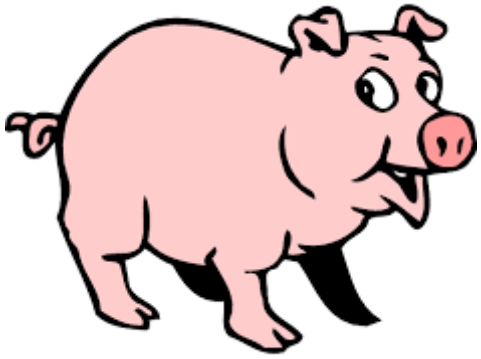
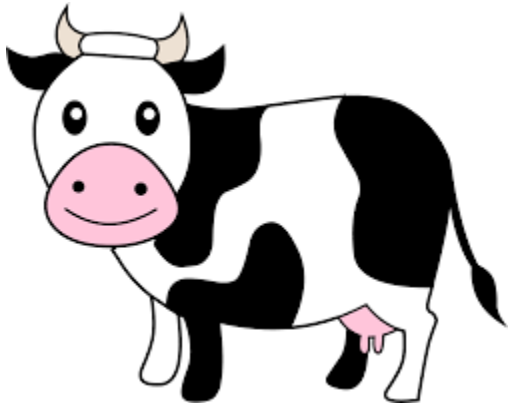
CompSci 101
Introduction to Computer Science

