LAB ASSIGNMENT 4

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1. Aim and Scope:

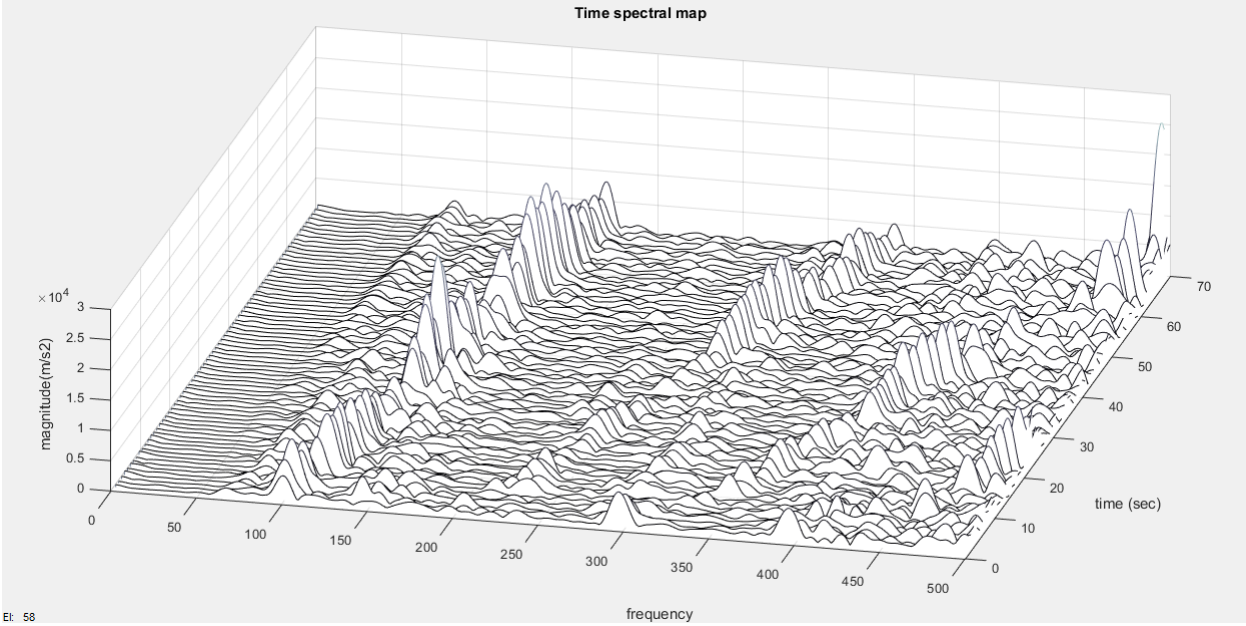
The aim of this experiment is to perform frequency analysis in MATLAB concerning rotating machinery by observing their vibration signals. We observe the signals with the help of MATLAB functions Waterfall.

2. Detailed Calculations and Results:

2.1 Task 1: Vibration from Tracked Vehicle.

In this task a signal recorded when an armoured tracked vehicle running at speed is given which consists of a vibrational signal, speed signal and sampling frequency from which a time spectral map is to be produced for the given parameters

