shrink

March 15, 2017

```
In [73]: from numpy import *
         from pylab import *
         %matplotlib inline
         from bitstream import BitStream
         from audio.coders import rice
         import audio.wave as wave
         import audio.io
```

1 Preamble: Rice Coder

```
In [3]: BitStream(42, uint16)
```

```
Out[3]: 0000000000101010
```

```
In [6]: frame = [0,0,1,1,7,255,301,16,78, 100, 0,0,0, 6]
        r = rice.from_frame(frame, signed=False)
        print r.b
```

```
5
```

```
In [8]: BitStream(0,r)
```

```
Out[8]: 000000
```

```
In [9]: BitStream(1,r)
```

```
Out[9]: 000010
```

```
In [10]: BitStream(255, r)
```

```
Out[10]: 1111111111110
```

```
In [7]: BitStream(frame, r)
```

```
Out[7]: 000000000000000010000010001110111111111111001101111111111010000001110110001001110000000000
```

```
In [11]: BitStream(1,rice(b=5,signed=True))
```

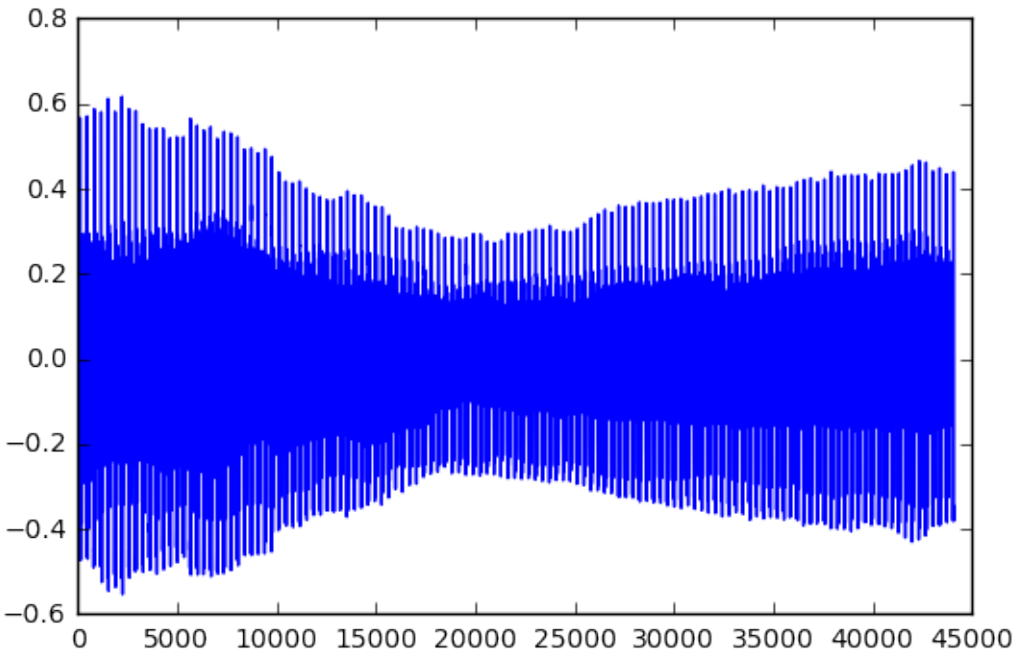
```
Out[11]: 0000010
```

```
In [13]: for b in range(0,9):
             print b, len(BitStream(frame, rice(signed=False, b=b)))
```

```
0 779
1 408
2 230
3 147
4 114
5 105
6 107
7 115
8 127
```

2 Rice Amplitude Coder (Audio)

```
In [77]: df = 44100.0; dt = 1.0 / df
         f = 440.0
         #t = r_[0:0.1:dt] # 0.1 sec of data
         #data = sin(2*pi*f*t)
         data = audio.io.record(1.0, df=df)[0]
         plot(data)
         data2 = wave.read(wave.write(data))
```



```
In [78]: data3 = wave.read(wave.write(data), scale=False)
         print data3.dtype
         data = data3[0]
         print len(data)
```

```
int16
44100
```

```
In [79]: r = rice.from_frame(data, signed=True) # near 15 ?
         print r.b
```

