Math508 Homework 5

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Abstract

Simple HMM

1 No. 1

Hidden markov model on a simple reflected r.w. X_n on A[0,20] starting at 10. $P(W_1 = \pm L) = \frac{1}{2}$. $Y_n = min\{max\{X_n + W_n, 0\}, 20\}$. See all figures.

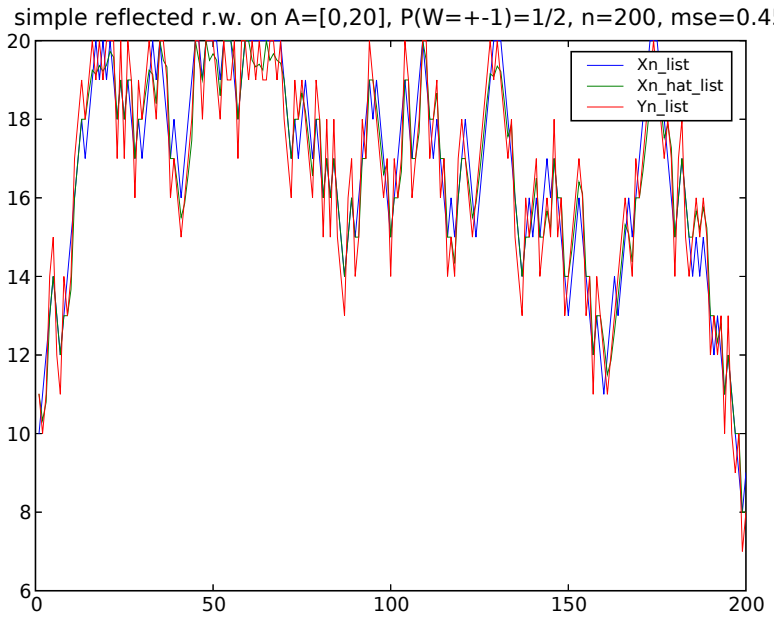

Figure 1:

2 No. 2

Tossing of a constant coin with initial coin randomly(uniformly) selected. Given $Y_{[0,4]} = (H, H, H, T, T)$, the ϕ_n^a matrix (row is n, column is the hidden state) is

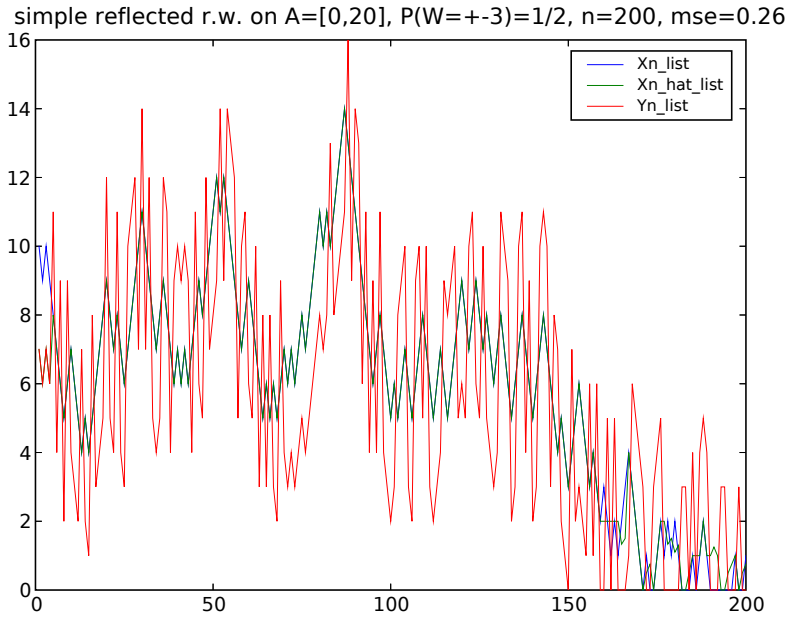

Figure 2:

