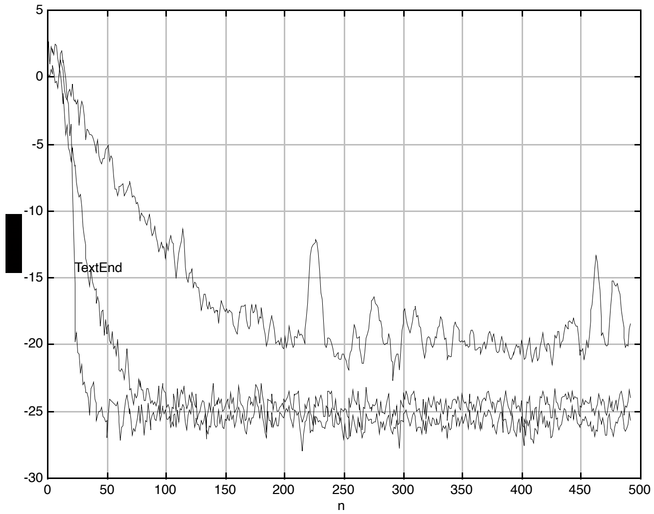
EE594 Adaptive Signal Processing
Fall 2002 Exam #2

1)



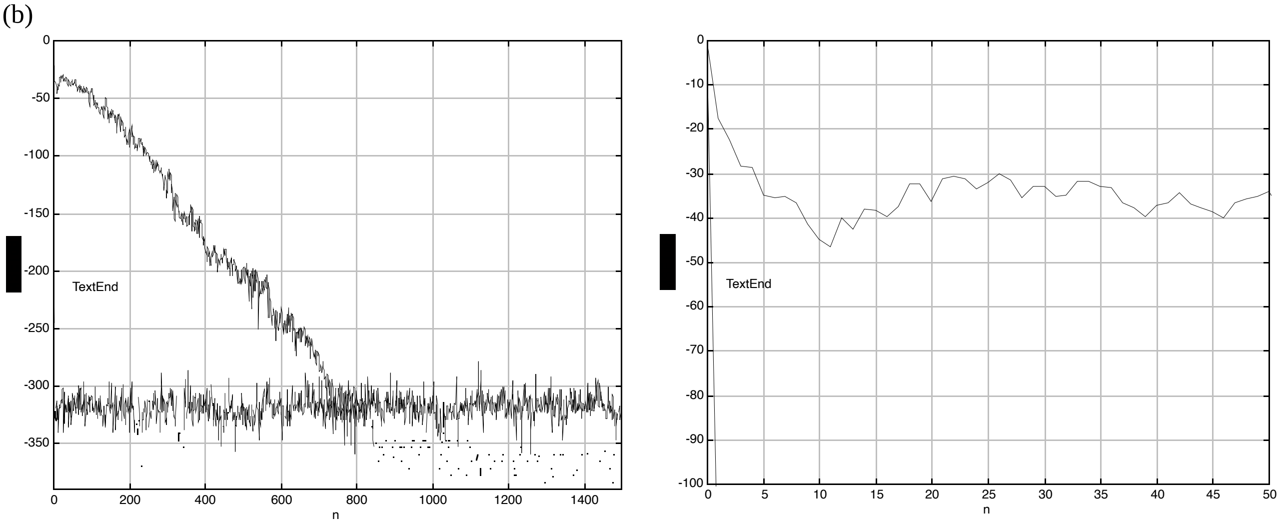
Comments are similar to Haykin, p. 475.

---

2)

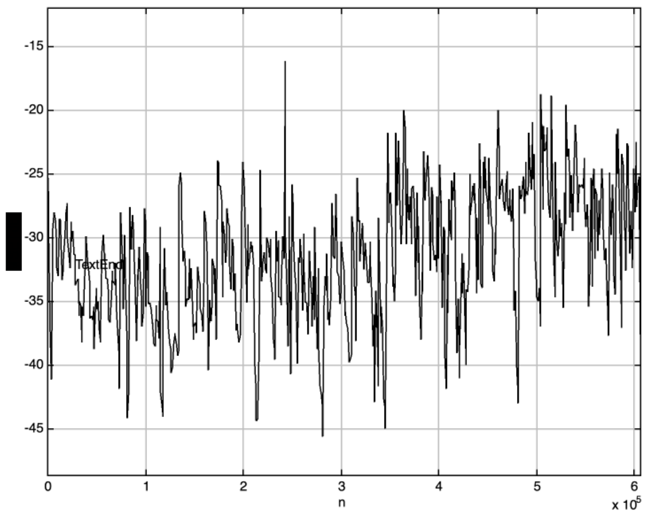
(a) Since $v(n)$ is white noise a simple delay of one sample is enough to decorrelate the broardband noise signal.