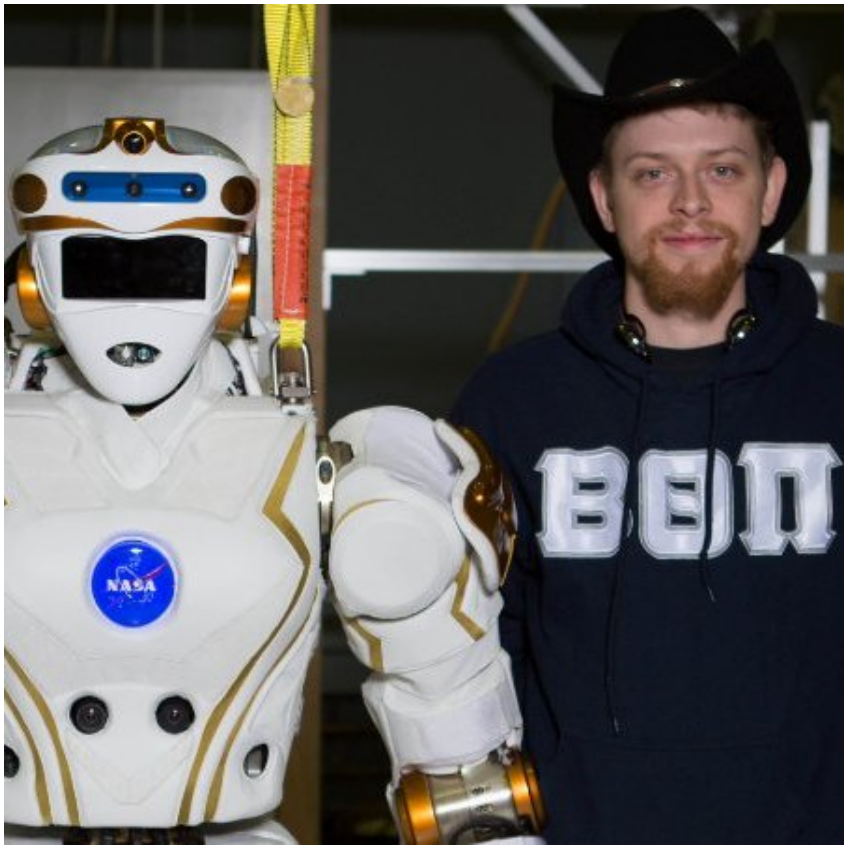




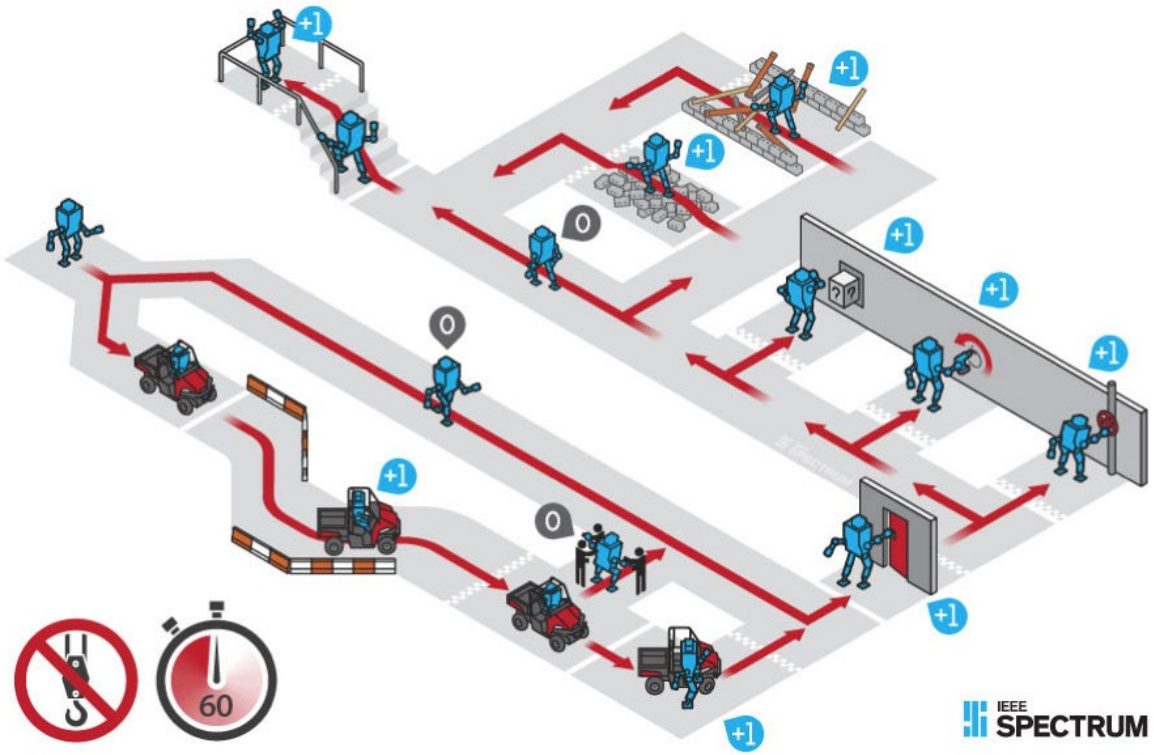
Sept 8, 2016

Prof. Rodger
(lecture by Barrett Ames)

Whose this guy?



What do I do?



Announcements

- Reading and RQ 4 due next time
- Asgn 2 out, APT 1 is due Tuesday
- Lab 2 this week
- To add class or change sections – see:
  - www.cs.duke.edu/courses/compsci101/fall16
- Today
  - more APT practice
  - functions, parameters
  - Names, types and values

Python Functions

- Answer these questions based on thinking, don't run any code
  - http://bit.ly/101f16-0906-3
- Why do we need functions?
  - Manage complexity of large programs
  - Test and develop code independently
  - Reuse code in new contexts: create APIs!

Functions return values

- Most functions return values
  - Sometimes used to make things simpler, but returning values is a good idea

```
def inch2centi(inches):
    return 2.54*inches

xh = inch2centi(72)
```

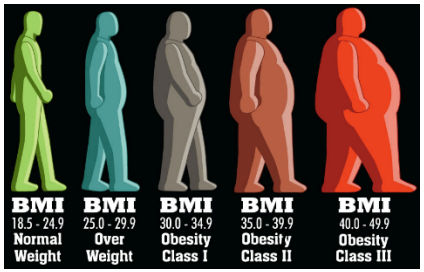
```
def pluralize(word):
    return word + "es"

pf = pluralize("fish")
```