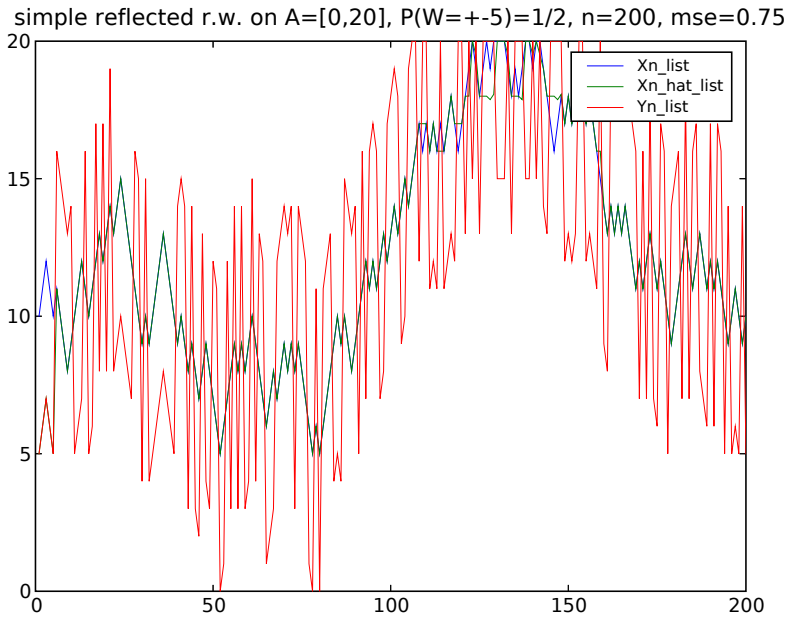

Figure 3:

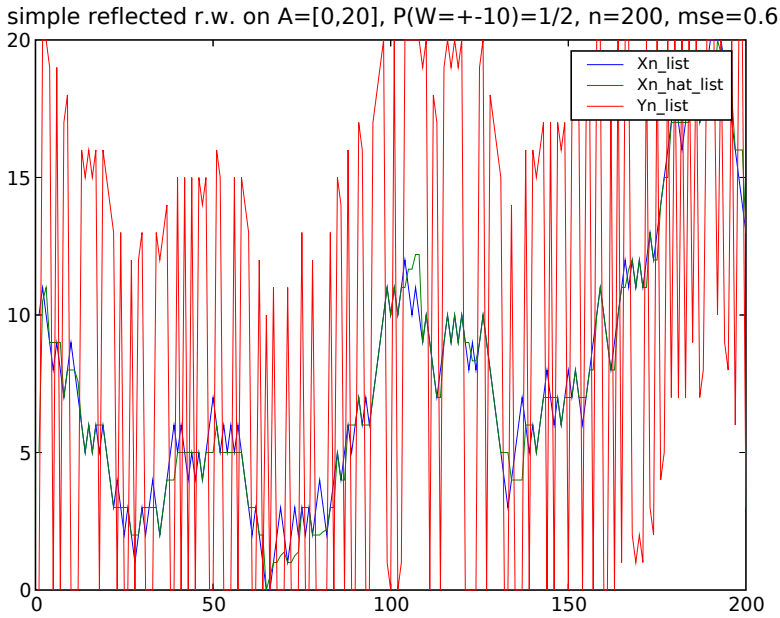

Figure 4:

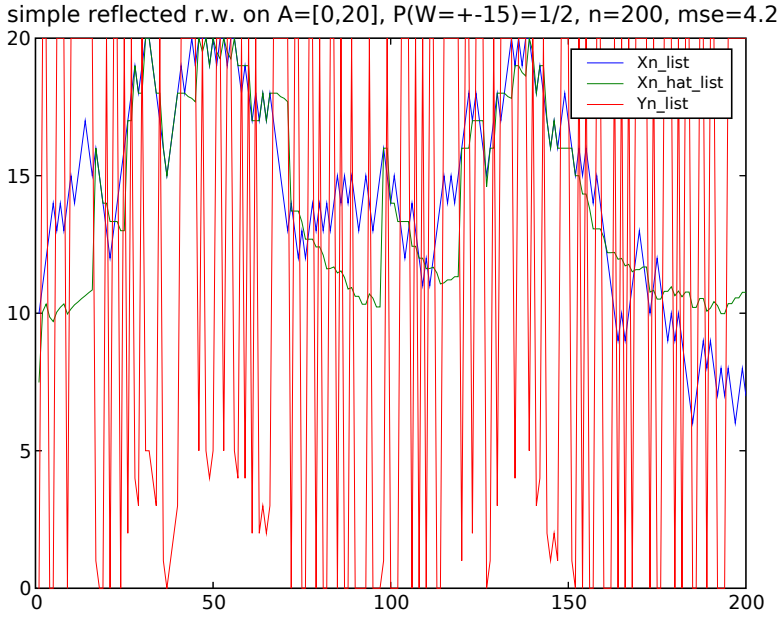

Figure 5:

