Spectrogram Examples

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MATLAB code

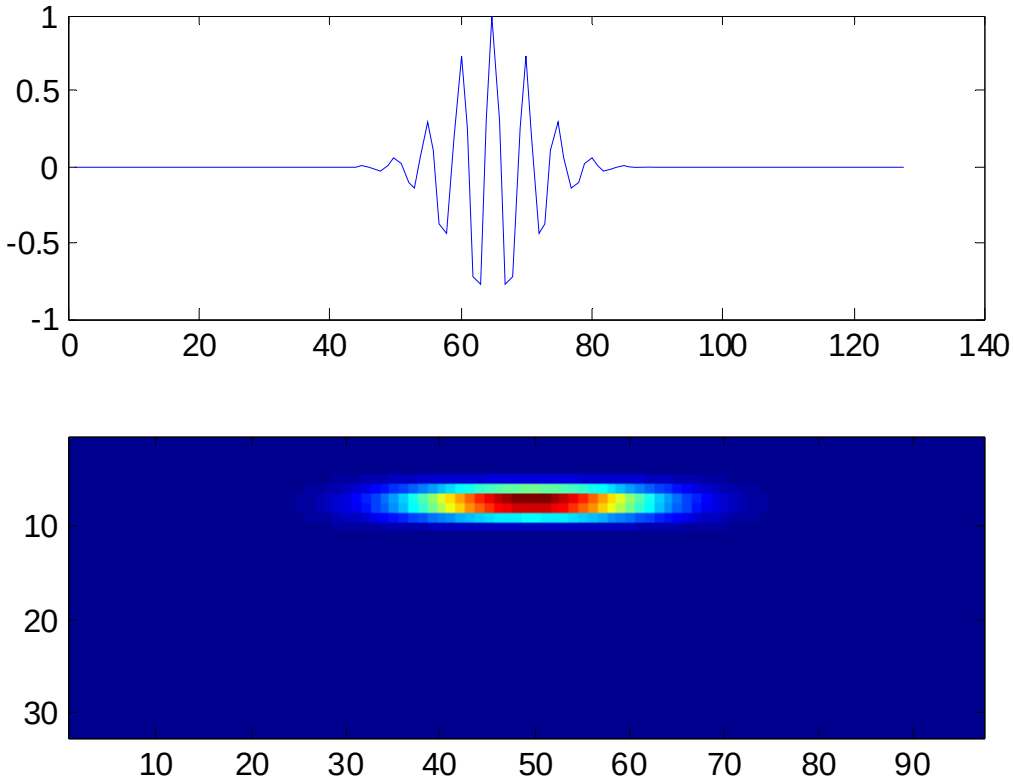
- You can use the MATLAB command: specgram
- SPECGRAM Spectrogram using a Short-Time Fourier Transform (STFT).
- B = SPECGRAM(A) calculates the spectrogram for the signal in vector A.
- SPECGRAM divides the signal into overlapping segments, windows each
- segment and forms the columns of B with their discrete Fourier
- transforms.
-
- B = SPECGRAM(A,NFFT,Fs) specifies the number of FFT points used to
- calculate the discrete Fourier transforms. If NFFT = [] or is not
- specified the default NFFT = minimum of 256 and the length of A. Fs is
- the sampling frequency which does not effect the spectrogram but is
- used for scaling plots. If Fs=[] or is not specified it defaults to 2
- Hz.
-
- B = SPECGRAM(A,NFFT,Fs,WINDOW,NOVERLAP) uses WINDOW to window each
- overlapping segment and forms the columns of B with their zero-padded,
- length NFFT discrete Fourier transforms. If you specify a scalar for
- WINDOW, SPECGRAM uses a Hanning window of length NFFT. WINDOW must
- have a length smaller than or equal to NFFT and greater than NOVERLAP.
- NOVERLAP is the number of samples each segement of A overlaps. The
- default value of NOVERLAP = length(WINDOW)/2.

