

Principles of Measurement & Instrumentation I

Laboratory

PHYS417

Laboratory Report

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Experiment 3- Data Acquisition

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Question 1: In Python, what do these functions do:

split()- Splits the string into a list.

encode()- With a specified encoding method, encodes the string.

decode()- Opposite of encode. It returns the original string.

len()- It shows us the number of characters in string.

min()- It shows the lowest number.

max()- It shows the biggest number

sorted()- It sorts a list for ordering alphabetically or numerically.

sum()- It sums all values in a tuple.

type()- It shows the type of the objects. (string, integer, etc.)

strip()-It removes the spaces at the begin and end of the values.

count()- It counts specified value.

clear()- It removes the all specified values from a list.

range()-It creates a range 0 to specified value.

map()- It does specified function for each object.

str()- It converts characters into string.

int()- It converts characters into integer.

repr()- It shows the object readable.

index()-It shows the position of the specified value.

find()- It finds the number and shows its position.

enumerate()- It enumerate the objects.

next()- It shows the next value of specified value.

open()- It opens a file and shows it as a file object.

round(x,y)- It rounds x to only y decimals.

Question2. In the python pyserial package, explain the purpose of the following functions:

write()- Writer the specified thing to the file.

open()-Opens the specified file and shows it as a file object.

close()- Closes the specified file.

read()- Shows whats inside the specified file.

readline()- Shows specified line from the specified file.

flushInput()- Removes data from the Input buffer.

flushOutput()- Removes data from the Output buffer.

inWaiting()- It returns the number of bytes from the buffer.

And define the following parameters:

port- It sets or shows the port number of URL.

baudrate –It is a rate of transformation of information.

bytesize – It is a size of one byte.

Parity - It means whether it contains even or odd numbers of 1-bits.

Question3. In the python pyvisa package, explain the purpose of the following functions

get_instruments_list() – Shows all instruments of a list to the local VISA system.

instrument()- Shows specified instrument.

ask()- Sends and takes, the message as a string to the instrument

write()- Writes the message to the instrument as a string.

trigger()- Sends the trigger signal to the instrument.

read_raw()- Shows the pure message which send to a computer by instrument.

read()- Shows the message which is sent to the computer by the instrument as a string.

clear()- Resets the device.

query_values()- Questions the specified values.

And define what these messages mean:

*IDN- Shows the instrument's identification as a string.

CURV- Creates and manipulates continuous variables.

*RST- Resets the instrument to factory settings.

Question4. In the python struct package, what is the result of using unpack() function?

Unpack, turns the packed value into its original representative form in a tuple.

```
C:\Users\Wilkins Inc\OneDrive\Desktop>python unpack.py
b'\x19\x00\x00\x00\x02\x00\x00\x00#\x00\x00\x00'
(25, 2, 35)

C:\Users\Wilkins Inc\OneDrive\Desktop>
```

Figure1.Example of `unpack()`

Question5. In the python NumPy package, explain the purpose of the following functions:

array()- It creates an array.

arange(x)- It creates a numpy array from 0 to x elements.

linspace(a,b,x)- It creates an equally divided interval a to b with x elements

append()- It adds specified value to the end of the list.

indices()- It gives the position of the specified value where it appears firstly.

shape()- It gives shape to array as in the example. I.e shape(3,1) makes [1,2,3] into [[1][2][3]] or (2,3) for [1,2,3,4,5,6] to [[1,2,3][4,5,6]] 2x3 matrix

reshape()- It gives a new shape but it doesn't change the original data.

split()- It splits an array into multiple arrays.

delete()- It deletes specified row or column from the array.

BONUS

```
import numpy as np
```

```
import matplotlib.pyplot as plt
```

```
x=[]
```

```
y=[]
```

```
for i in np.arange(0,2*np.pi,2*np.pi/1000):  
    x.append(i)  
    y.append(np.sin(i))  
plt.plot(x,y,'b-',linewidth=2)  
plt.grid(True)  
plt.axis([0,2*np.pi,-1.5,1.5])  
plt.title('My Sine Wave')  
plt.xlabel('Time in Seconds')  
plt.ylabel('Sin(t)')  
plt.show()
```

