

University of Texas at Dallas
Department of Electrical Engineering
EEDG 6306 - Application Specific Integrated Circuit Design
Homework #3

Due on Midnight 12:00, September 14, 2016

Submission for Homework #3:

(a) Your C/C++ source code. (b) Your output file

Input files will be posted on: <http://utdallas.edu/~zxb107020>

Please submit this homework to: zxb107020@utdallas.edu

Write a C/C++ program to implement algorithm presented in the MSDAP paper

(1.1) Use the provided coefficients and inputs.

(1.2) Input samples are **signed 16-bit hex number, fixed-point, two's complement, Leftmost bit is sign bit.**

(1.3) The output data should be 40 bits and printed out as hexadecimal number. (More details check page 4.)

(1.4) Filter's order is 256.

(1.5) Total number of input data is 1000.

(1.6) Assume $x(-255)=x(-254)=\dots=x(-2)=x(-1)=x(0)=0$.

(1.7) Print your output data (for data2.in) to the file named as data2.out

(1.8) Follow the procedure in the example for computation.

(1.9) data1.in and output1.out are for testing purpose

(1.10) Please use gcc/g++ compiler to compile your code (More details check page 6-7.)

Computation transformation

Example:

Assume filter order $N=3$, POT digit limit to 2^{-4} (in this HW, it can reach 2^{-16})

$$\begin{aligned}y(n) &= \sum_{k=0}^3 h(k)x(n-k) \\ &= h(0)x(n-0) + h(1)x(n-1) + h(2)x(n-2) + h(3)x(n-3)\end{aligned}$$

Assume:

$$h(0) = 2^{-1} - 2^{-3}$$

$$h(1) = 2^{-3} + 2^{-4}$$

$$h(2) = 2^{-1} + 2^{-2} - 2^{-4}$$

$$h(3) = -2^{-3}$$

\Rightarrow

$$y(n) = (2^{-1} - 2^{-3})x(n-0) + (2^{-3} + 2^{-4})x(n-1) + (2^{-1} + 2^{-2} - 2^{-4})x(n-2) + (-2^{-3})x(n-3)$$

Use the highlight formulation for this homework. The following bit operations are not required at this time.

=>

$$y(n) = 2^{-1}[x(n-0) + x(n-2)] + 2^{-2}[x(n-2)] + 2^{-3}[-x(n-0) + x(n-1) - x(n-3)] + 2^{-4}[x(n-1) - x(n-2)]$$

Let:

$$u_4 = x(n-0) + x(n-2)$$

$$u_3 = x(n-2)$$

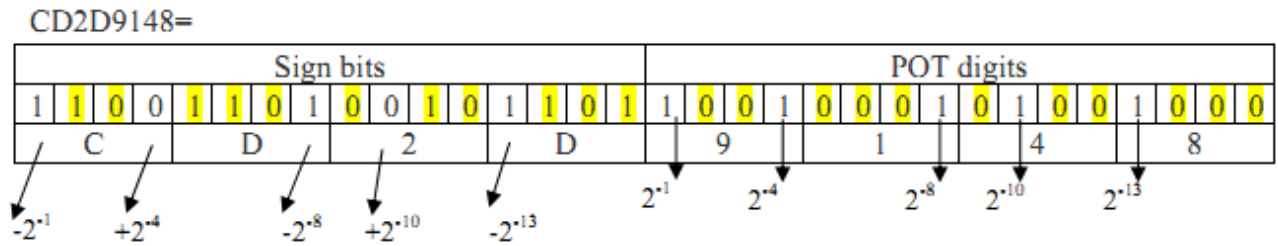
$$u_2 = -x(n-0) + x(n-1) - x(n-3)$$

$$u_1 = x(n-1) - x(n-2)$$

=>

$$\begin{aligned} y(n) &= 2^{-1}u_4 + 2^{-2}u_3 + 2^{-3}u_2 + 2^{-4}u_1 \\ &= 2^{-1}(u_4 + 2^{-1}(u_3 + 2^{-1}(u_2 + 2^{-1}u_1))) \end{aligned}$$