(b)



It is clear that GNLMS has superior convergence properties compared to NLMS.

(c)



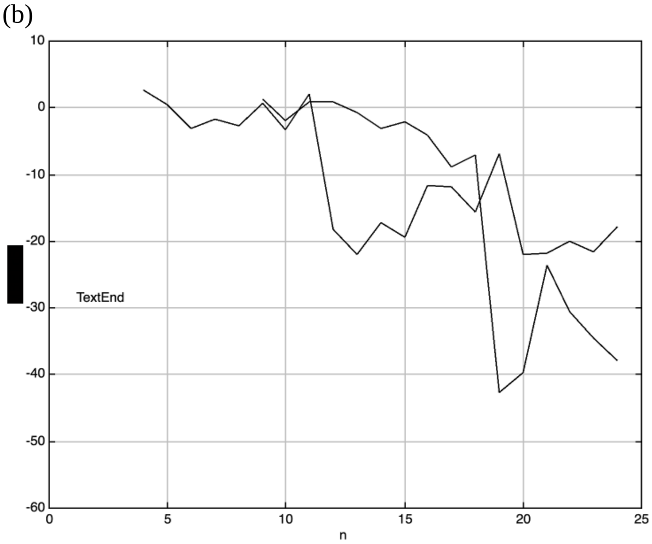
(d) In $d(n)$ we clearly a single tone mixed with Jon Coltrain's Blue Train. Approximately every 5.5s the tone changes frequency. In $e(n)$ we hear the result of removing the done based on an ALE structure. The distortion results from a delayed filtering of the signal. For the most part the result sound acceptable with the tone removed.

---

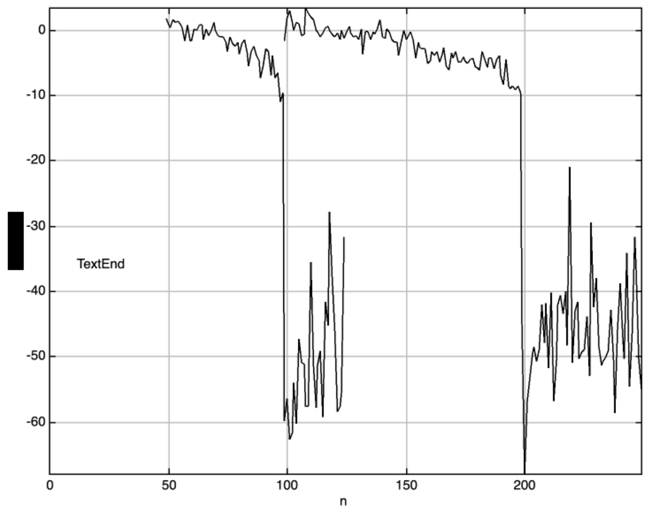
3)

(a) $x(n)$ represents noise present in the system due to sensor noise, A/D conversion, etc...

(b)



(c)



(d)

M	Convergence Time (samples)
5	12
10	18
50	100
100	200

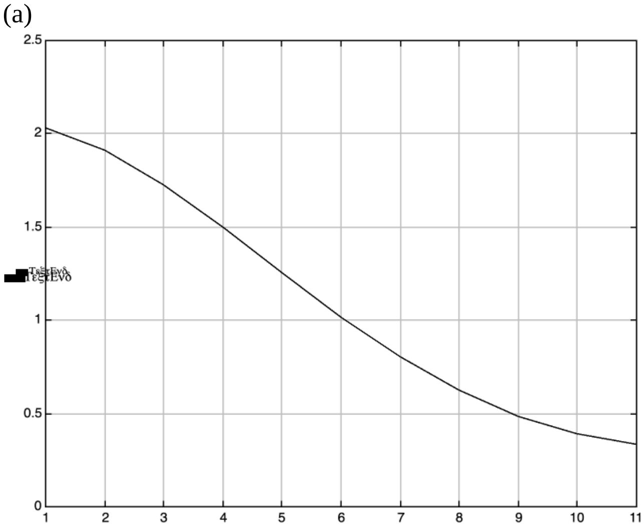
(e)

We see that RLS converges in approximately 2*M* samples.