What is an APT? BMI APT

- Automated/Algorithmic Problem Testing
  - Write one function, 2-30 lines, solve a problem
  - Tested automagically in Eclipse or the browser
  - Lots of test cases – test test test

- Start simple, build toward more complex
  - What is a function? A function call?
  - What is a parameter? Argument?
  - How do you run/execute a program



Demo Solving APT BMI

- Write your code in Eclipse
  - Create python file
  - Name of file important – case matters
  - name of function important – cut and paste this
  - Write your code
  - Test a few examples in Eclipse
- Run online on using APT Tester
  - Tests on lots of examples, Debug, fix
  - Get all GREEN – Green dance!
- Submit on APT page
  - README form too

Function Detective

- http://bit.ly/101sp16-0126-1

Results of Code Analysis

- For details on plurals: http://bit.ly/1N49u6b
- How did we call `pluralize` many times?
  - Loop. What is an alternative?
- What does the 'if' statement do?
  - Selects a code block to execute (more next week)
- If you have a question? Write and run code!

Organization matters

- https://www.youtube.com/watch?v=1ve57l3c19g

APT organization, Code organization

- You've written the BMI.py APT
  - Where is that module? How do you test it?
  - PyDev console, but then must import it
  - Adding print statements in BMI.py to test
- Putting sentences together in order…
  - "Once upon a time…" "It was the best of times…" "Aujord'hui ma maman est morte"
- Putting code together in order
  - Takes judgment and experience

Python – Names and Types

- Names vs abstractions
  - What is http://152.3.140.1
  - What is http://www.amazon.com
- Types are important
  - What is foo.pdf, foo.mp4, foo.jpg, foo.wav
  - Do the file extensions guarantee file type?
- Python – what types are these?

```
first = "Susan"
x = 6
y = 3.4
```

Strings

- Sequence of characters in quotes

```
"I" + 'Love' +  '''Python'''
"I"    'Love'    '''Python'''
```

- String operators: concatenation (+), repeat(*)
- Precedence?

```
"a" + "b" + "c" * 3
```

- Precedence?

```
"a" + "b" "c" * 3
'abcbcbc'
```

Strings

- Sequence of characters in quotes (same result)

```
"I" + 'Love' +  '''Python'''
"I"    'Love'    '''Python'''
'ILovePython'
```

- String operators: concatenation (+), repeat(*)
- Precedence?

```
"a" + "b" + "c" * 3
'abccc'
```

- Precedence?

```
"a" + "b" "c" * 3
'abcbcbc'
```

Function

- def functionName(parameters):

  block of code

- Parameters – place holder, will store value passed in
- Arguments – values in the call, that you pass to the function to use as input

Function – return or print?

- Example function that returns a value

```
def sum(a, b):
    return a+b
```

- Example function that prints

```
def hw(name):
    print "Hello " + name
```

- Call Functions

```
print sum(4,7)
answer = sum(4,7)
hw("Sue")
```

```
sum(4,7)
print hw("a")
```

Function – return or print?

- Example function that returns a value

```
def sum(a, b):
    return a+b
```

- Example function that prints

```
def hw(name):
    print "Hello " + name
```

- Call Functions

```
print sum(4,7)
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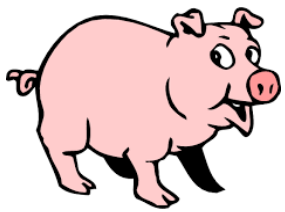
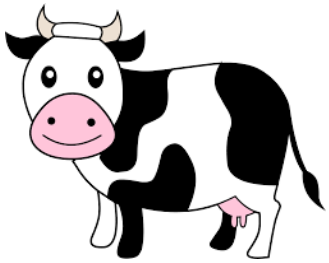
```
sum(4,7)
print hw("a")
```

Old MacDonald Song

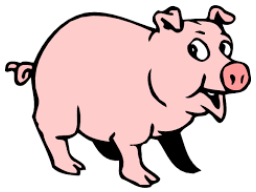


