ENGR 3421: Robotics I

Python Tutorial

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Outline

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Python Getting Started

```
Python 3.9.12 (main, Apr  5 2022, 06:56:58)

[GCC 7.5.0] :: Anaconda, Inc. on linux

Type "help", "copyright", "credits" or "license" for more information.

>>>
```

Python Shell/Interpreter

```
[username@hostname] $ ~ python
Python 3.9.12 (main, Apr  5 2022, 06:56:58)
[GCC 7.5.0] :: Anaconda, Inc. on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> print("Hello World!")
Hello World!
>>> 1+2
3
>>> 3-4
-1
>>> 5*6
30
>>> 7/8
0.875
>>> 3**3
27
>>> 64**(1/2)
8.0
```

Python Data Types

```
>>> type("Hello World")
<class 'str'>
>>> type(2)
<class 'int'>
>>> type(0.875)
<class 'float'>
>>> type([1, 2, 3])
<class 'list'>
>>> type({'name': 'leonardo', 'color': 'blue'})
<class 'dict'>
```

Python Variable

```
>>> v = 'Hello World!'
>>> print(v)
Hello World!
>>> var1 = 2
>>> var2 = 3
>>> sum = var1 + var2
>>> print(sum)
5
```

Python List & Dictionary

```
>>> brands = ['chevy', 'ford', 'toyota', 'vw']
>>> print(brands)
['chevy', 'ford', 'toyota', 'vw']
>>> print(brands[0])
chevy
>>> print(brands[1])
ford
>>> print(brands[3])
vw
>>> print(brands[4])
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
IndexError: list index out of range
>>> brands.pop(1)
'ford'
>>> print(brands)
['chevy', 'toyota', 'vw']
>>> brands.append('ford')
>>> print(brands)
['chevy', 'toyota', 'vw', 'ford']
>>> brands.append('dodge')
>>> print(brands)
['chevy', 'toyota', 'vw', 'ford', 'dodge']
```

```
>>> nums = {'odd': [1, 3, 5], 'even': [2, 4]}
>>> nums
{'odd': [1, 3, 5], 'even': [2, 4]}
>>> nums[0]
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
KeyError: 0
>>> nums['odd']
[1, 3, 5]
>>> del nums['odd']
>>> nums
{'even': [2, 4]}
>>> nums['prime'] = [2, 3, 5, 7]
>>> nums
{'even': [2, 4], 'prime': [2, 3, 5, 7]}
```

Python Script

```
"""
This is a simple example of python script.
Save this script and give it a name, e.g. example.py
To run this script, execute `python example.py` in terminal.
"""

print("Load data")
data = ['ford', 'f150', 20000]  # brand, model, investment
print(f"Brand: {data[0]}, Model: {data[1]}, Invest: {data[-1]}")
expect = data[2] * 1.5
print(f"Expected selling price: {expect}")  # display expected selling price
```

Python If Statement

```
age = input("Please enter your age: ")

if int(age) >= 65:
    print("You are free.")
elif int(age) >= 18:
    print("You have to work hard.")
elif int(age) >=0:
    print("Have fun.")
else:
    print("You are not a human being.")
```

Python While Loop

```
counter = 0

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

```
x = 0
y = 1

while True:
    z = x + y
    print(f"x={x}, y={y}, z={z}")
    # terminate loop if y is too big
    if z > 100:
        break
    # update x, y
    x = y
    y = z
```

Python For Loop

```
counter = 0

for _ in range(10):
    print(counter)
    counter += 1
```

```
x = 0

for i in range(10):
    x += i
    y = x - i * 5
    z = x + y
    print(f"x={x}, y={y}, z={z}")
```

Python Function

```python
def add_funtion(num1, num2):
    sum = num1 + num2
    return sum

x, y = 9, 16
z = add_funtion(x, y)
print(f"{x}+{y}={z}")
```

```python
def fibonacci(n):
    """
    This function calculates Fibonacci Series
    Args:
        n, index
    Returns:
        y, value
    """

    x = 0
    y = 1
    if n < 0:  # check n less than 0
        print("Incorrect input")
    elif n == 0:  # check n equal to 0
        return 0
    elif n == 1:  # check n equal to 1
        return y
    else:
        for _ in range(n-1):
            z = x + y
            x = y
            y = z
        return y

print(fibonacci(9))
```

Python Libraries

```
from gpiozero import LED
from time import sleep

led = LED(17)

while True:
    led.on()
    sleep(1)
    led.off()
    sleep(1)
```