q3

March 12, 2018

1 Create a spectrogram

1.0.1 Function to calculate spectrogram

```
% Create a simple spectrogram
% Input
%   X - initial signal
%   W - window length
%   s - stride
% Output
%   result - image produced by the spectrogram

function [result] = SPECTROGRAM(y,W,s)
    num_iter = int16((size(y,1) - W)/s) + 1;
    fin_img = zeros(num_iter,W+1);
    result = zeros(num_iter,int16(size(fin_img,2)/2));
    for i = [1:num_iter-2]
        f_y = fft(y(i*s:W + i*s));
        f_y = fftshift(f_y);
        fin_img(i,1:size(f_y)) = abs(f_y);
    end
    fin_img = log(fin_img +1);
    fin_img = mat2gray(fin_img);
    result = fin_img(1:min(size(result,1),int16(W/2)) ,int16(end/2) + 1:end);
    imshow(result);
    axis on;
    ylabel('Samples');
    xlabel('Frequency');
    colorbar;
    title('New Spectrogram');
end
```

1.0.2 Run on different sounds and compare image produced

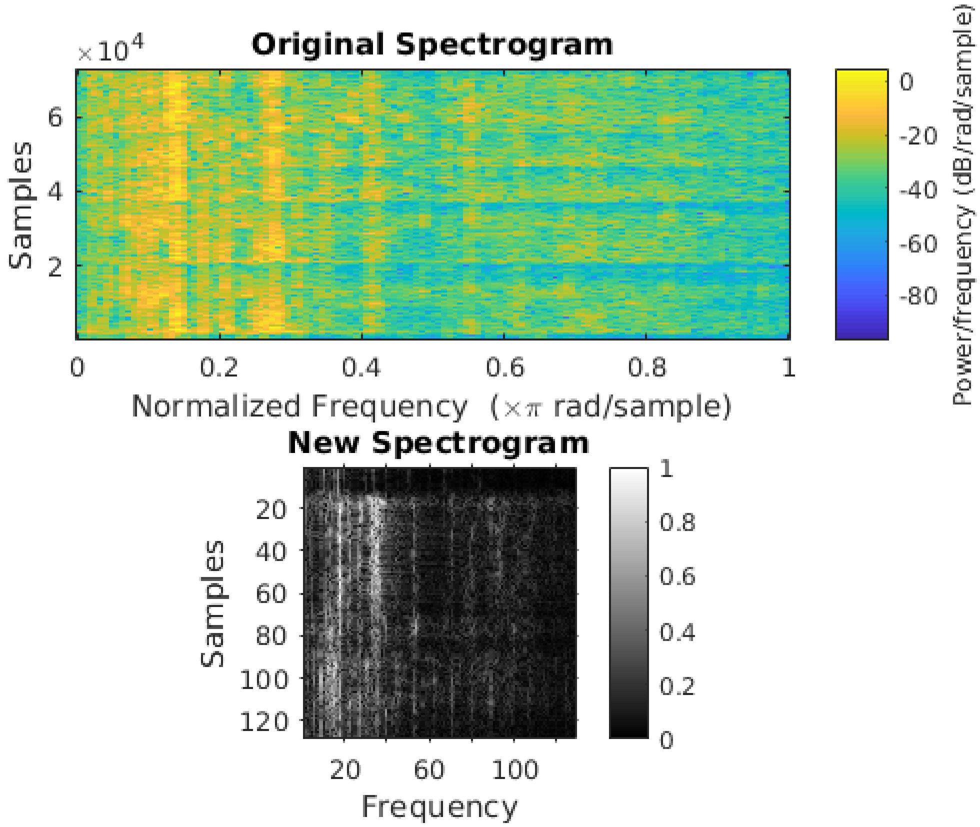
1.handel

```
In [6]: load 'handel.mat';
        sound(y);
```

```
W = 256;
s = 128;

% Using inbuilt spectrogram
figure;
subplot(2,1,1);
spectrogram(y,W,W/s);
title('Original Spectrogram');

% Using my spectrogram
subplot(2,1,2);
fin_img = SPECTROGRAM(y,W,s);
```



