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% WaveModifyV2.m
% PICOSECOND PULSE LABS, Boulder, Colorado, USA
% J.R.Andrews, 11/10/04
disp('  ')
disp('WaveModifyV2.m --- MatLab Program')
disp('PICOSECOND PULSE LABS, ver.2.0, J.R.Andrews, 11/10/04')
disp('Input waveform comes from an oscilloscope, another MatLab program,')
disp('or other source as a *.txt file')
disp('Program allows user to do time shifting, select portion of window,')
disp('& then modify # of data points and time window by interpolation.')
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*dt;
end
tin = t;
vin = v;
plot(t,v,'.b')
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)  ');
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if shift1 == 1
    vs = v;
    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,'.b')
    grid
    xlabel('time in ns')
    ylabel('Volts')
    title('v(t) after time shift')
    pause
end
SmTw = input('Do you want a smaller time window? (1=yes, 0=no)   ');
if SmTw == 1
    NewTw = input('Enter new Time Window in NanoSeconds =   ');
    NewN = round(N*(NewTw/Tw));
    NewTw = NewN*dt;
    disp('new time window (in ns) is')
    disp(NewTw)
    disp('new # of data points is')
    disp(NewN)
    clear t
    for i=1:NewN
        vn(i) = v(i);
        tn(i) = i*dt;
    end
    plot(tn,vn,'.b')
    grid
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    xlabel('time in ns')
    ylabel('Volts')
    title('v(t) after truncation')
    pause
    v = vn;
    t = tn;
    Tw = NewTw;
    N = NewN;
    clear vn
    clear tn
end
MoreData = input('Do you want diff. size data array?  (1=yes, 0=no)   ');
if MoreData == 1
    NewN = input('Enter new data array size   ');
    disp('New time window can not be larger than current window')
    NewTw = input('Enter new Time Window in NanoSeconds =   ');
    dt = NewTw/NewN;
    disp('the new sample spacing, dt, is (in ns)')
    disp(dt)
    for i=1:NewN
        tn(i) = i*dt;
        vn(i) = interp1(t,v,tn(i),'linear');
        % note: interp1 is MatLab interpolation subroutine
    end
    % caution: interpl can create NaN for end points
    vn(1) = vn(2);
    vn(NewN) = vn(NewN-1);
    t = tn;
    v = vn;
    plot(t,v,'.b')
    grid
    xlabel('time in ns')
    ylabel('Volts')
    title('v(t) after modifying N or Tw')
    pause
end
plot(tin,vin,'ob',t,v,'.g')
grid
xlabel('time in ns')
ylabel('Volts')
title('v(t) before (blue) & after modification (green)')
pause
plot(t,v,'b')
grid
xlabel('time in ns')
ylabel('Volts')
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title('Modified Waveform Array, v(t)')
pause
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
    dlmwrite(dname,v,'\r');
    disp('Output Data written to disc')
end
disp('end of WaveModifyV2.m program')
```