Example

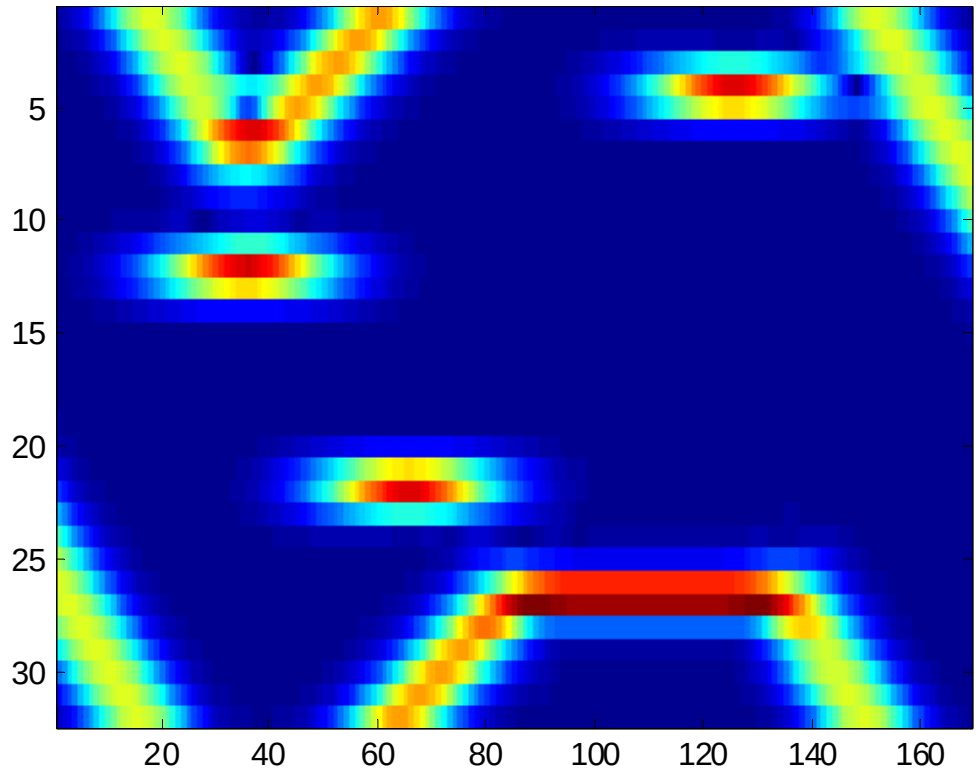
```
%logon;
x=logon(64,0.4,128);
tflog=specgram(x,32,128,32,31);
subplot(211);
plot(real(x));
subplot(212);
imagesc(abs(tflog));
pause;
figure
%demo signal;
tfdemo=specgram(demosig,32,200,32,31);
imagesc(abs(tfdemo));
pause
figure;
% effect of the window length;
y=[zeros(1,128),exp(j*0.6*[1:128])];
subplot(411);
plot(real(y));
subplot(412);
tf1=specgram(y,16,256,16,15);
imagesc(abs(tf1));
subplot(413);
tf2=specgram(y,32,256,32,31);
imagesc(abs(tf2));
subplot(414);
tf3=specgram(y,64,256,64,63);
imagesc(abs(tf3));
```

```
t=0:0.001:2;                % 2 secs @ 1kHz sample rate
tf1=specgram(y,256,1E3,256,250);
y=chirp(t,0,1,150);         % Start @ DC, cross 150Hz at t=1sec
t=-2:0.001:2;               % +/-2 secs @ 1kHz sample rate
y=chirp(t,100,1,200,'q');   % Start @ 100Hz, cross 200Hz at t=1sec
tf2=specgram(y,128,1E3,128,120); % Display the spectrogram
figure;
subplot(211)
imagesc(abs(tf1));
title('Linear Chirp: start at DC, cross 150Hz at t=1sec');
subplot(212)
imagesc(abs(tf2));
title('Quadractic Chip: start at 100Hz and cross 200Hz at t=1sec');
```