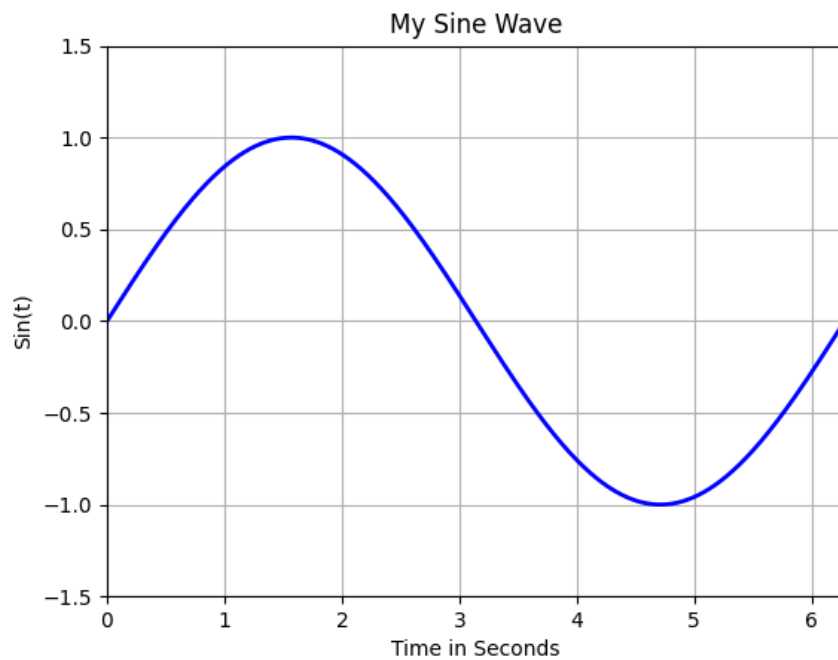


Figure2. First Code Sine Wave

```
import numpy as np  
import matplotlib.pyplot as plt
```

```

x=np.linspace(0,2*np.pi,50)
y=np.sin(x)
z=np.cos(x)

plt.plot(x,y,'b-d',linewidth=2, label='sinx')
plt.plot(x,z,'r-o',linewidth=2, label='cosx')

plt.grid(True)

plt.axis([0,2*np.pi,-1.5,1.5])

plt.title('My Sin and Cos Waves')

plt.xlabel('Time in Seconds')

plt.ylabel('Mywaves')

plt.legend()

plt.show()

```

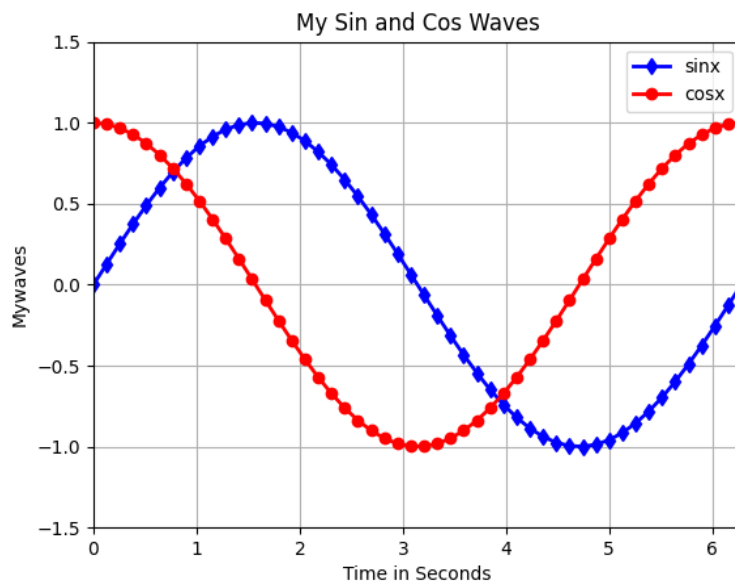


Figure3. Second Code Sine and Cosine Waves

```
import visa
```

```

import numpy as np

import pylab

from struct import unpack

rm = visa.ResourceManager()

print(rm.list_resources())

inst = rm.open_resource('USB0::0x0699::0x0368::C027317::INSTR')

print(inst.query("*IDN?"))


inst.write('Data:SOU CH1')

inst.write('DATA:WIDTH 1')

inst.write('DATA:ENC RPB')

ymult = float(inst.ask('WFMPRE:YMULT?'))

yzero = float(inst.ask('WFMPRE:YZERO?'))

yoff = float(inst.ask('WFMPRE:YOFF?'))

xincr = float(inst.ask('WFMPRE:XINCR?'))


inst.write('CURVE?')

data= inst.read_raw()

headerlen = 2+int(data[1])

header = data[:headerlen]

ADC_wave = data[headerlen:-1]

ADC_wave=np.array(unpack('%sB' % len(ADC_wave),ADC_wave))

Volts = (ADC_wave - yoff)* ymult + yzero

```



```
Time = np.arange(0, xincr* len(Volts),xincr)
```

```
pylab.plot(Time,Volts)
```

```
pylab.show()
```

```
#Couldn't make it open.
```

REFERENCES

[Python Strings encode\(\) method - GeeksforGeeks](#)

[Frequently asked questions — PyVISA 1.8 documentation](#)

[Installation — PyVISA 1.8 documentation](#)