Loops

CS 1111
Introduction to Programming

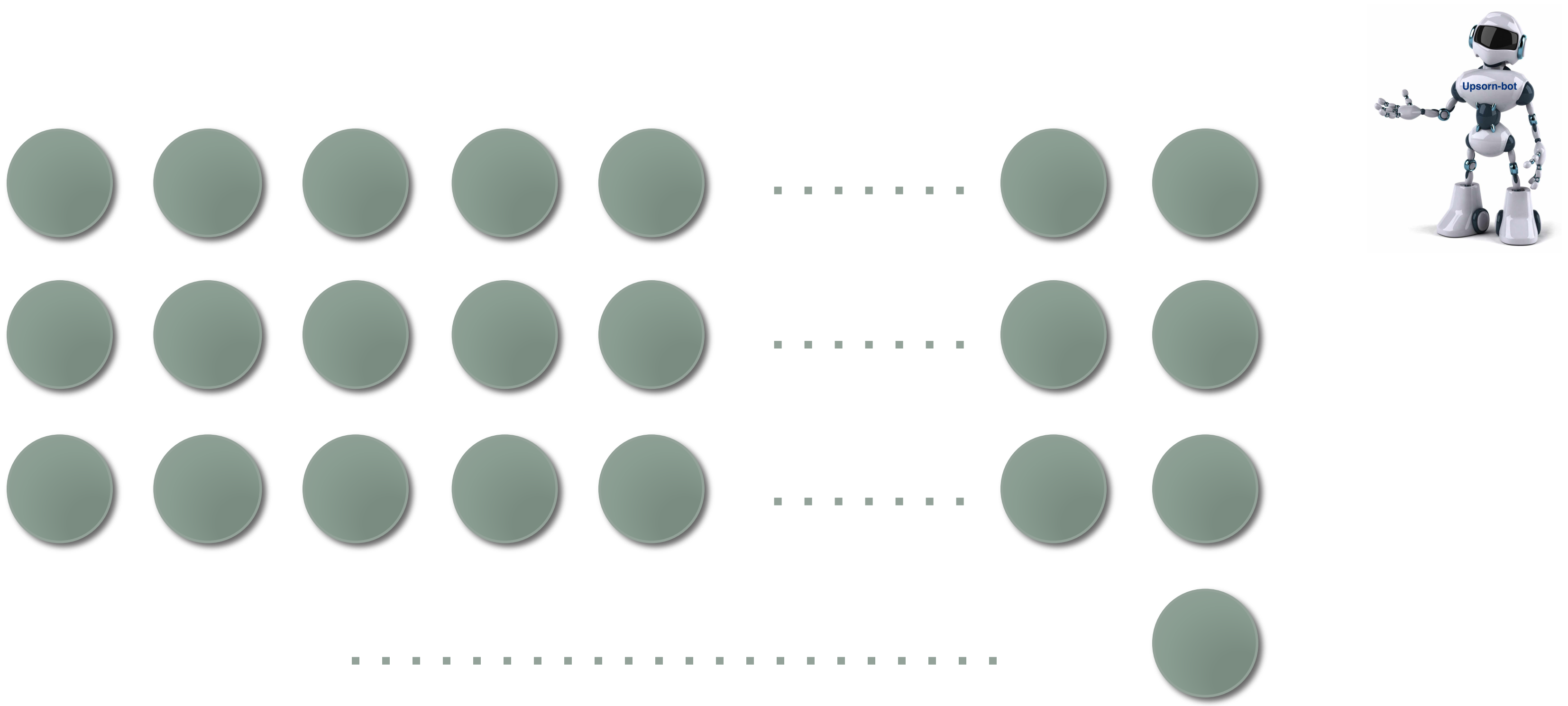
Spring 2019

[*The Coder's Apprentice*, §7]

Walking and Shaking – if

Given a list of Python experts in this room

Upsorn-bot wants to shake hands the Python experts who wear glasses



“Repeated” Process – if

Walking and shaking

Given a list of Python experts in this room

Write code that print **“shake”** if an expert wears glasses and print **“no”** if an expert does not wear glasses

100 experts = 100 if-else blocks ??

```
if expert_1 == "wear":
        print("shake")
else:
        print("no")
```

```
if expert_2 == "wear":
        print("shake")
else:
        print("no")
```

…

```
if expert_n == "wear":
        print("shake")
else:
        print("no")
```

Looping

- What is looping?
  - The process of doing something in the same order again and again
- Why do we do looping?
  - To automated some repeated processes
  - To shorten the code, less time/effort, less chance of errors
  - To make code more readable and maintainable
  - To save memory as few instances are created
- When should we do looping?
- How do we write loops?

