ROBOTICS FROM SCRATCH

Review

Functions

- A function is a named block of code that performs a specific task.
- Functions help organize your programs and avoid repeated code.
- You give the function input, it does some work on it, and gives you an output.
- Vending machine

Defining and Calling a Function

- Defining

```
def greet():
    print(“Hello!”)
```

- Calling

```
greet()
```

Function Parameters

- You pass in a parameter
- Definition

```
def greet(name):
    print(“Hello” + name + “!")
```

- Calling

```
greet(“Bob”)
```

Return Values

- Often you will want to get a variable back from your function
- These are called return values
- Lets write a quick function to convert °F to °C

Temperature Conversion

```
# First define the function
def f2c(temp_f):
    temp_c = (temp_f – 32) * (5/9)
    return temp_c
# Now call it with some known temperatures to test
print( f2c(212) ) # 212°F is 100°C
print( f2c(32) )   # 32°F is 0°C
```

Libraries

- A library is a collection of useful code you can import and use.
- Things that other people have written so you don’t have to.
- Use the keyword import to bring them into your code
- Some commonly used libraries are math and time

Math Library

- Square root of 12,345 from scratch?
- Use the math library

```
import math
print(math.sqrt(12345))
```

- Many useful functions, just a few:
  - Square root math.sqrt(x)
  - Trig functions: math.sin(x), math.cos(x), math.tan(x)
  - Powers math.pow(x, y)
  - Angle conversions math.radians(x), math.degrees(x)

Time Library

- Keeping track of time is very important in robotics applications
- Use the time library
- Print something every second

```
import time
for i in range(0, 5):
    print(i)
    time.sleep(1)
```

- This type of code is called “blocking” code. While it is sleeping nothing else can happen. This can cause issues with robots. They often will need to check sensors while waiting for something.

Non-Blocking Code

```
import time

def check_sensor():
    print("Checking sensor")

target_time = time.time() + 5

while True: # Infinite loop
    if time.time() >= target_time:
        print("Time target reached")
        break
    else:
        check_sensor()
```

Libraries

- You can also import only certain parts of a library.
- If you know you are only using sqrt() from the math library you can:

```
from math import sqrt

print( sqrt(12345) ) # no ‘math.’ needed
```

Summary

- Functions allow you to reuse code easily
- Libraries make your life easier
- We will use a lot of libraries for the robotics portion of the class

Questions?

Future

- This is the end of the python basic portion of the class
- Next up: Electronics
- Soon, you will need a laptop that can program a Raspberry Pi Pico
- Windows, OSX, or Linux are best
- A chromebook *might* work.
- I will resend an email detailing how to possibly get it working.
- If you can beg, borrow, or ~~steal~~ another laptop that would be easiest.

*Don’t steal a laptop