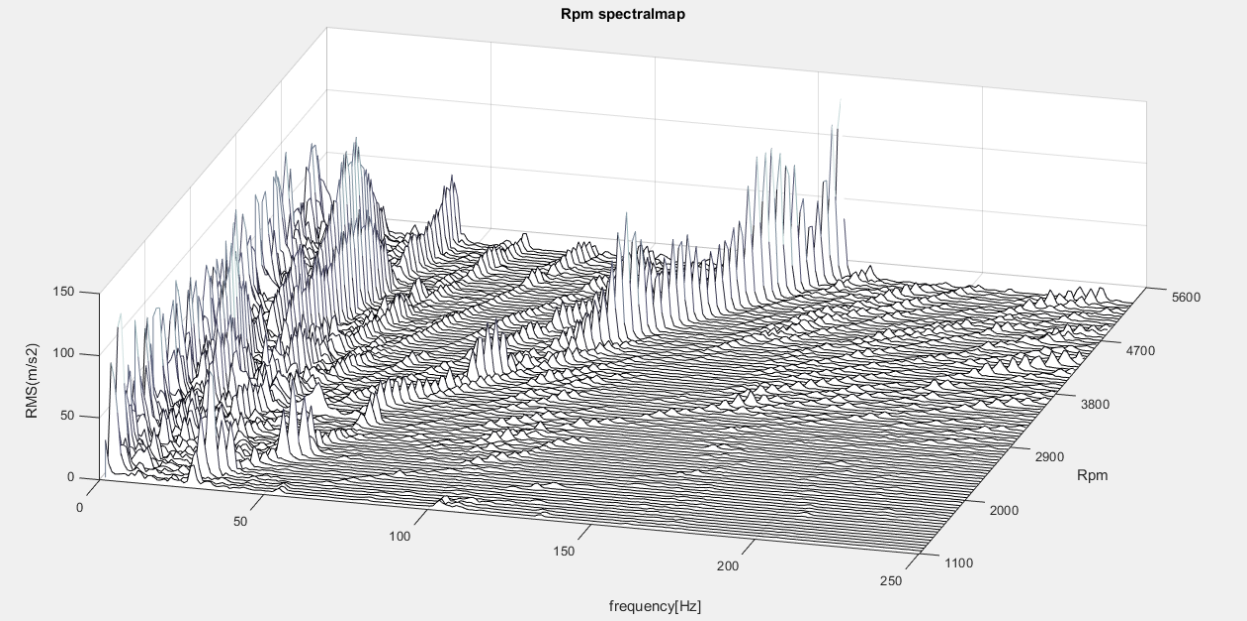
We use waterfall plot since it gives three dimensional plots. The time spectral plot is as obtained as shown in the following figure.



2.2 Task 2: Vibration from Rotating Machinery.

In this task a signal recorded in a passenger car with engine running at varying speed is given which consists of vibration & a tacho signal for which we have to produce RPM spectral map for the given parameters.

We first get Rpm as function of time from which the Rpm spectral map is plotted and is as shown in following figure.



3.Conclusion:

From the experiment we observed the changes in the vibrations of the rotating machinery with respect to time and frequency. The three dimensional diagrams plotted in MATLAB using waterfall function with the vibrations from rotating machinery depicts the various properties regarding the machinery.

4.References:

[1]. Noise and vibration analysis: signal analysis and experimental procedures 2010/2011 written by Anders Brandt.

[2]. Math works.

Appendix:

Task 1:

```
clc
clear all
close all
load ass4_signal1.mat
K=length(x);
y=round(K/200);
window=hann(1540);
fft_blocksize=8192;
for i=1:199
k(i,:)=x((((i-1)*(y))+1):(y+(i-1)*(y))).*window;
q(i,:)=abs(fft(k(i,:),fft_blocksize));
end
waterfall(q)
xlim([0 500])
ylim([0 70])
colormap bone
grid on;
xlabel('frequency')
ylabel('time (sec)')
zlabel('magnitude(m/s2)')
title('Time spectral map')
```

Task 2:

```
clc
clear all
close all
load ass4_signal2.mat
p=length(x);
t1=1:p;
trigglevel=0;
z=sign(tacho-trigglevel);
d1=diff(z);
```

```
t2=t1(2:end);
tt=t2(find(d1==2));
r=60/1./diff(tt);
n=round(length(x)/95);
window=hann(6640);
for i=1:94
k(i,:)=x((((i-1)*(n))+1):(n+(i-1)*(n))).*window;
q(i,:)=abs(fft(k(i,:)));
end
waterfall(q)
xlim([0 250])
% ylim([1100 5800])
set(gca,'yticklabel',(1100:900:5800))
colormap bone
grid on;
ylabel('Rpm')
xlabel('frequency[Hz]')
zlabel('RMS(m/s2)')
title('Rpm spectralmap')
```