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% WaveModifyV1.m
% PICOSECOND PULSE LABS, Boulder, Colorado, USA
% J.R.Andrews, 11/8/04
disp('  ')
disp('WaveModifyV1.m --- MatLab Program')
disp('PICOSECOND PULSE LABS, ver.1.0, J.R.Andrews, 11/8/04')
disp('Input waveform comes from an oscilloscope, another MatLab program,')
disp('or other source as a *.txt file')
disp('Program allows user to reduce # of data points, do zero padding')
disp('and time shifting')
clear
disp('Please use the keyboard to respond to the following questions.')
drive = input('Data in via drive A: or C:?  (1=A: 3=C:)   ');
if drive == 1
    disp('Data in will be as *.txt file via floppy disc in drive A:')
else
    disp('Data in will be as *.txt file in current C: drive directory')
end
disp(' ')
fname = input('Enter Data File Name =   ','s');
if drive == 1
    dname = ['A:', fname, '.txt'];
else
    dname = [fname, '.txt'];
end
v = load(dname);
Tw = input('Enter Time Window in NanoSeconds =   ');
N = length(v); % = # of data points
disp('Number of data points =')
disp(N)
dt=Tw/N; % (in ns)
disp('sample spacing, dt, in ns =')
disp(dt)
for i=1:N
    t(i)=(i-1)*dt;
end
plot(t,v)
grid
xlabel('time in ns')
ylabel('Volts')
title('Input Pulse')
disp('plot of input pulse --- press any key to continue')
pause
shift1 = input('Does v(t) need time shifting? (1=yes, 0=no)  ');
vs = v;
if shift1 == 1
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    shift2 = input('shift to the right (1) or left (0)?   ');
    Tshift = input('Enter reqd. shift in ns ?   ');
    Nshift = round(Tshift/dt);
    Tshift = Nshift * dt;
    if shift2 == 1  % i.e. shift to right
        for i=1+Nshift:N
            vs(i) = v(i-Nshift);
        end
        for i=1:Nshift
            vs(i) = v(N-Nshift+i);
        end
    end
    if shift2 == 0  % i.e. shift to left
        for i=1:N-Nshift
            vs(i) = v(i+Nshift);
        end
        for i=N-Nshift+1:N
            vs(i) = v(i-N+Nshift);
        end
    end
    v = vs;
    plot(t,v)
    grid
    xlabel('time in ns')
    ylabel('Volts')
    title('v(t) after time shift')
pause
end
fewpt = input('Do you want fewer data points? (1=yes, 0=no)  ');
if fewpt == 1
    disp('Original input array size is')
    disp(N)
    divisor = input('Enter desired divisor of original array size, (power
of 2 reqd.):  ');
    new_N = N/divisor;
    disp('The new array size is')
    disp(new_N)
    dt = Tw/new_N;
    disp('The new sample spacing, dt, is')
    disp(dt)
    clear t
    for i=1:new_N
        vf(i) = v(divisor*i);
        t(i) = i*dt;
    end
    N = new_N;
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    clear v
    v = vf;
end
% optional zero padding
disp(' ')
zeropad = input('Do you want to do "zero padding" to increase time window?
(1=yes  0=no) ');
if zeropad == 1
    disp('array size is')
    disp(N)
    multiple = input('Enter desired multiple of array size, (power of 2
reqd.):  ');
    new_N = N*multiple;
    disp('The new array size is')
    disp(new_N)
    disp('Vpad value set by 1= mean of last 10 pts., 2= mean of first 10
pts.')
    padtype = input('or 3= keyboard entry ?   ');
    if padtype == 1   % i.e. step
    % determine mean value of last 10 pts. of in & tdr arrays
        for i=1:10
            zpad(i) = v(N+1-i);
        end
        Vpad = mean(zpad);
    end
    if padtype == 2   % i.e. impulse
    % determine mean value of first 10 pts. of in & tdr arrays
        for i=1:10
            zpad(i) = v(i);
        end
        Vpad = mean(zpad);
    end
    if padtype == 3  % i.e. keyboard entry
        Vpad = input('enter Vpad in Volts   ');
    end
    for i=N+1:new_N
        v(i) = Vpad;
        t(i) = i*dt;
    end
    N = new_N;
    Tw = N*dt;
    plot(t,v)
    grid
    xlabel('time in ns')
    ylabel('Volts')
    title('Padded Waveform')
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    disp(' ')
    pause
end
shift1 = input('Does v(t) need time shifting? (1=yes, 0=no)  ');
vs = v;
if shift1 == 1
    shift2 = input('shift to the right (1) or left (0)?   ');
    Tshift = input('Enter reqd. shift in ns ?   ');
    Nshift = round(Tshift/dt);
    Tshift = Nshift * dt;
    if shift2 == 1  % i.e. shift to right
        for i=1+Nshift:N
            vs(i) = v(i-Nshift);
        end
        for i=1:Nshift
            vs(i) = v(N-Nshift+i);
        end
    end
    if shift2 == 0  % i.e. shift to left
        for i=1:N-Nshift
            vs(i) = v(i+Nshift);
        end
        for i=N-Nshift+1:N
            vs(i) = v(i-N+Nshift);
        end
    end
    v = vs;
    plot(t,v)
    grid
    xlabel('time in ns')
    ylabel('Volts')
    title('v(t) after time shift')
pause
end
reply = input('do you want to save results to disc? (1=yes, 0=no)  ');
if reply == 1
    fname = input('Enter Output Data File Name:   ','s');
% '\r' or '\n' is delimiter for carriage return (newline), i.e. 'enter' key
% this writes output file with one data point per line
% note: this doesn't appear correct in NotePad,
% but is correct in WordPad or Word
    disp('writing modified waveform')
    dname = [fname, '.txt'];
    if drive == 1
        dname = ['A:', fname, '.txt'];
    end
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    dlmwrite(dname,v,'\r');
    disp('Output Data written to disc')
end
disp('end of WaveModifyV1.m program')
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