Getting Started with Python and Myro

Week #2

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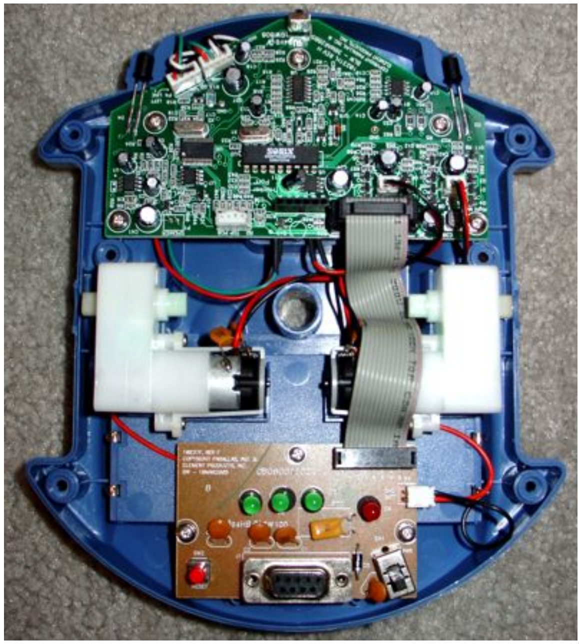
Scribbler

- Three Wheels – Big ones on either side are powered by motors
- Scribbler's movements are performed through the two motor-driven wheels



motors(LEFT, RIGHT)

motors(0.0, 1.0) – only right motor works

Which way does the robot move?

Speed of Myro

forward(SPEED)

backward(SPEED)

turnLeft(SPEED)

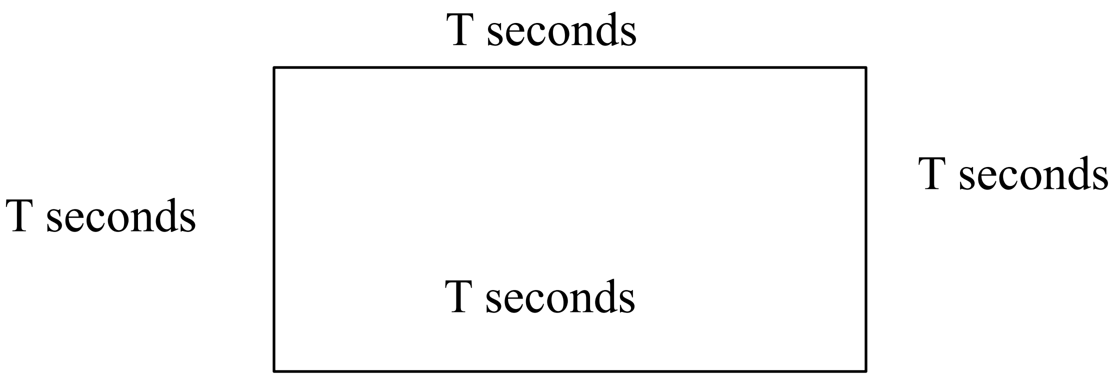
turnRight(SPEED)

stop()

turnLeft(1, .3)
forward(1, 1)

forward(SPEED, SECONDS)
backward(SPEED, SECONDS)
turnLeft(SPEED, SECONDS)
turnRight(SPEED, SECONDS)

Make your robot traverse in a rectangular path
Try making the robot traverse along the shorter two paths in the same time as the longer two paths (sides) of the rectangle



T seconds

T seconds

T seconds

T seconds

New Commands

- Making a robot carry out more complex behaviors requires several series of commands
- Packaging a series of commands into a brand new command called a *function*
- Yoyo()

```
>>>def yoyo():
        forward(1)
        backward(1)
        stop()
>>> yoyo()
```

- Issuing the new function like this one in Python is called, *invocation*

New *functions() - parameters*

```
def yoyo():
    forward(1)
    wait(1)
    backward(1)
    wait(1)
    stop()
```

The Robot will move forward for 1 second before applying the command that follows the wait

```
>>>def yoyo1(speed):
       forward(speed, 1)
       backward(speed, 1)
>>>yoyo1(0.5)
```

The Robot moves at half the speed

Try passing other parameters like *waitTime*
Pass multiple parameters: *yoyo3(0.5, 1.5)*