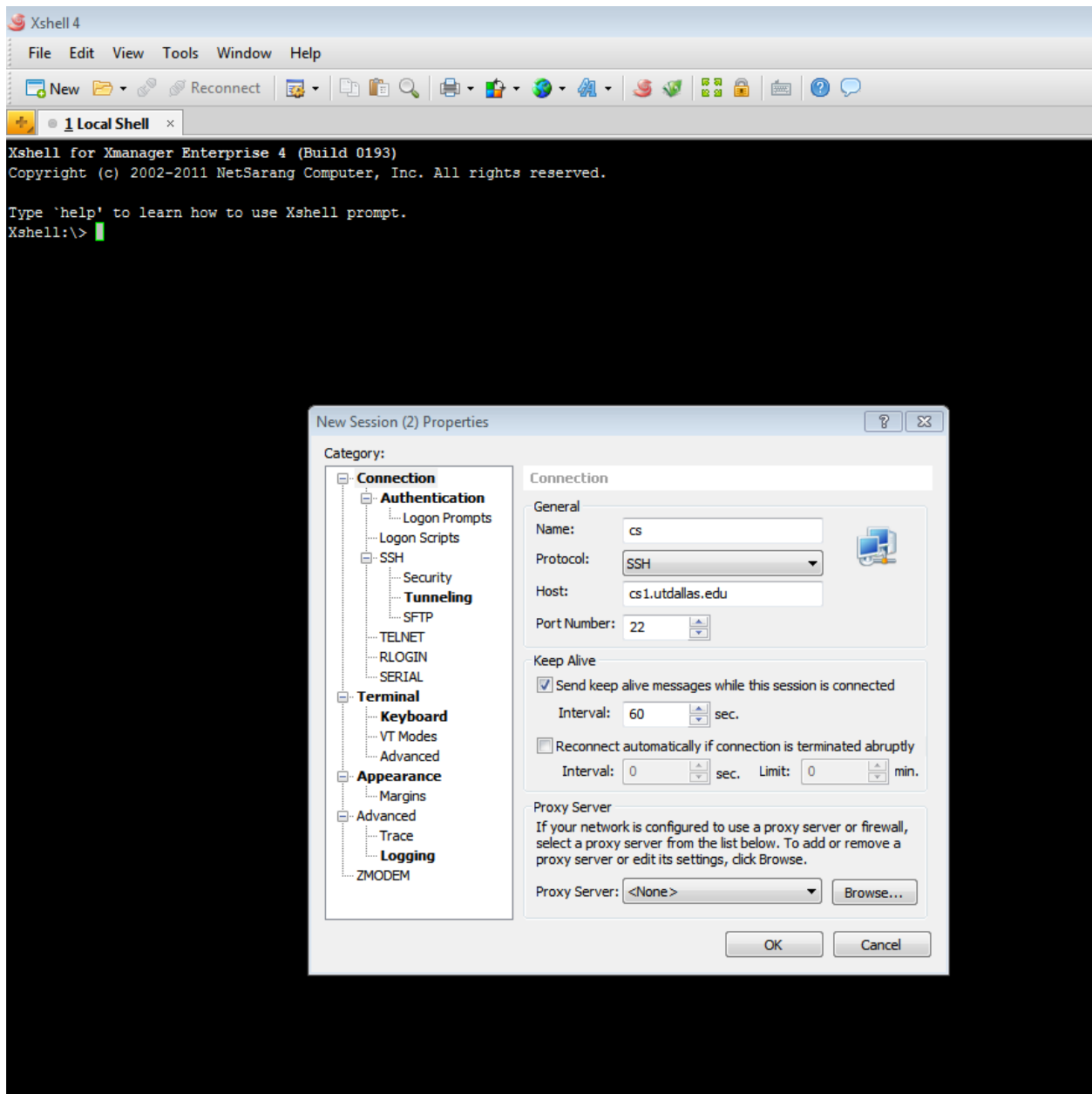
The format of coefficient h(k):

