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
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)

1. Indent commands
2. add a def name():
3. abstract common parts
4. add variables
5. add a return
6. add useful comments
7. “call” the function
8. test and debug!
Function to Sequence Commands

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

refrain(.5)
Function to Compute

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

    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)
What is range(4)?

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

```python
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
while True:
    left = getLight("left")
    right = getLight("right")
    if left < right:
        turnLeft(1, .4)
    else:
        turnRight(1, .4)