```
Old MacDonald had a farm, E-I-E-I-O
And on his farm he had a pig, E-I-E-I-O
With a Oink Oink here, and a Oink Oink there
Here a Oink, there a Oink everywhere a Oink Oink
Old MacDonald had a farm E-I-E-I-O
```



```
Old MacDonald had a farm, E-I-E-I-O
And on his farm he had a cow, E-I-E-I-O
With a Moo Moo here, and a Moo Moo there
Here a Moo, there a Moo everywhere a Moo Moo
Old MacDonald had a farm E-I-E-I-O
```

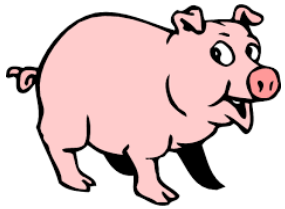
- Write a Program to print this song



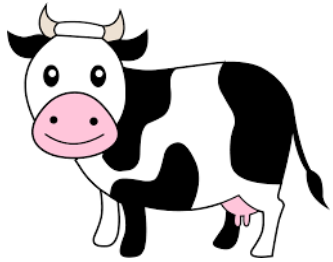
Function OldMacPig()

```
def OldMacPig():
    print "Old MacDonald had a farm,",
    print "E-I-E-I-O"
    print "And on his farm he had a pig,",
    print "E-I-E-I-O"
    print "With a Oink Oink here,",
    print "and a Oink Oink there"
    print "Here a Oink, there a Oink",
    print "everywhere a Oink Oink"
    print "Old MacDonald had a farm",
    print "E-I-E-I-O"
```

Rest of Code



- Function OldMacCow
  - Replace “pig” with “cow”
  - Replace “Oink” with “Moo”
- Code to start:



```
if __name__ == '__main__':
    OldMacPig()
    print
    OldMacCow()
```

Discuss how to make code better bit.ly/101sp16-0126-1a

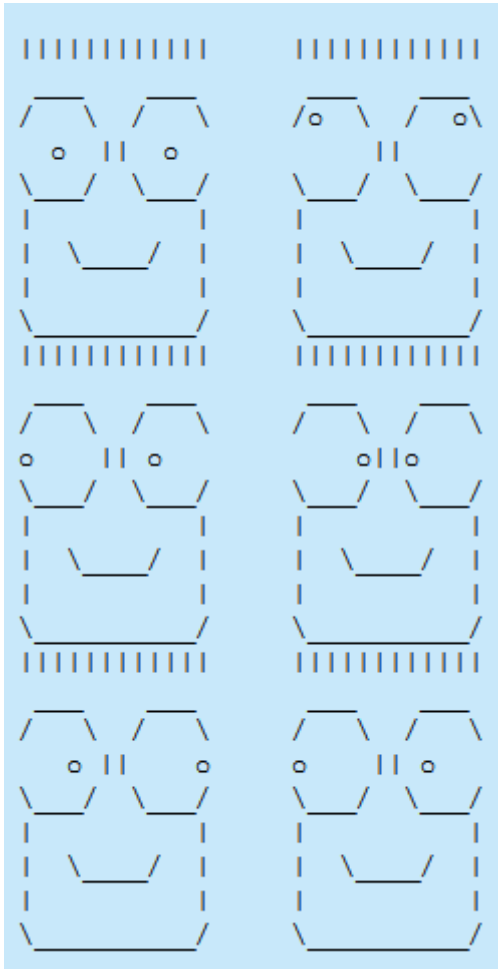
- Describe in words how you can make the code better? More efficient?
  - Fewer lines of code?
  - Use more functions?
  - Discuss your changes.
- What advantages do the changes you make have?

Demo – Old Mac improvements

- What does the horse say?
- What does the cow say?
- What does the fox say?

Assignment 2 out

- Totem poles
  - printing heads
  - functions



Names, Types and Values

- bit.ly/101sp16-0126-2