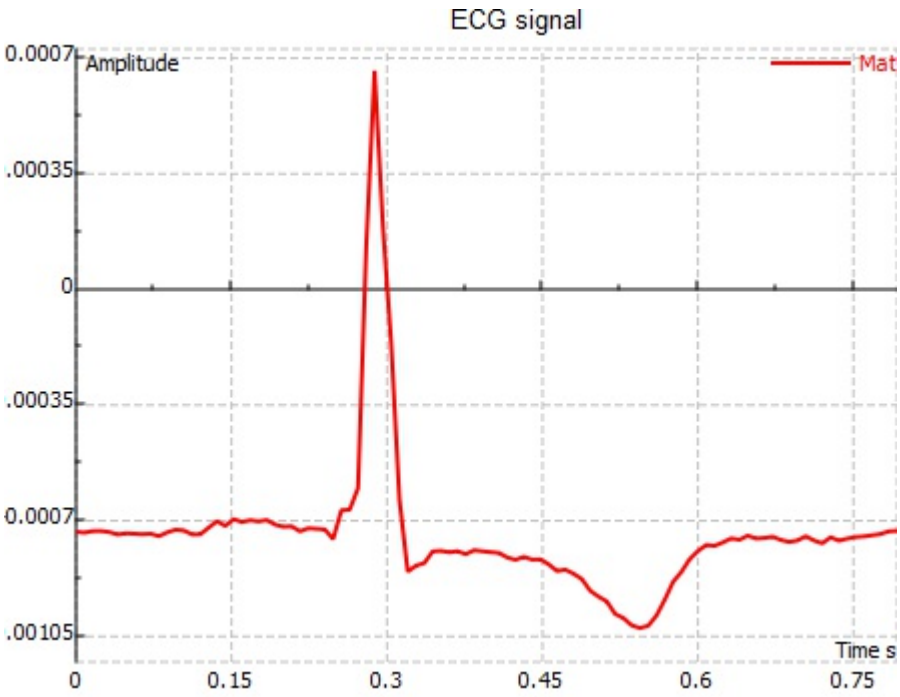
Filtering of ECG signal with DC bias

The following example represents how the ECG signal is recorded and how it can be displayed and manipulated in order to remove the DC bias and any high frequency noise in an .xls file .

```
a := excel read("ECG.xlsx" , "Sheet 1" , "A1:A100" , false)   Read data from .xlsx file
Fs := 125   Hz, sampling frequency
N := size(a)   Length of signal
Dt := curve2d(x , 0 , (N - 1) / Fs , N)   Time axis
dt := col2vec(Dt , 0)
Mat := join mat cols(dt , a)   Graph of ECG in time domain
```