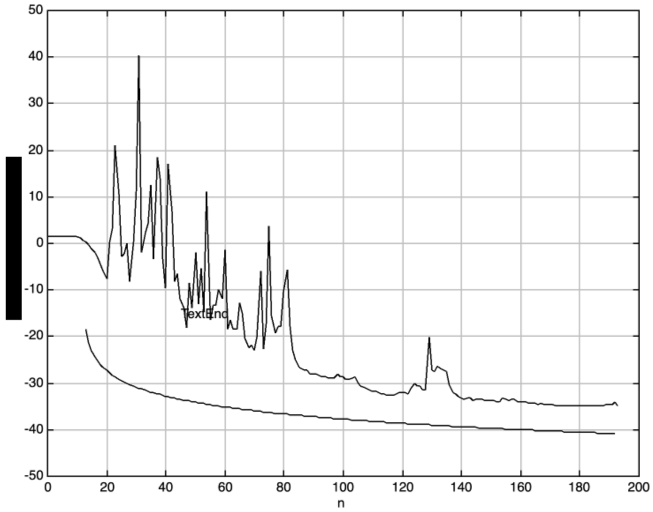
---

4)

(a)

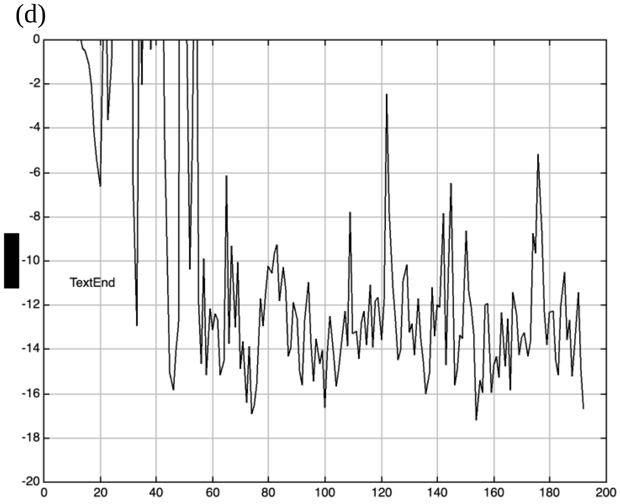


(b)

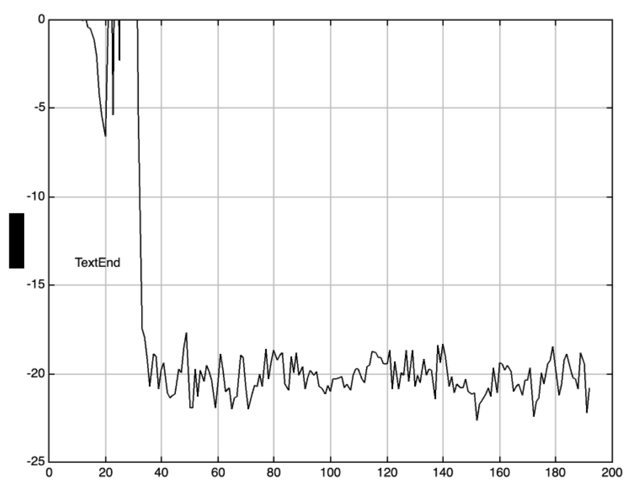


(c) We see some agreement between theory and experiment especially as n grows large. Our theoretical calculation serves as a lower bound given the assumptions.

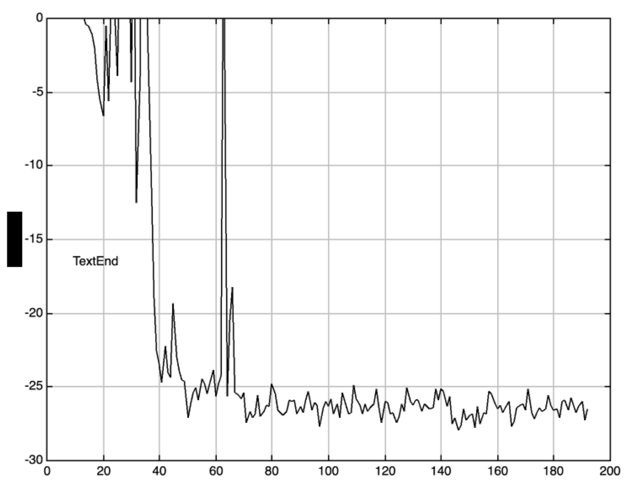
(d)



$\lambda = 0.1$



$\lambda = 0.5$



$\lambda = 0.9$

The steady-state levels of MSE (a priori error) rise in direct amount to smaller lambda, consistent with theoetical misadjustment.