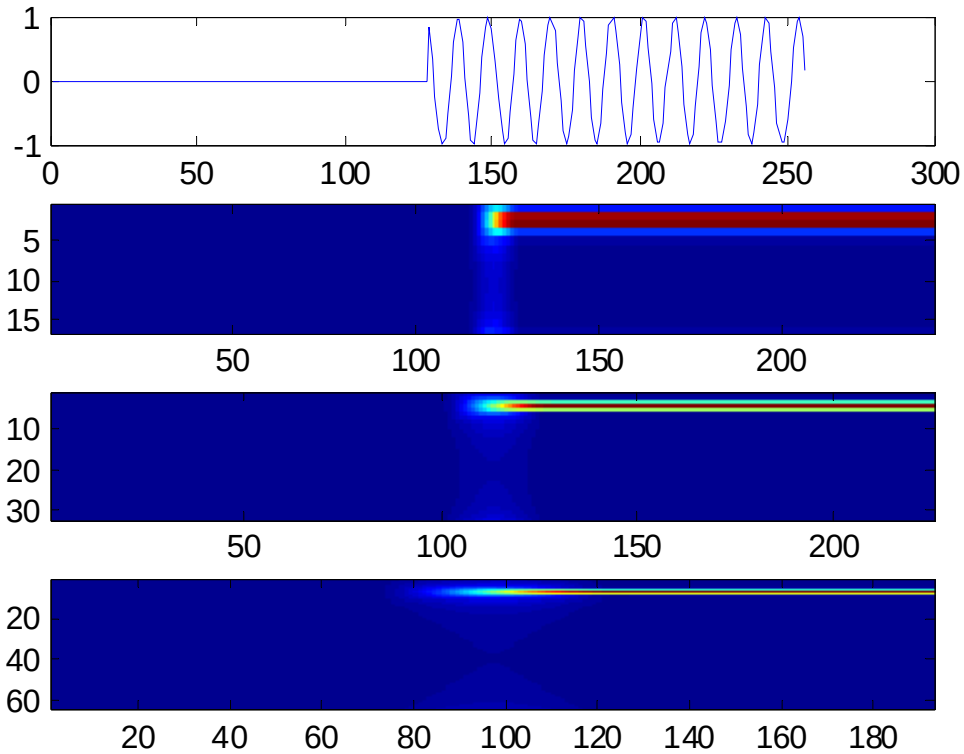
Logon



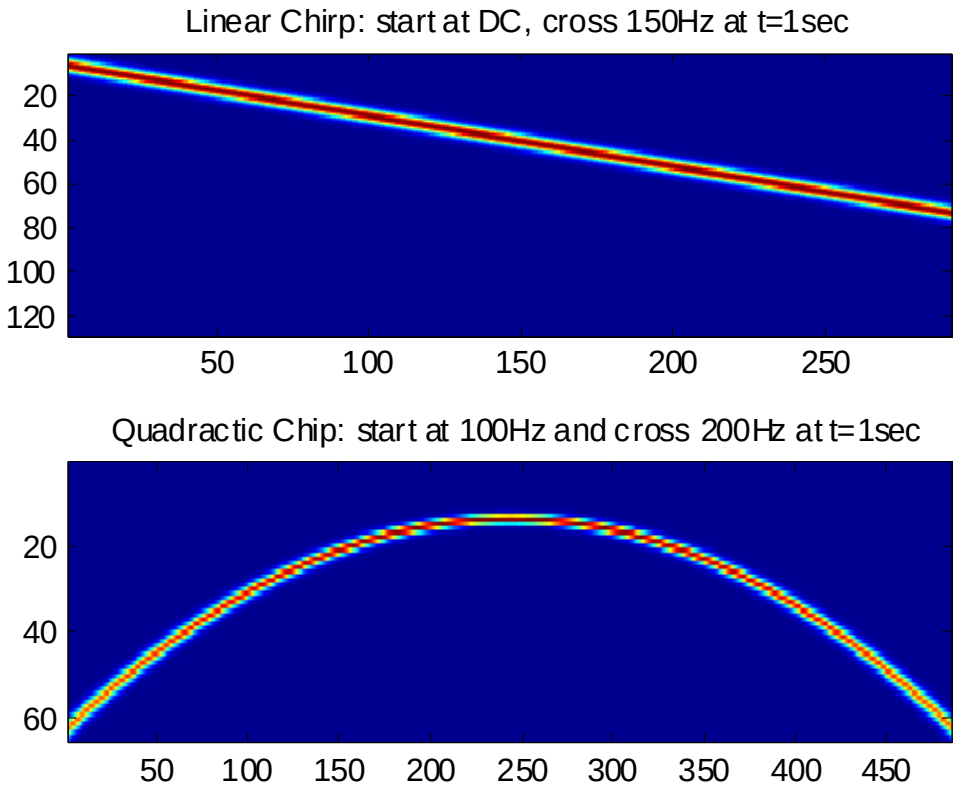
Demo Signal



Effect of Window Length



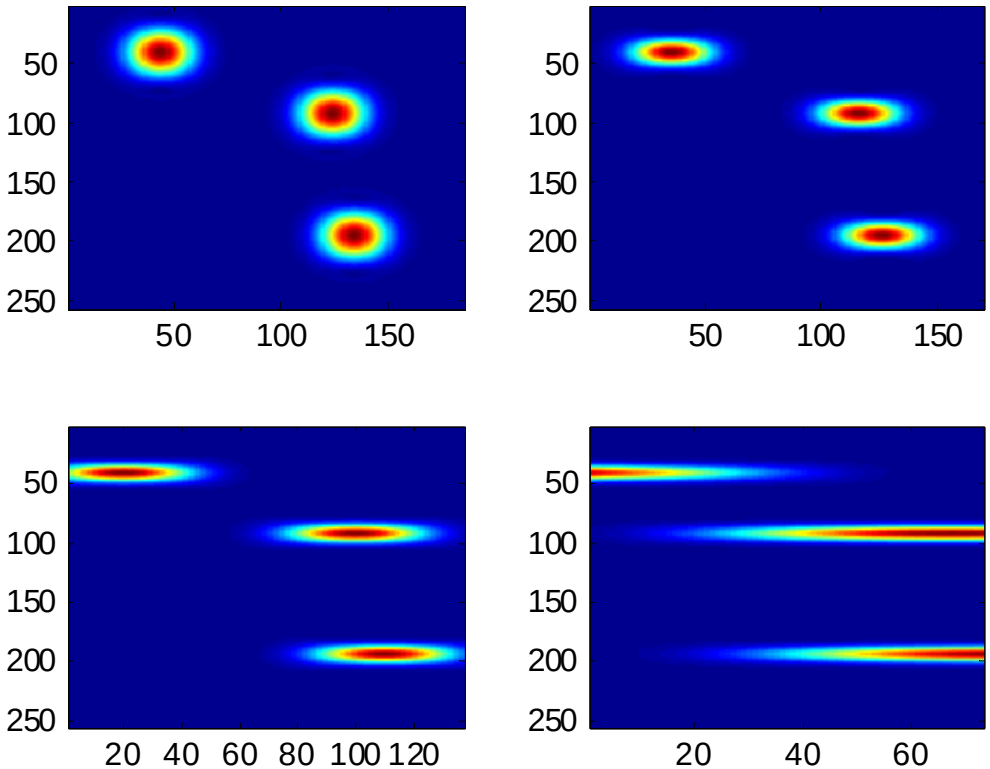
Chirp Signals



Spectrogram Examples-2

- %spcgrm;
- x=logon(50,0.3,200)+logon(130,0.7,200)+logon(140,-0.5,200);
- S1=specgram(x,256,200,16,15);
- S2=specgram(x,256,200,32,31);
- S3=specgram(x,256,200,64,63);
- S4=specgram(x,256,200,128,127);
- subplot(221);
- imagesc(abs(S1));
- subplot(222);
- imagesc(abs(S2));
- subplot(223);
- imagesc(abs(S3));
- subplot(224);
- imagesc(abs(S4));
- %example 2;
- x=exp(j*0.5*[1:200])+exp(j*2*[1:200]);
- S=specgram(x,256,200,32,31);
- figure
- imagesc(abs(S));

Multiple Logons



Two Sinusoids