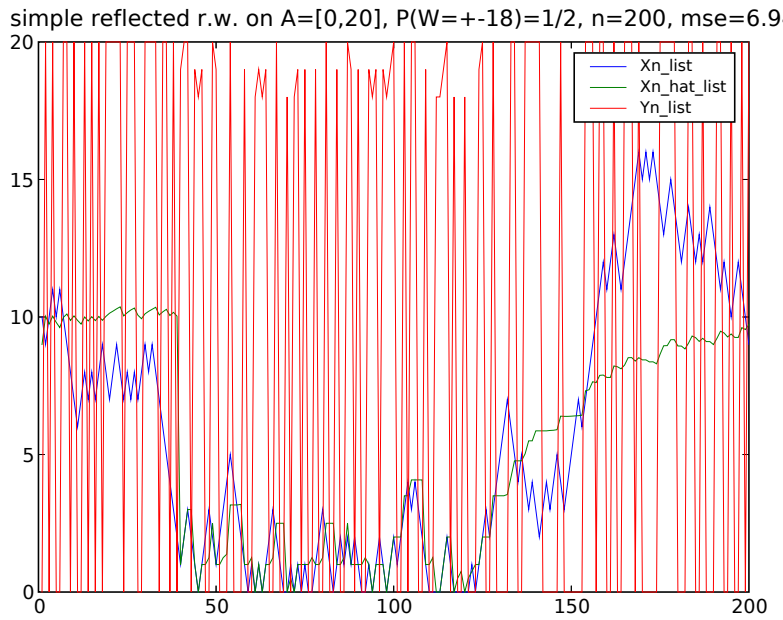

Figure 6:

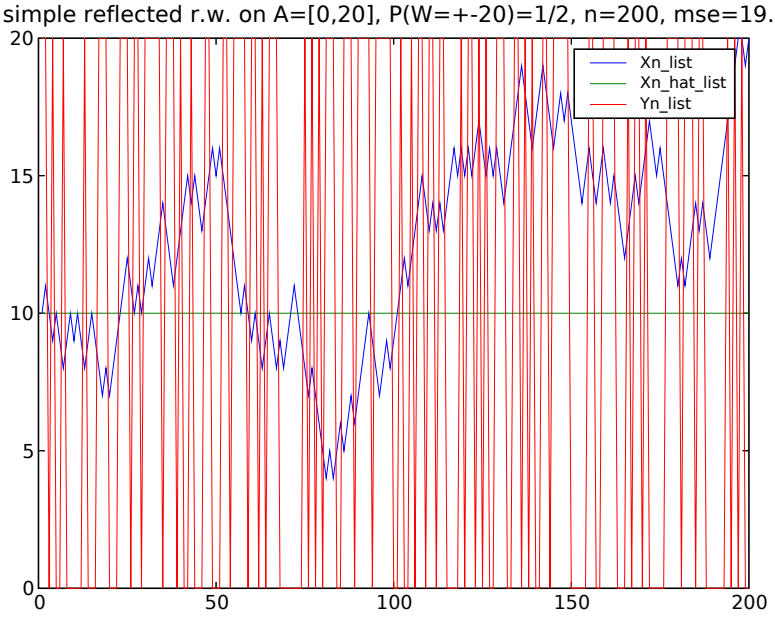

Figure 7:

```
[[ 0.1         0.16666667  0.23333333]
 [ 0.03        0.08333333  0.16333333]
 [ 0.009       0.04166667  0.11433333]
 [ 0.0063      0.02083333  0.0343    ]
 [ 0.00441     0.01041667  0.01029   ]]
```

the posterior π_n^a matrix is

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[[ 0.2         0.33333333  0.46666667]
 [ 0.10843373  0.30120482  0.59036145]
 [ 0.05454545  0.25252525  0.69292929]
 [ 0.10255019  0.339121    0.55832881]
 [ 0.17558062  0.41473125  0.40968812]]
```

The estimated $\hat{X_n}$ vector (the state space is $\{0, 1, 2\}$ is

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[1.266, 1.482, 1.638, 1.456, 1.234]
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So it's pretty much the 2nd or 3rd coin.