Loops in Python

- **while** loop – a condition-controlled loop
- **for** loop using the **in** operator with a list

Today's focus

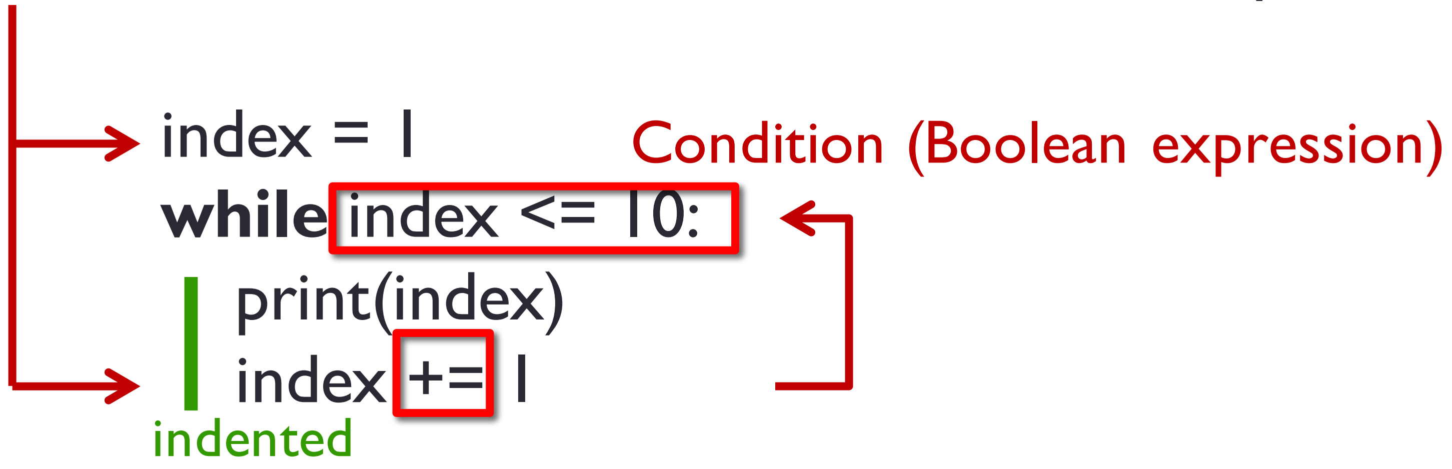
- **for** loop using the **range** operator – a count-controlled loop
- Nested loops

While Loop

while <*condition*>:

  <*statements*>

  <*handler*> to break the condition such that the loop terminates



```
index = 1
while index <= 10:
    print(index)
    index += 1
```

Try: tracing through code with http://www.pythontutor.com/visualize.html#mode=edit

Practice

Write a program, using a while loop, that prints the numbers 1, 2, 3, ..., 10

Write a program, using a while loop, that prints the numbers 10, 8, 6, 4, 2 (exactly this order)

While Loop (2)

```
while input("Do you want to continue (Y/N) ? ") == "Y":
    print("let's continue")
```

```
→ done = ""
  while done != "quit":
      print("let's continue -- not done yet")
→     done = input("Continue ? (type quit to quit) ")
```

Practice

Imagine you are writing a program to mimic the Simpson kids in the Simpsons' ride scenario

Write a program, using a while loop, that repeatedly asks **"Are we there yet?"** until the answer is **"yes"** the program then prints **"Yay!!"**

While Loop (3)

```
cnt = 1
while infinite > -1:
    print(cnt)
    cnt += 1
```

Variable not found !!

While Loop (4)

```
→ cnt = 1
  while cnt > -1:
      print(cnt)
→     cnt += 1
```

```
1
2
3
4
5
6
7
8
...
```

Infinite loop !!

```
→ cnt = 1
  while True:
      print(cnt)
→     cnt += 1
```

```
1
2
3
4
5
6
7
8
...
```

Infinite loop !!

