOAD_FAST	0 (s)
	12	GET_ITER	
>>	13	FOR_ITER	16 (to 32)
	16	STORE_FAST	2 (ch)
9	19	LOAD_FAST	2 (ch)
	22	LOAD_FAST	1 (r)
	25	BINARY_ADD	
	26	STORE_FAST	1 (r)
	29	JUMP_ABSOLUTE	13
>>	32	POP_BLOCK	
10 >>	33	LOAD_FAST	1 (r)
	36	RETURN_VALUE	

- Create version on the right using disassembler
`dis.dis(code.py)`

Bug and Debug

- software 'bug'
- Start small
 - Easier to cope
- Judicious 'print'
 - Debugger too



- Verify the approach being taken, test small, test frequently
 - How do you 'prove' your code works?

Anatomy of a Python String

- String is a sequence of characters
 - Functions apply to sequences: `len`, `slice [:]`, `sorted`,
 - Methods applied to strings, specific to strings: `st.split()`, `st.startswith()`, `st.strip()`, `st.lower()`, `st.find()`, `st.count()`, `st.join()`
- Strings are *immutable* sequences
 - Cannot change a string, can only create new one
 - What does upper do?
 - See resources for functions/methods on strings
- *Iterable*: Can loop over it, *Indexable*: can slice it



Anatomy of a Python List

- Lists are indexable
 - Start with index 0, index with [int], slice too
 - Indexing past end?
- Lists are iterable: `for x in [1,2,3]:`
 - Confusing boolean use, `if 3 in [1,2,3]:`
- Lists are mutable
 - Change: `lst[0] = 5`, can append, can extend
- Lists are heterogenous, can store any type of element, including lists!
- Methods `.count()`, `.append()`, `.index()`, `.sort()`

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Lynn Conway

See Wikipedia and lynnconway.com

- Joined Xerox Parc in 1973
 - Revolutionized VLSI design with Carver Mead
- Joined U. Michigan 1985
 - Professor and Dean, retired '98
- NAE '89, IEEE Pioneer '09
- Helped invent dynamic scheduling early '60s IBM
- Transgender, fired in '68



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Standard accumulation idiom

```
def wcount(collection, word):
    total = 0
    for elt in collection:
        if elt == word:
            total = total + 1
    return total
```

- How do we count 'scarlet' in *Scarlet Letter*?
 - Or dagger in *Hamlet* or *Romeo*?
 - Or friend in *Little Brother*?
 - Or CGAT in a genome?

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If we knew all Python's built ins, ...

- Suppose we want to (what are types and values)

```
f = open("/data/kjv10.txt")
st = f.read()
words = st.split()
angels = wcount(words, "angel")
# can use Python built in too
devils = words.count("devil")
```

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Accumulation revisited

```
def getFirsts(collection, letter):  
    total = []  
    for elt in collection:  
        if elt.startswith(letter):  
            total.append(elt)  
    return total
```

- Finding words that start with 't', The Bible?
 - Or words that start with 'U' in *The Illiad*?

Work Together on Expression Review

<http://bit.ly/101fall15-0915-1>