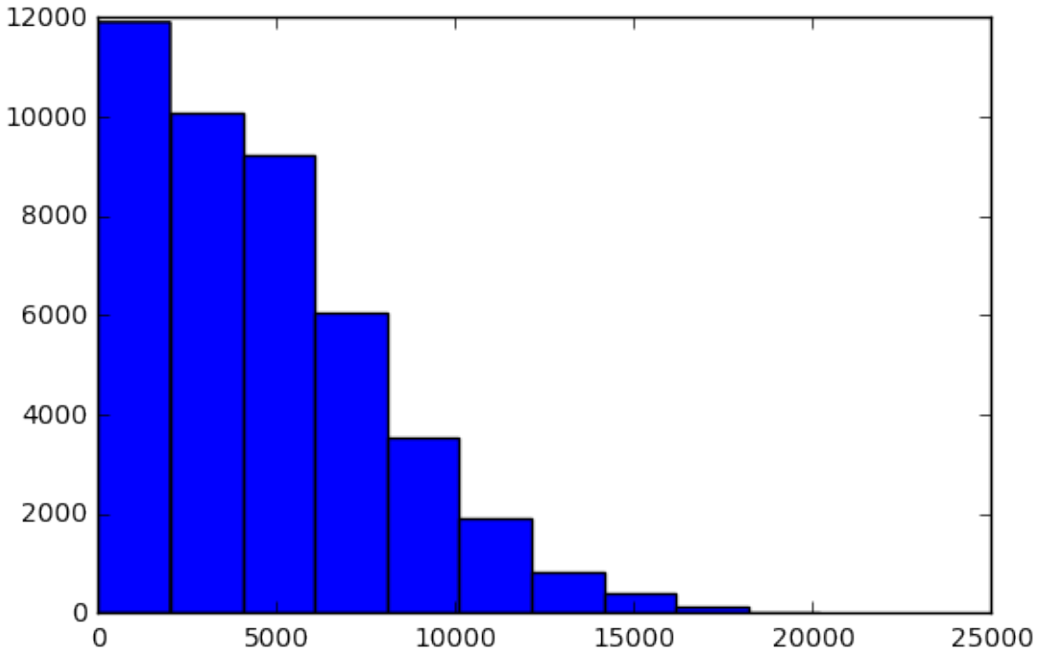
```
12
```

```
In [80]: stream = BitStream(data, r)
         print len(data) * 16
         print len(stream)
```

```
705600
647279
```

```
In [81]: close()
         hist(abs(data.astype(int32)))
         # negative values of abs(data) ? WTF!!!
         print abs(int16(-2**15)) # overflow: abs output is a int16!
```

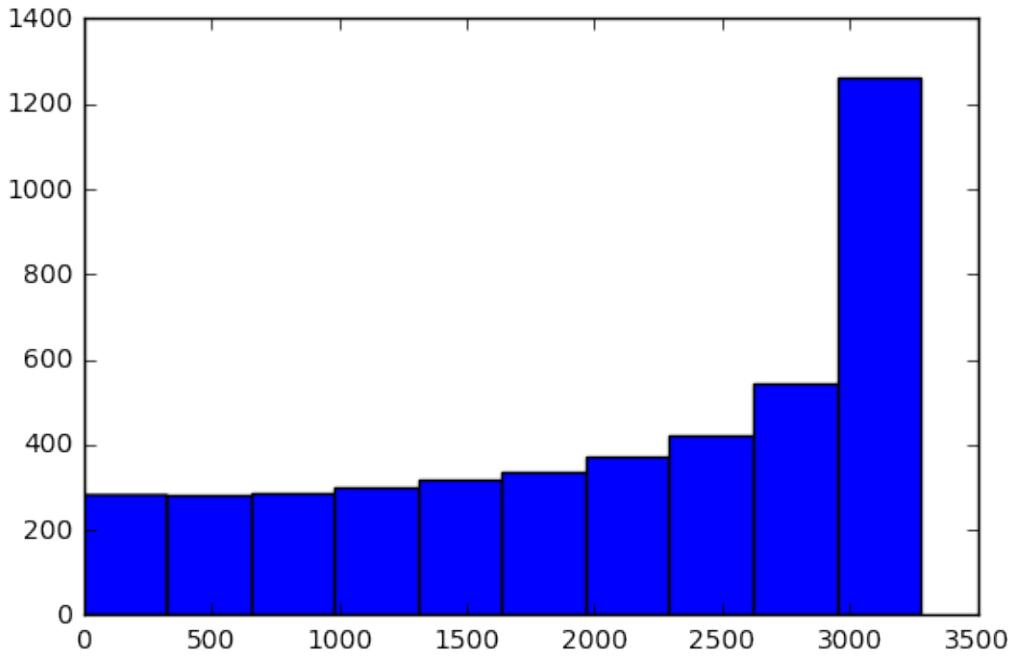
```
-32768
```



```
In [49]: df = 44100.0; dt = 1.0 / df
         f = 440.0
         t = r_[0:0.1:dt] # 0.1 sec of data
         data = 0.1*sin(2*pi*f*t)
         data = wave.read(wave.write(data), scale=False)[0]
         print len(BitStream(data, rice.from_frame(data, signed=True)))
         hist(abs(data))
```

```
59956
```

```
Out[49]: (array([  282.,   284.,   288.,   300.,   316.,   336.,   372.,   424.,
                   544.,  1264.]),
          array([    0. ,   327.7,   655.4,   983.1,  1310.8,  1638.5,  1966.2,
                  2293.9,  2621.6,  2949.3,  3277. ]),
          <a list of 10 Patch objects>)
```



