

Dan Hauer 10-10-05 BSLF

W.N.A
11/10/05
2:10PM

I have been working on creating a Matlab test file to verify the operation of my usage of the $\text{fft}()$ function. The file creates two sinusoidal signals as the left and right source signals to test. ~~I will create a SIFT-m function that accepts~~ After I verify the correct operation of the fft , I will work on implementing the ICLD calculation.

The test-main.m file creates the test signals and takes the n -point fft of an ~~n~~ n -point sample of the source signal. I have begun work on the ICLD module which will accept the n -point fft of a signal and output the n -point ΔL array with the indexes corresponding to the frequency points

$$\arg = \tan^{-1} \left(\frac{\text{imag}(s)}{\text{real}(s)} \right)$$

↑
After speaking to Dr Stewart about the function 'arg' in the *Trangelista and Vire* paper. We suspect it means the phase of the argument as shown above.

I have completed a prototype of the ICLD function, but matlab is giving an error pertaining to 'undefined' arguments to the log10 function, so division by zero is most likely the culprit.

The function I am trying to implement from EU papers is:

$$\Delta L(k, q) = 20 \log_{10} \left| \frac{X_{\text{right}}(k, q)}{X_{\text{left}}(k, q)} \right|$$

Equation 3-1 ICLD calculation.

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The main test module at this point is printed below

```
% *****
% BSLF test_main
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% *****

Fs = 1000; % Sampling frequency
dur = 2; % Signal duration
freq_L = 200; % Signal frequency
freq_R = 200;

n = 512; % Number of points to sample and fft
t = 0:1/Fs:dur;
f = Fs*(1:n/2)/n;

amp_L = 1; % Signal amplitudes
amp_R = 1.5;

source_L = amp_L * sin(freq_L*2*pi*t); % Signals
source_R = amp_R * sin(freq_R*2*pi*t);

stft_L = fft(source_L(1:n+1),n); % n point fft
stft_R = fft(source_R(1:n+1),n); % of n points

figure(1)
subplot(211)
plot(t/Fs,source_L);
subplot(212)
stem(f,abs(stft_L(1:(n/2))),'.')

figure(2)
subplot(211)
plot(t/Fs,source_R);
subplot(212)
stem(f,abs(stft_R(1:(n/2))),'.')

L = icld(stft_L,stft_R,n);

figure(3)
stem(L)
```

Code listing 4-1 Main m-file to test functions.

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```

% *****
% BSLF ICLD.m
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% *****

function L = icld(stft_L, stft_R, n)

