Questions for Lecture 1

Lei Yin

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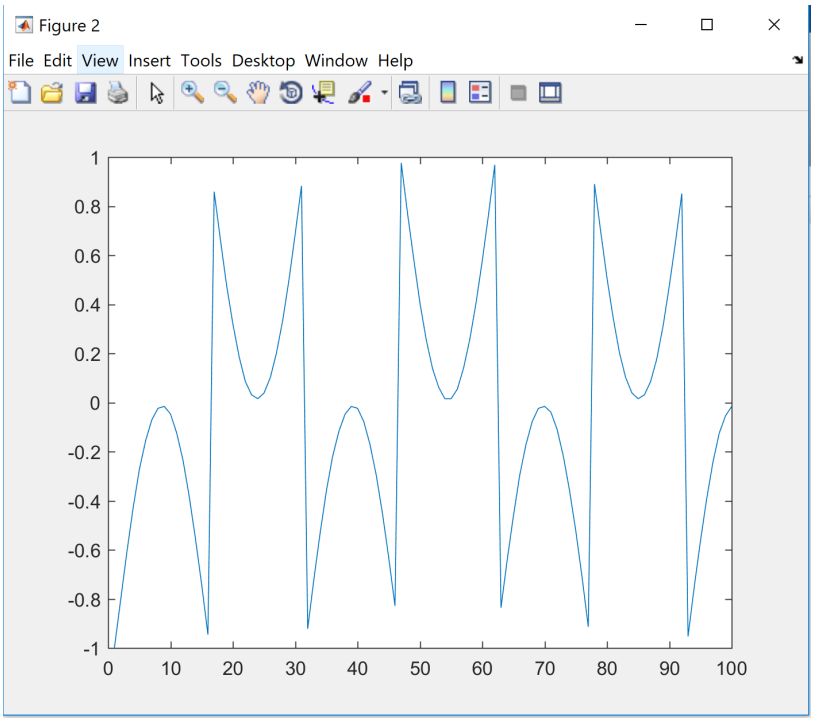
1 Generate 8 bits sinusoidal signal

1.1 Wrong python code

```
from struct import pack
from math import sin, pi
import wave

Fs = 8000

# Write a mono wave file

wf = wave.open('sin_8bits_mono.wav', 'w')
wf.setnchannels(1)
wf.setsampwidth(1)
wf.setframerate(Fs)
A = 2**7 - 1.0
f = 261.6
N = int(0.5*Fs)
for n in range(0, N):
        x = A * sin(2*pi*f/Fs*n)
        byte_string = pack('b', int(x))
        # 'h' stands for 'short integer' (8 bits)
        wf.writeframes(byte_string)
wf.close()
```

1.2 Matlab demo the signal

```
[x,fs] = audioread('sin_8bits_mono.wav');
figure;plot(x(1:100))
```



1.3 Reasons

```
help audioread
```

```
File Format      BitsPerSample  Data Type of Y     Data Range of Y
-------------------------------------------------------------------------
WAVE (.wav)            8            uint8              0 <= Y <= 255
                      16            int16         -32768 <= Y <= 32767
                      24            int32          -2^32 <= Y <= 2^32-1
                      32            int32          -2^32 <= Y <= 2^32-1
                      32            single          -1.0 <= Y <= +1.0
-------------------------------------------------------------------------
FLAC (.flac)           8            uint8              0 <= Y <= 255
                      16            int16         -32768 <= Y <= 32767
                      24            int32          -2^32 <= Y <= 2^32-1
-------------------------------------------------------------------------
MP3 (.mp3)             N/A          single          -1.0 <= Y <= +1.0
MPEG-4(.m4a,.mp4)
OGG (.ogg)
-------------------------------------------------------------------------
```

The data type for WAVE file contain uint8 (Unsigned integer 8 bits), not the signed integer 8 bits. The way to solve this problem is to generate a sinusoidal signal with unsigned 8 bits integer.

1.4 Right python code

```
from struct import pack
from math import sin, pi
import wave

Fs = 8000

# Write a mono wave file

wf = wave.open('sin_8bits_mono.wav', 'w')
wf.setnchannels(1)
wf.setsampwidth(1)
wf.setframerate(Fs)
A = 2**7 - 1.0
f = 261.6
N = int(0.5*Fs)
for n in range(0, N):
        x = A * sin(2*pi*f/Fs*n)
        byte_string = pack('B', int(x+128))
        wf.writeframes(byte_string)
wf.close()
```