Report.

Method:

1. Since the signals we are going to analyse usually have a trend, therefore, finding the frequency of the trend would can be useful for after analysis.
2. Apply the finding frequency method to the “damping sin” and “multiple sin” model to see the result.
3. Apply the CSD and CORR method on TE model output data.

Result:

1. Find the frequency:
2. Using fft
   1. Apply discrete Fourier transform on the signal
   2. Compute the single-sided spectrum.
   3. Find the frequency with the largest amplitude (can be changed to find the peak which has the lowest frequency, but in our testing the peak with the largest amplitude always have lowest frequency)

ii) Using magnitude squared coherence estimate

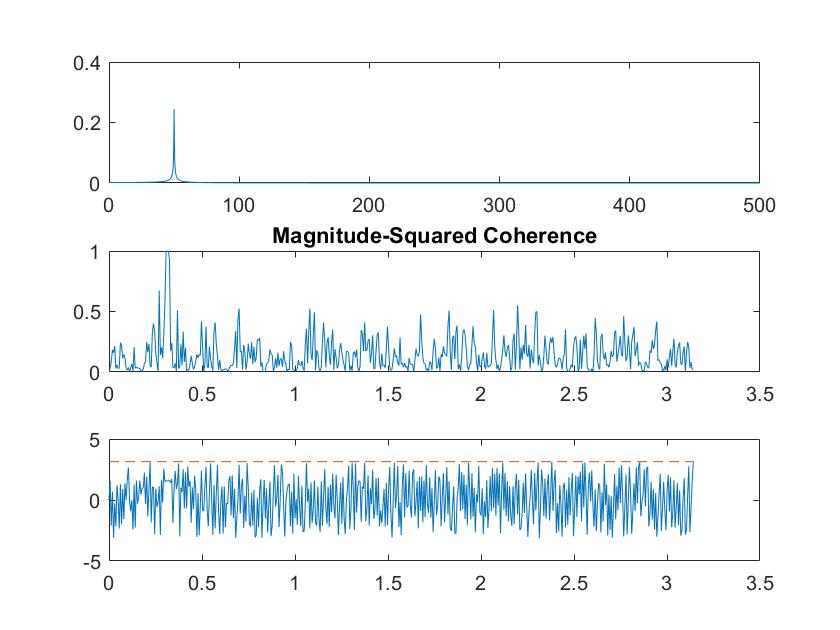
a) Apply the method directly on the signal (matlab command : mscohere)

b) The frequency used is where the magnitude squared coherence has the largest or second largest value.

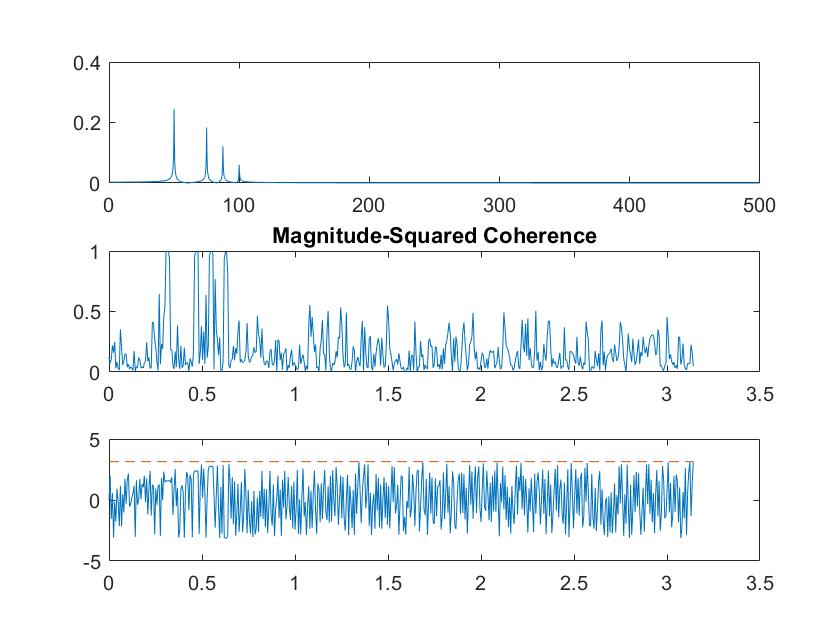
1. Testing
   1. Testing on damping sin and multi sin
      1. Frequency calculated VS frequency set

|  |  |  |
| --- | --- | --- |
|  | Frequency set | Frequency calculated |
| Damping sin | 10Hz | 9.9975 |
| 30Hz | 29.9925 |
| 50Hz | 49.9875Hz |
|  | Frequency set | Frequency calculated |
| Multi sin | 10Hz | 9.9975 |
| 30Hz | 29.9925 |
| 50Hz | 49.9875Hz |

Damping sin



Multi sin



As we see the frequency calculated is very close to the real value.

* + 1. Magnitude squared coherence method was used in calculating the delay of
  1. Testing on the TE output signal

There are 15 sets of TE output signals were used for testing. Because we do not know the frequency of these signals, we insert delay into the signal and test our method.

Delay calculates (%xmeas 1 2 3 4 7 8 9 10 11 12 14 15 17 23 40)



Table 1.

The first and third rows of the table 1, the 0.01s delay was inserted, for second and fourth rows the 1s delay was inserted.

The first and second rows used Correlation method and the third and fourth rows the CSD method was used.

As we most of the time the Correlation method worked well on these signals, and CSD method was way off.

ii)