Building Brains 2

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Review

• Functions
  – Used to sequence commands
  – Used to do a well-defined computation
    • Function composition

• Building Brains
  – Use functions to sequence robot movements
  – Use “for VARIABLE in SEQUENCE:”
    • Do something N times
    • Do something to each item in a sequence
Function to Sequence Commands

def refrain(timing):
    """ Function that plays the refrain """
    beep(timing, c2)
    beep(timing, a)
    beep(timing, fSharp)
    beep(timing, aSharp)

refrain(.5)
def refrain(timing):
    ''' Function that plays the refrain '''
    beep(timing, c2)
    beep(timing, a)
    beep(timing, fSharp)
    beep(timing, aSharp)

refrain(.5)
def refrain(timing):
    beep(timing, c2)
    beep(timing, a)
    beep(timing, fSharp)
    beep(timing, aSharp)

refrain(.5)
def celsius(F):
    ''' Converts Fahrenheit to Celsius '''
    return ((F – 32) / 9.0) * 5

celsius(72)
def celsius(F):
    ''' Converts Fahrenheit to Celsius '''
    return ((F – 32) / 9.0) * 5

celsius(72)
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Building Brains

def yoyo():
    forward(1, 2)
    turnLeft(1, .7)
def yoyo():
    forward(1, 2)
    turnLeft(1, .7)

yoyo()
yoyo()
yoyo()
yoyo()
yoyo()
def yoyo():
    forward(1, 2)
    turnLeft(1, .7)

for i in range(4):
    yoyo()
Python's `for` command

```python
for VARIABLE in SEQUENCE:
    COMMAND
    COMMAND
    ...
```
Python's `for` command

```python
for letter in "Hello":
    print letter
```

```
h
e
l
l
o
```
Python's `for` command

```python
for letter in "Hello":
    print letter

for i in range(4):
    print i
```
Python's `for` command

```python
for i in range(4):
    print i
```

0
1
2
3
What is range(4)?
What is range(4)?

>>> range(4)

[0, 1, 2, 3]
What is `range(4)`?

```python
>>> range(4)
[0, 1, 2, 3]
```
What is range(4)?

```python
>>> range(4)
[0, 1, 2, 3]
```

New type: List
For Command

• Used for doing things N times (where N is the argument to range)

• Used for doing something to each item in the sequence

for i in range(23):
    dance()

for i in [2, 3, 6, 8]:
    beep(.5, 440 * i)

for i in range(8):
    beep(.5, 440 * i)
Review

- New type: “list”
- Lists and strings are both “sequences”
- New command: “for”
  - Used for doing things $N$ times (where $N$ is the argument to `range`)
  - Used for doing something to each item in the sequence
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Building Brains 2

- What's missing from our robot control programs so far?
Building Brains 2

- What's missing from our robot control programs so far?

*Senses!*
Know your Robot: Senses
Reading Sensors

- **Light sensors**
  - `getLight(POSITION)`
  - `getBright(POSITION)`
  - POSITION is either “left”, “center”, “right”, 0, 1, 2

- **Infrared (IR) sensors**
  - `getIR(POSITION)` - “left”, “right”, 0, 1
  - `getObstacle(POSITION)` - “left”, “center”, “right”, 0, 1, 2

- POSITION can also be “all”
Building Brains 2

- Follow a maze
- Avoid obstacles
- Go to the light
- Run away from the light
Structure of a Robot Brain

- Read sensors
- Decide what to do
- Make Movement
- Repeat