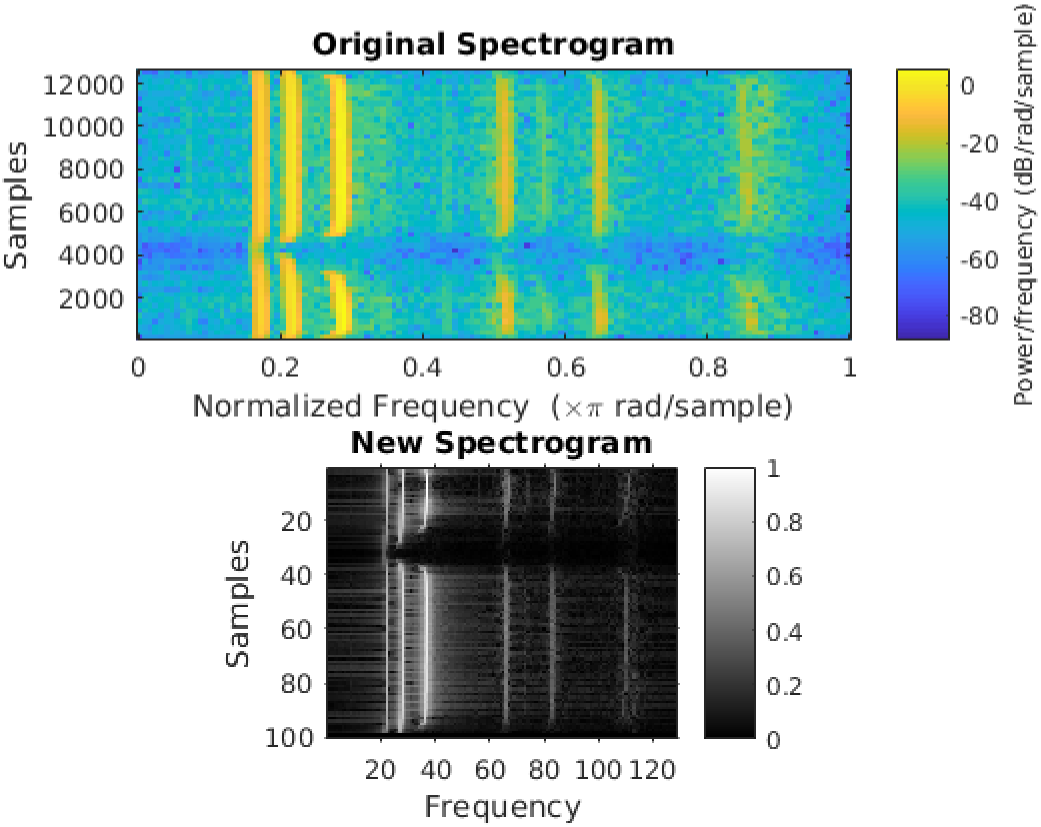
2.Train

```
In [2]: load train;
        sound(y);

        W = 256;
        s = 128;
```

```
% Using inbuilt spectrogram
figure;
subplot(2,1,1);
spectrogram(y,W,W/s);
title('Original Spectrogram');

% Using my spectrogram
subplot(2,1,2);
fin_img = SPECTROGRAM(y,W,s);
```



Original Spectrogram

New Spectrogram

3.Laughter

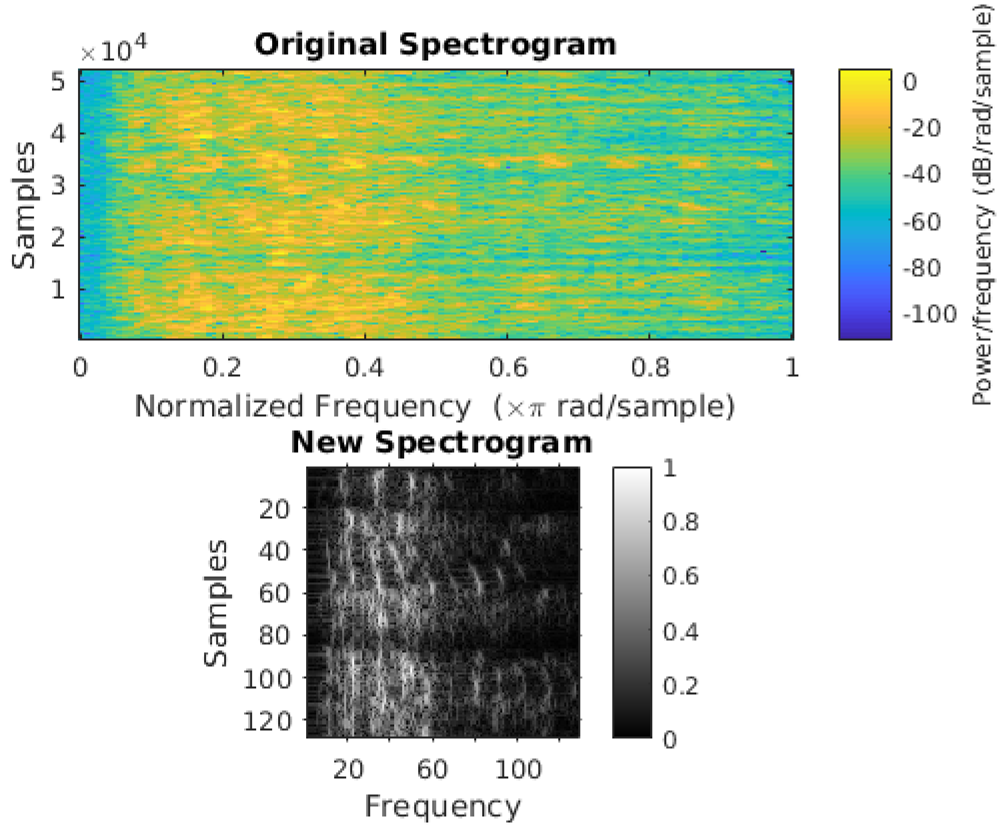
```
In [1]: load laughter;
        sound(y);

        W = 256;
        s = 64;

        % Using inbuilt spectrogram
        figure;
```

```
subplot(2,1,1);
spectrogram(y,W,W/s);
title('Original Spectrogram');

% Using my spectrogram
subplot(2,1,2);
fin_img = SPECTROGRAM(y,W,s);
```



1.0.3 Results

1.0.4 Window size

- Lesser window size => coarse image
- Wider window size => fine image
- because precision of fft reduces with decrease in N(width)

1.0.5 Stride

- More stride less width of spectrogram
- Less stride more time to compute