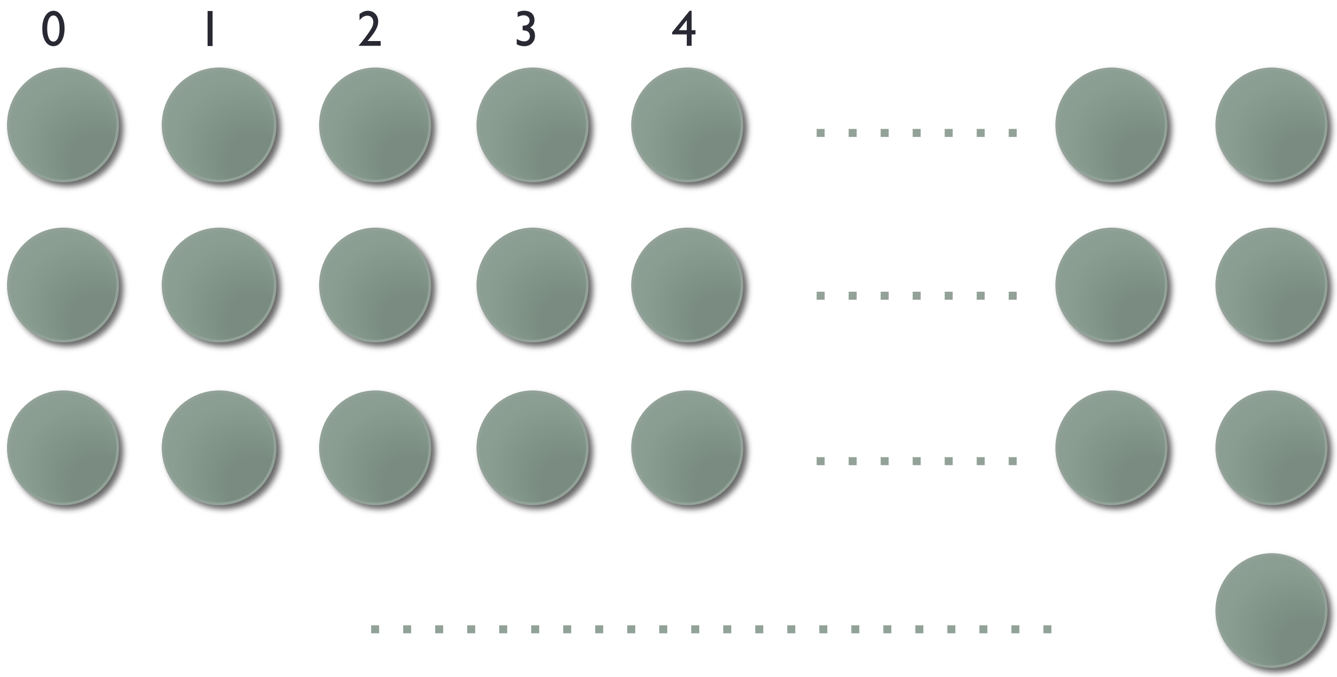
While Loop (5)

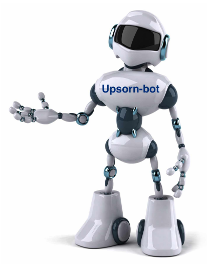
```
list_of_colors = [“green”, “blue”, “red”, “yellow”]

index = 0
while index < len(list_of_colors):
    print(list_of_colors[index])
    index += 1
```

Back to Walking and Shaking

Given a list of Python experts in this room

Upsorn-bot wants to shake hands the Python experts who wear glasses





"Repeated" Process – while loop

Walking and shaking

Given a list of Python experts in this room

Write code that

print **"shake"** if an expert wears glasses and

print **"no"** if an expert does not wear glasses

```
while   # there are more experts
        # if an expert wears glasses
        #     print "shake"
        # otherwise
        #     print "no"
```

```
ctr = 0
while ctr < len(experts):
    expert = experts[ctr]
    if expert == "wear":
        print("shake")
    else:
        print("no")
    ctr += 1
```

experts = ["wear", "no", "no", "wear", "wear", "no"]

Common mistake: infinite loop

```
experts = ["wear", "no", "no", "wear", "wear", "no"]

    ctr = 0
    while ctr < len(experts):
        if experts[ctr] == "wear":
            print("shake")
        else:
            print("no")
        # ctr = ctr + 1
```

```
shake     shake     shake     shake     ...
```

Common mistake: index out of range

```
experts = ["wear", "no", "no", "wear", "wear", "no"]

    ctr = 0
    while ctr >= 0:
        if experts[ctr] == "wear":
            print("shake")
        else:
            print("no")
        ctr = ctr + 1
```

```
shake    no    no    shake    shake    no    Index out of range
```

Practice

Write a function, using a **while** loop,
that takes a list of animals and a list of sounds.

Use the given animals and sounds and
print the "**Old MacDonald had a farm**" song

You may assume that the sizes of both lists are the same
(that is, the number of animals and
sounds given are the same)

For Loop (using in operator)

for <*iterate_var*> **in** <*collection*>:

    <*statements*>

```
animals = ['dog', 'cat', fish']
for animal in animals:
    print('Current animal :', animal)
```

```
for letter in 'Python':
    print('Current Letter :', letter)
```

Example: for Loop (using in operator)

Walking and shaking

Given a list of Python experts in this room

```
for    # expert in list of experts
       # if an expert wears glasses
       #     print "shake"
       # otherwise
       #     print "no"
```

Write code that

print **"shake"** if an expert wears glasses and

print **"no"** if an expert does not wear glasses

```
for expert in experts:
    if expert == "wear":
        print("shake")
    else:
        print("no")
```

```
experts = ["wear", "no", "no", "wear", "wear", "no"]
```

Practice

Write a function, using a **for** loop, that takes a list of what-to-do.

Use the given what-to-do and print the "**If you're happy and you know it**" song