Homework 2
Implementation of discrete-time systems

Due: February 11, 2000

In this homework you will implement several discrete-time systems. The input to the system will be the signal *x(n)* shown below in Figure 1.

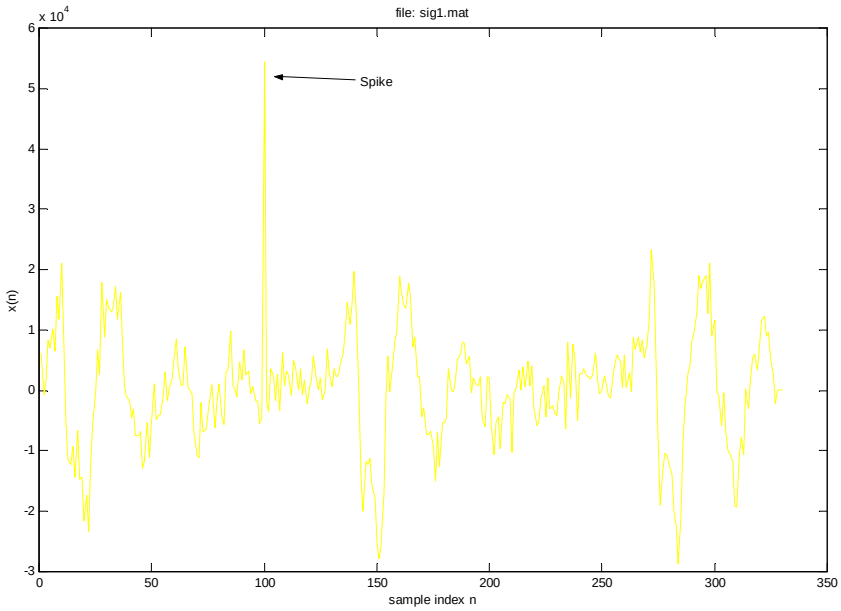

Figure 1. The discrete-time signal x(n).

You can download the signal *x(n)* from www.utdallas.edu/~loizou/ee6360.htm
The signal is in the MATLAB file sig1.mat. After downloading the file in your local hardrive, you can read the signal *x(n),* using the following command in MATLAB:
>> load sig1.mat
After executing the *load* command, the signal *x(n)* should be in the vector **x.** When you plot the vector **x** you should see the signal shown in Figure 1.

Questions

Write a MATLAB program to implement the following discrete time systems:

1. $y(n) = \frac{1}{L+1}\sum_{i=0}^{L} x(n-i)$

   where L=3, 6, 9 ,15, 23, 43

Describe, in qualitative terms, what happens to the signal x(n) as L increases. Plot the output signal y(n) for L=6 and L=43.

2. $y(n)= x(n) – a\, x(n-1)$
where a=0.2, 0.4, 0.8, 1

Describe, in qualitative terms, what happens to the signal *x(n)* as the parameter "a" increases. Plot the output signal y(n) for a=0.2 and a=1.0.

3. $y(n)=\text{median}(x(n-1),x(n),x(n+1))$

Describe what happens to the signal x(n), and plot the output signal y(n).

4. $y(n) = a\, y(n-1) + x(n)$
where a= 0.5, -0.5.

Describe what happens to the signal x(n) for "a" positive and for "a" negative. Plot the output signal for both cases.

5. Which of the above 4 systems was most efficient in removing the spike contained in the original signal?

Attach the MATLAB code to your report.