3 Differential Rice Coder

```
In [58]: df = 44100.0; dt = 1.0 / df
         f = 440.0
         t = r_[0:0.1:dt] # 0.1 sec of data
```

```
        #data = sin(2*pi*f*t)
        #data = wave.read(wave.write(data), scale=False)[0]
```

```
In [82]: ddata = diff(data)
         print len(data), len(ddata)
```

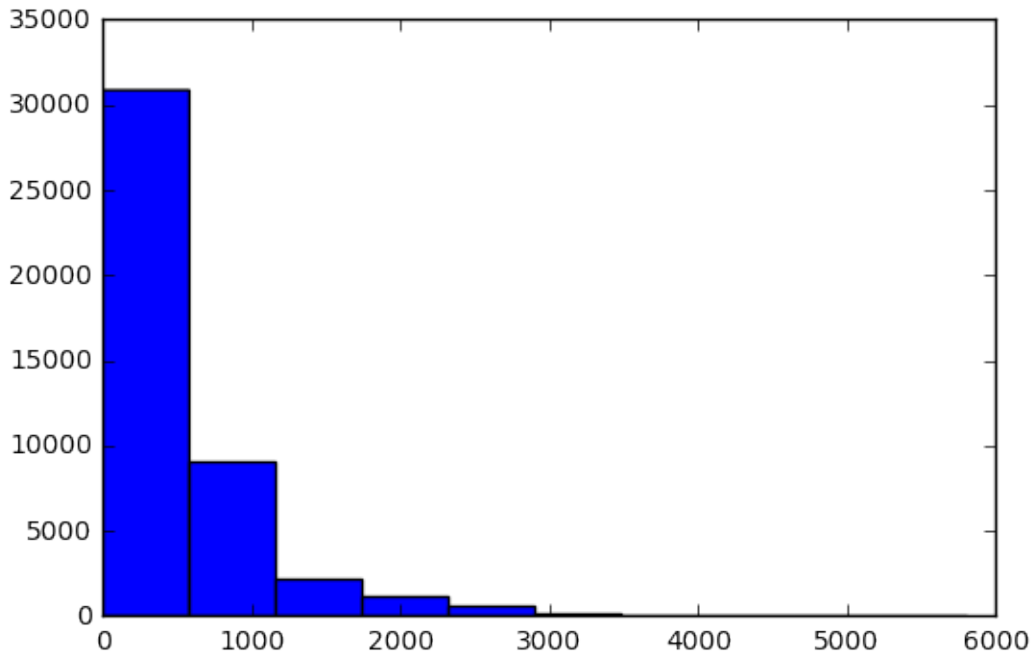
```
44100 44099
```

```
In [83]: ddata = diff(r_[0,data]) # coding of the first value
         print len(data), len(ddata)
```

```
44100 44100
```

```
In [84]: hist(abs(ddata))
```

```
Out[84]: (array([  3.08580000e+04,   9.10300000e+03,   2.15300000e+03,
                   1.15400000e+03,   6.16000000e+02,   1.76000000e+02,
                   3.60000000e+01,   2.00000000e+00,   1.00000000e+00,
                   1.00000000e+00]),
          array([    0. ,   579.9,  1159.8,  1739.7,  2319.6,  2899.5,  3479.4,
                  4059.3,  4639.2,  5219.1,  5799. ]),
          <a list of 10 Patch objects>)
```




```
In [85]: r = rice.from_frame(ddata, signed=True)
         print r.b
         print len(BitStream(ddata, r))
```

```
8
508118
```

```
In [67]: idata = cumsum(ddata)
         all(data == idata)
```

```
Out[67]: True
```

```
In [86]: dddata = diff(r_[0, diff(r_[0, data])])
         r = rice.from_frame(dddata, signed=True)
         print r.b
         print len(BitStream(dddata, r))
```

```
7
430724
```

```
In [72]: iidata = cumsum(cumsum(dddata))
         all(data == iidata)
```

```
Out[72]: True
```

```
In [ ]:
```