for i = 1:n
    L(i) = 20 * log10 * abs((stft_R(i)/stft_L(i) + 0.00001));
end

```

Code listing 5-1 ICLD computation.

After printing the file, the problem is obvious:

$$L(i) = 20 * \log_{10} * \text{abs} \dots$$

should be: \updownarrow

$$L(i) = 20 * \log_{10}(\text{abs} \dots)$$

fixed.

The module appears operational now.

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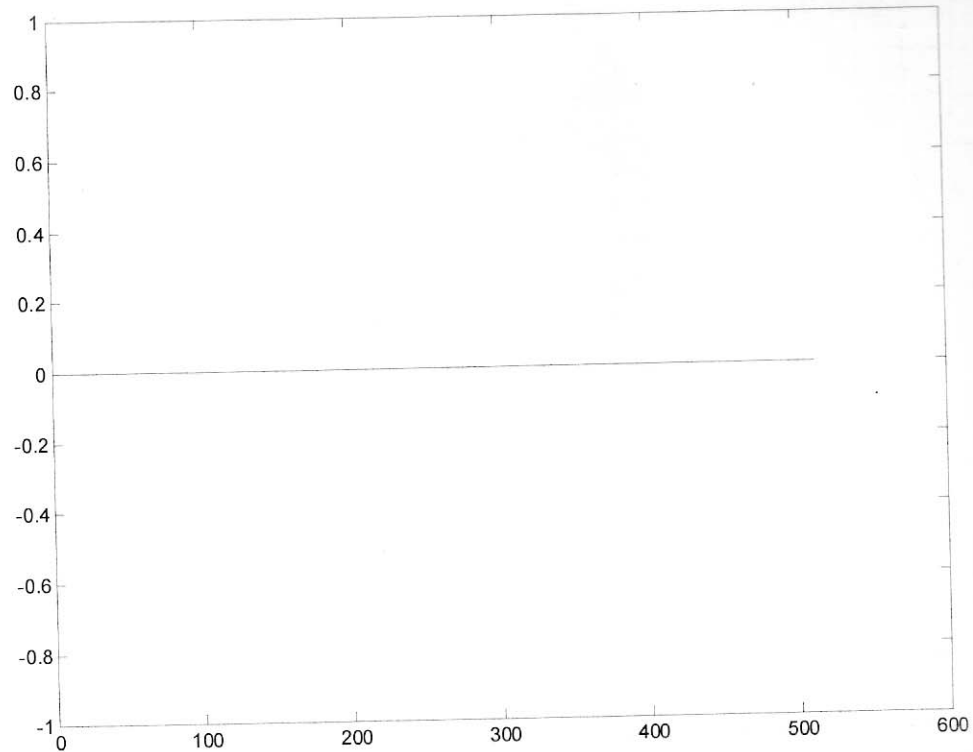
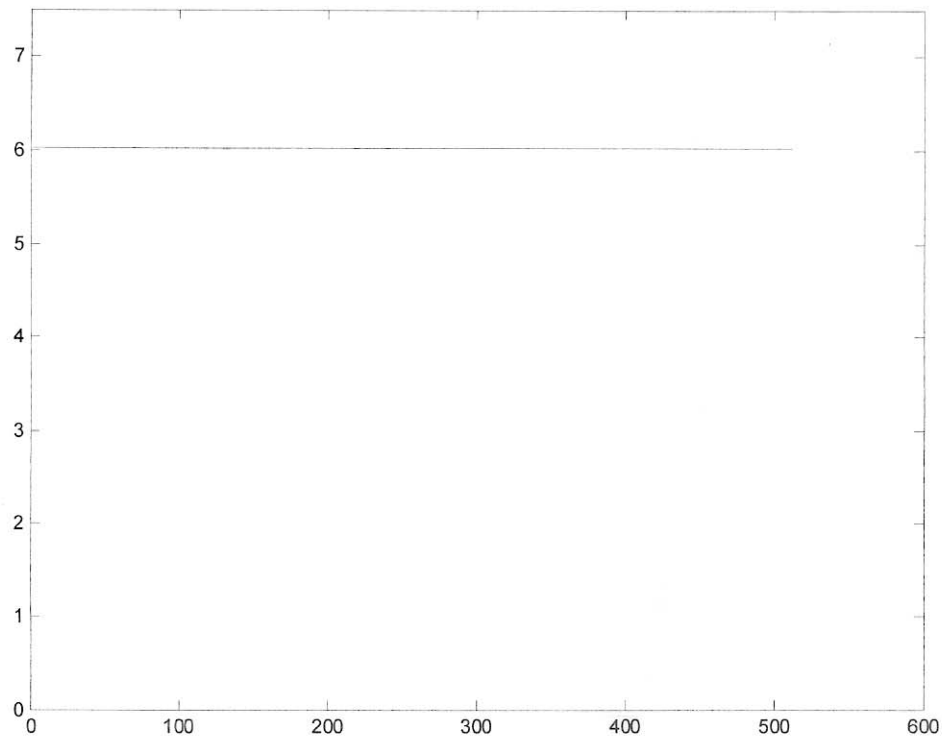
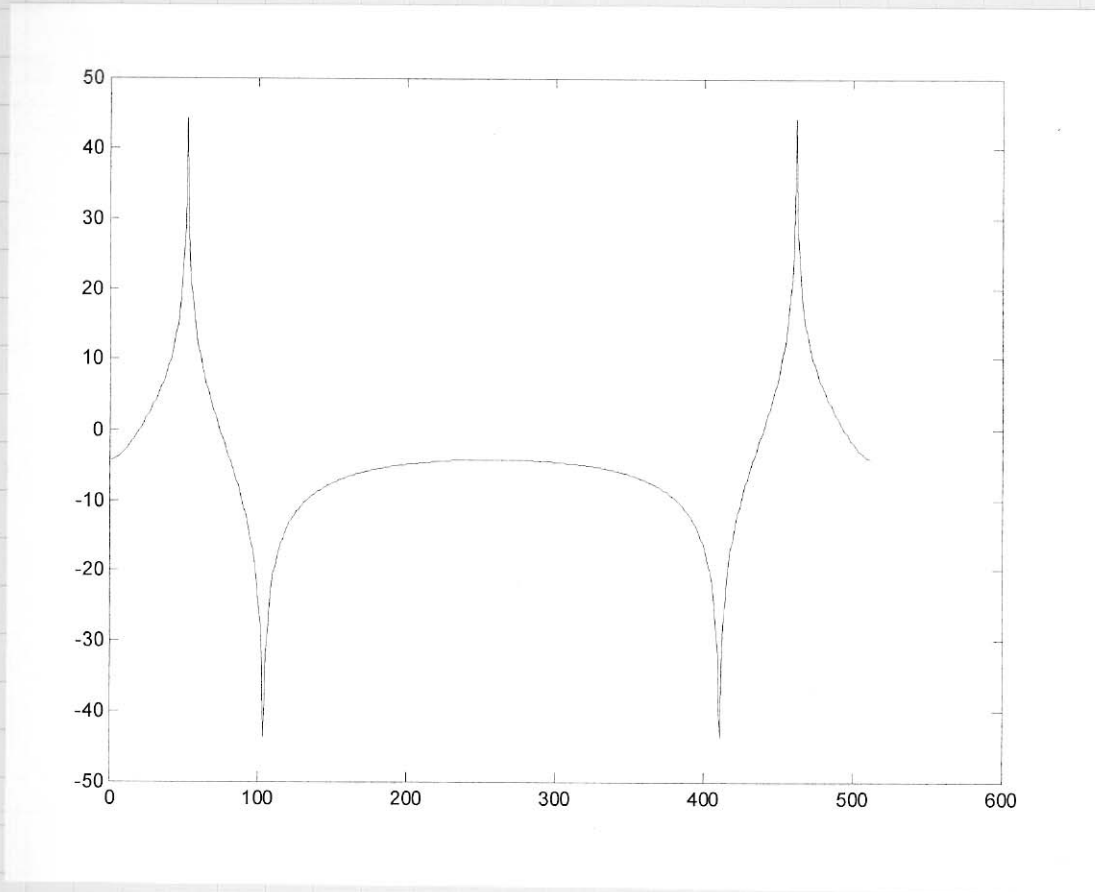


Figure 6-1 ECLD output when $\text{amp}_L = \text{amp}_R = 1$



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Figure 7-1 FCLD output with $\text{freq-L} \neq \text{freq-R}$.