CSE 250A HW3 3.6

October 24, 2017

In [14]:
```
import math
from numpy import random
```

In [124]:
```
# constants
ALPHA=0.1
Z=128
N=10
SAMPLE_BITS=[2,5,8,10]
```

In [125]:
```
def f_B(bitSeq):
    sum=0
    for i in range(len(bitSeq)):
        sum+=pow(2,i)*bitSeq[i]
    return sum
```

In [126]:
```
def likelihood_weight(B):
    exp = abs(Z - f_B(B))
    out = ((1-ALPHA)/(1+ALPHA))*(pow(ALPHA,exp))
    return out
```

In [127]:
```
def estimate(samples, bit):
    numer=0.0
    denom=0.0
    for i in range(samples):
        binarySeq = random.randint(2, size=N)
        pz = likelihood_weight(binarySeq)
        denom += pz
        indicator = binarySeq[bit-1]
        numer+= pz*indicator
    return numer/denom
```

In [250]:
```
### 3.6b ###
print("sampling %d times" % N)
bit = 2 # {2,5,8,10}
prob = estimate(N,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
```

```
prob = estimate(N,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(N,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 10 # {2,5,8,10}
prob = estimate(N,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))

### 3.6c ###
print("sampling %d times" % 100)
bit = 2 # {2,5,8,10}
prob = estimate(100,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
prob = estimate(100,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(100,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 10 # {2,5,8,10}
prob = estimate(100,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))

print("sampling %d times" % 1000)
bit = 2 # {2,5,8,10}
prob = estimate(1000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
prob = estimate(1000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(1000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 10 # {2,5,8,10}
prob = estimate(1000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))

print("sampling %d times" % 10000)
bit = 2 # {2,5,8,10}
prob = estimate(10000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
prob = estimate(10000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(10000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
```

```
bit = 10 # {2,5,8,10}
prob = estimate(10000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))

print("sampling %d times" % 100000)
bit = 2 # {2,5,8,10}
prob = estimate(100000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
prob = estimate(100000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(100000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 10 # {2,5,8,10}
prob = estimate(100000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))

print("sampling %d times" % 1000000)
bit = 2 # {2,5,8,10}
prob = estimate(1000000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 5 # {2,5,8,10}
prob = estimate(1000000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 8 # {2,5,8,10}
prob = estimate(1000000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
bit = 10 # {2,5,8,10}
prob = estimate(1000000,bit)
print("P(B%d=1|Z=128) = %f" % (bit, prob))
```

```
sampling 10 times
P(B2=1|Z=128) = 1.000000
P(B5=1|Z=128) = 0.000000
P(B8=1|Z=128) = 1.000000
P(B10=1|Z=128) = 0.000000
sampling 100 times
P(B2=1|Z=128) = 1.000000
P(B5=1|Z=128) = 1.000000
P(B8=1|Z=128) = 0.000000
P(B10=1|Z=128) = 0.000000
sampling 1000 times
P(B2=1|Z=128) = 0.052586
P(B5=1|Z=128) = 0.008204
P(B8=1|Z=128) = 0.909663
P(B10=1|Z=128) = 0.000000
sampling 10000 times
```

```
P(B2=1|Z=128) = 0.078729
P(B5=1|Z=128) = 0.080470
P(B8=1|Z=128) = 0.926077
P(B10=1|Z=128) = 0.000000
sampling 100000 times
P(B2=1|Z=128) = 0.088145
P(B5=1|Z=128) = 0.111571
P(B8=1|Z=128) = 0.899598
P(B10=1|Z=128) = 0.000000
sampling 1000000 times
P(B2=1|Z=128) = 0.097695
P(B5=1|Z=128) = 0.091172
P(B8=1|Z=128) = 0.912785
P(B10=1|Z=128) = 0.000000
```