Saving Commands in Modules

- When you work with different functions of the Robot you may end up with large collection of new functions
- Wouldn't it be better to store them in files on your computer so that you can call them when you need?
- Typical robot programs have huge number of functions and it is easy to store them in a file and call them when needed

Writing and Saving to a File

```
from myro import *
init()
# Define the new functions
def yoyo(speed, waitTime):
    forward(speed)
    wait(waitTime)
    backward(speed)
    wait(waitTime)
    stop()
```

- Click file on IDLE GUI and open a new window
- # is used to enter comments (so that you remember what you did when you come back to your program)
- Enter your program as you would do in your Python IDLE GUI

Writing and Saving to a File

- A good programmer always comments his program well
- Once you are done writing your program click File > Save As and enter the file name you like say ‘moves’ with an extension ‘.py’ (*All Python modules end with the filename extension .py*)
- Make sure they are always saved in the same folder as the Start Python.pyw file

Accessing the Files

- You can use the file in two ways

  *>>> from moves import **

  # Try the commands we used before

  >>> yoyo(0.5,0.5)

- Accessing the commands defined in a module is similar to accessing the capabilities of the myro module

from <MODULE NAME> import <SOMETHING>

*When you replace <SOMETHING> with * you import everything*

Functions as Building Blocks

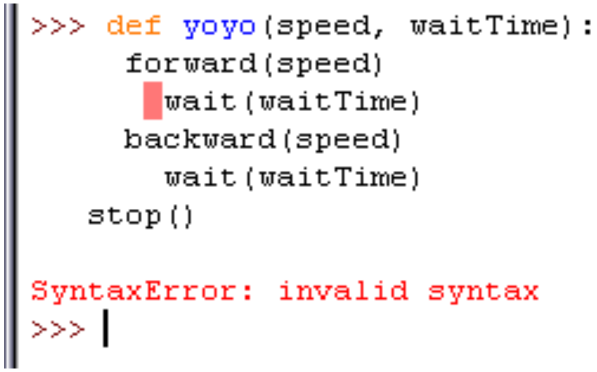
- The basic syntax for defining a Python function takes the form:

```
def <FUNCTION NAME>(<PARAMETERS>):
        <SOMETHING>
        ...
        <SOMETHING>
```

- To define a new function,
  - Start by using the word *def* followed by the name of the function (<FUNCTION NAME>) followed by <PARAMETERS> enclosed in parenthesis followed by a colon (:).
  - This line is followed by the commands that make up the function definition (<SOMETHING>...<SOMETHING>).

Syntax

- Each command is to be placed on a separate line, and all lines that make up the definition should be indented (aligned) the same amount
- The number of spaces in the indentation should be same



```
>>> def yoyo(speed, waitTime):
     forward(speed)
       wait(waitTime)
     backward(speed)
       wait(waitTime)
   stop()

SyntaxError: invalid syntax
>>> 
```

```
def yoyo(speed, waitTime):
          forward(speed); wait(waitTime)
          backward(speed); wait(waitTime)
          stop()
```

Commands on the same line can be entered separated by a semi-colon (;)

Syntax – Readability in Python

- The indentation helps better readability of your code (program)
- Python also has a color highlighting feature

  For example, the word def in a function definition appears in red, the name of your function, yoyo appears in blue
- Defining new functions using existing functions is very effective and is used by all computer programmers

By defining the function yoyo as a new function using the existing functions (forward, backward, wait, stop)) you have abstracted a new behavior for your robot

Sample Function using Functions

Try this:

```
>>> def dance():
        yoyo(0.5, 0.5)
        yoyo(0.5, 0.5)
        wiggle(0.5, 1)
        wiggle(0.5, 1)
>>> dance()
```

Summary

- Commands to make a Robot move in different ways

- Define new commands by defining new Python Functions

- Saving Functions in a File

- Importing from a File or Module

Try These

Compare the robot's movements in the commands turnLeft(1), turnRight(1) and rotate(1), rotate(-1).

Closely observe the robot's behavior and then also try the motor commands:

```
>>> motors(-0.5, 0.5)
>>> motors(0.5, -0.5)
>>> motors(0, 0.5)
>>> motors(0.5, 0)
```