WORKSHEET FOR EXERCISES FROM CHAPTER 6

EXERCISE 6.1

1. **What is the total SSE for the network after training has finished?**

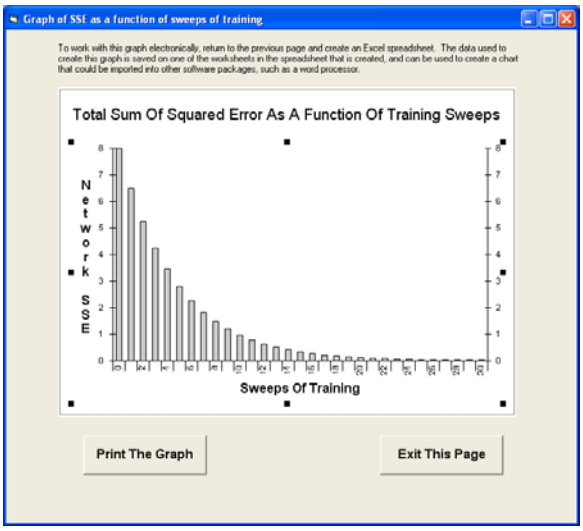
Total SSE was approximately 0.01.

2. **How does this value for SSE compare to the same value that was observed in Exercise 5.1? What can one conclude from this comparison?**

This value is a few orders of magnitude smaller than was the case in Exercise 5, where the total SSE was 32. This indicates that additional training with the delta rule does not cause problems for the distributed associative memory.

3. **Examine how SSE for this network changed over time. Compare and contrast the performance in this simulation to that observed for the same training set in Exercise 5.1. What are the implications of this comparison for Delta rule learning?**

Network SSE dropped with each epoch of learning, and the trend of this decrease in error was exponential. That is, the greater drops in error were earlier in learning; later in learning error decreased, but more slowly. This is shown in the graph below. This is quite different from exercise 5, because in that exercise error exponentially increased. Again, the implications are that delta rule learning is not affected by overtraining. The graph also shows that the amount of learning depends on the amount of error.



EXERCISE 6.2

1. **What is the total SSE for the network after training has finished?**

Total SSE was approximately 0.05

2. **How many epochs of training were required before the program stopped training the network because SSE was sufficiently low?**

The network reached this acceptably low level of SSE after 5183 epochs of training.

3. **How does the value for SSE compare to the same value that was observed in Exercise 5.2? What can one conclude from this comparison?**

There is a dramatic difference between the two SSEs. In this simulation, error is low enough to say that the network has learned all of the associations. In the previous exercise, error was enormously high in some simulations (over 33,000) and no lower than about 7 in others. In other words, when the Hebb rule was used in exercise 5 this training set could not be learned. However, it can be learned when the delta rule is used.

4. **Examine how SSE for this network changed over time. Compare and contrast the performance in this simulation to that observed for the same training set in Exercise 5.2. What are the implications of this comparison for Delta rule learning?**

As was the case in the exercise above, SSE exponentially decreased over time, with larger decreases occurring later in learning. Again, this is to be expected – the learning rule is driven by error, so when error decreases (because of learning) less error will occur.