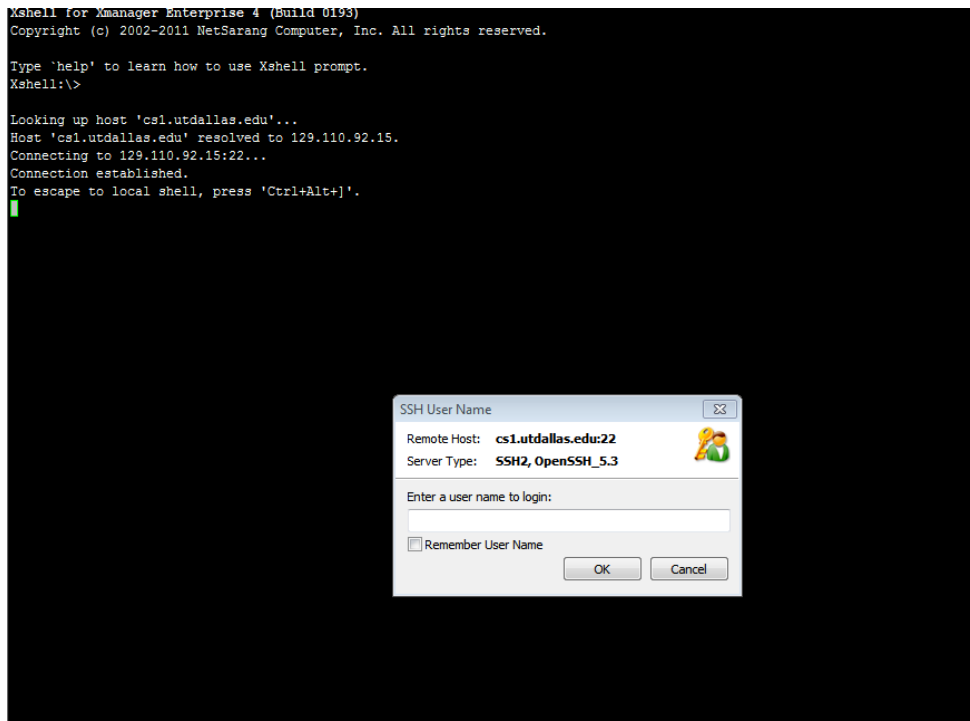


$h(0) = -2^{-1} + 2^{-4} - 2^{-8} + 2^{-10} - 2^{-13}$ (Bits marked as yellow are don't care value, simply discard)

How to use gcc/g++ compiler,

- (1) Download PUTTY or
- (2) Use Xshell (utd lab computer)
- (3) The server name is cs1.utdallas.edu
- (4) Login with your NetId and password





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Department of Computer Science
University of Texas at Dallas

Pursuant to Texas Administrative Code 202:

(1) Unauthorized use is prohibited;
(2) Usage may be subject to security testing and monitoring;
(3) Misuse is subject to criminal prosecution; and
(4) No expectation of privacy except as otherwise provided by
    applicable privacy laws.

Last login: Tue Sep  9 23:24:42 2014 from ee250337.campus.ad.utdallas.edu
***-----**
cs1.utdallas.edu - Linux/CentOS 6.5
cs2.utdallas.edu - Linux/CentOS 6.5
cs3.utdallas.edu - Solaris 10
cs4.utdallas.edu - Solaris 10
***-----**
This system is for use by CS students
who need a general purpose Linux system
to complete homework assignments.

Computationally or resource intensive simulations will
be throttled automatically.

Thank you,
CS Lab Manager
cs-labs@utdallas.edu

        /scratch disk space can be used for temporary files.
        All files will be erased on a regular basis (Sunday 0300).
Sourcing /usr/local/etc/skel/global/profile
{cslinux1:~} gcc your_source_file.c -o youroutput.c
```

GCC manual:

<https://gcc.gnu.org/onlinedocs/gcc-4.9.1/gcc.pdf>