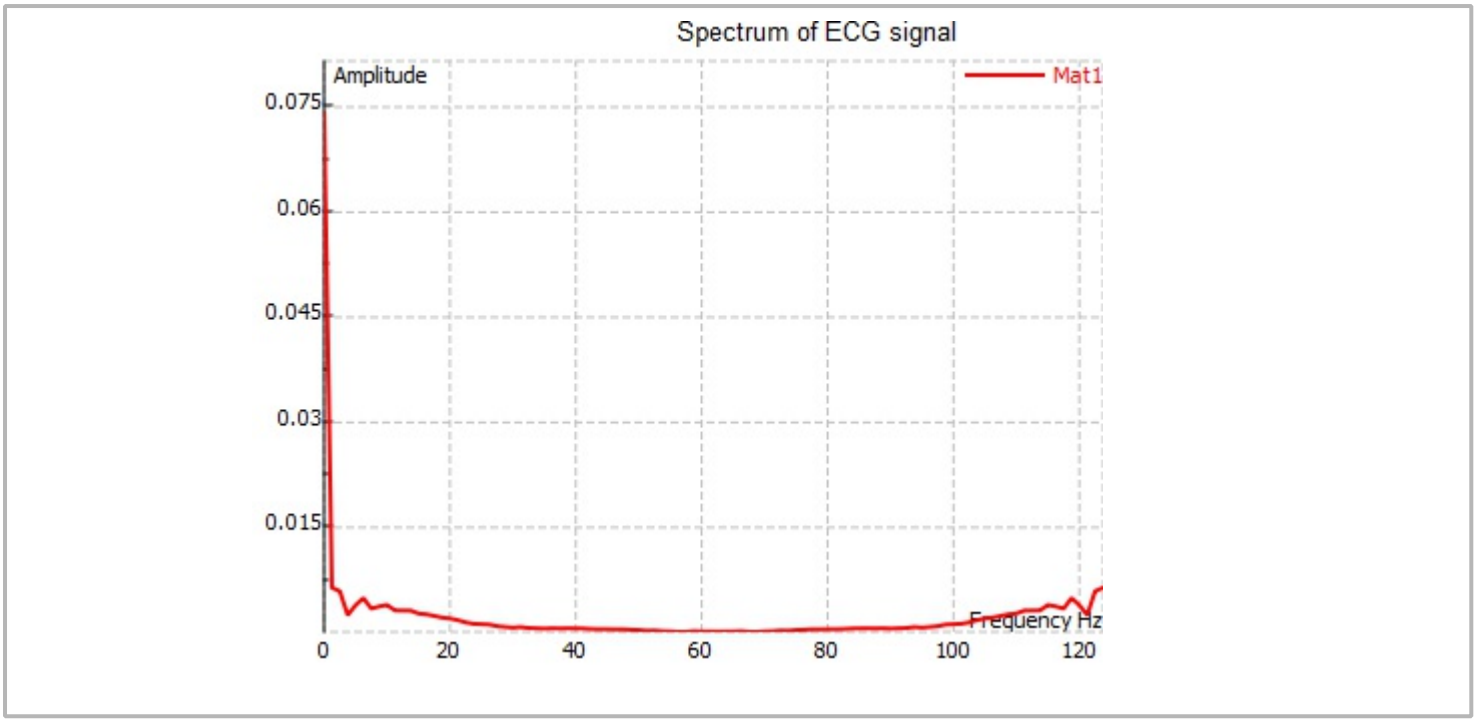


The next thing is to process the signal with a simple DC blocking IIR filter with the following transfer function:

$$H(z)=(z-1)/(z-p).$$

We can also show the spectrum of the input signal a.

```
y := fft1(a)   Spectrum of the input ECG signal
y11 := |y|   Amplitude spectrum of the input ECG signal
f := curve2d(x , 0 , (N - 1) / (N / Fs) , N)   Frequency axis
ft := col2vec(f , 0)
Mat1 := join mat cols(ft , y11)   Graph of the amplitude spectrum of ECG signal
```



The filtering can be performed using a code to implement the simple IIR filter.

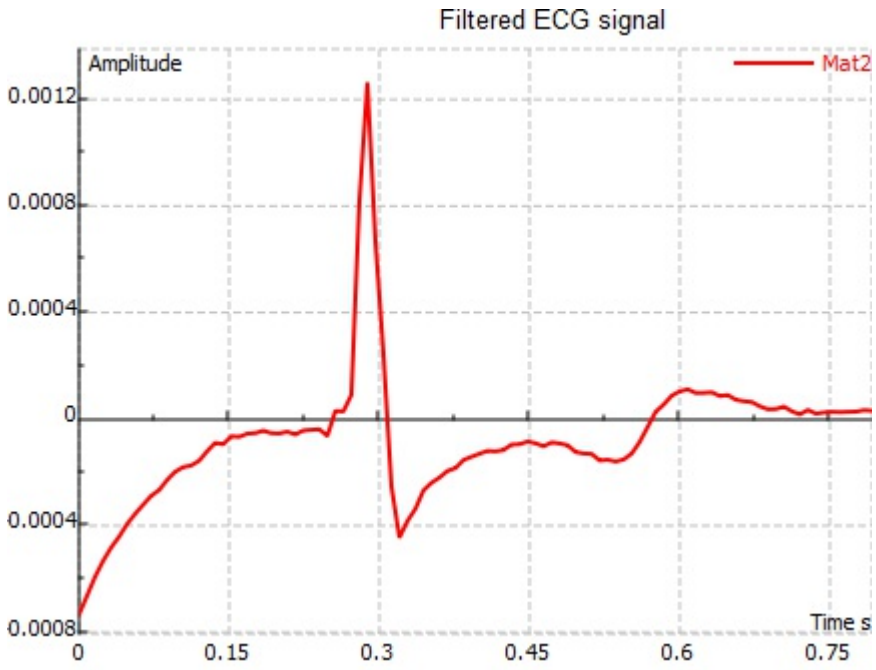
```
aout := DCfilt(a)      Filter the input ECG signal using function DCfilt()

DCfilt(vec)
{
  sz := size(vec)
  xprev := 0.0
  yprev := 0.0
  pole := 0.9
  Matr := vector create(sz , false , 0)
  for(i := 0 , i < sz , i += 1 )
  {                                        IIR filter implemented to remove DC bias
    temp := vec[i]
    temp1 := (temp - xprev ) + yprev · pole
    Matr[i] = temp1
    xprev = temp
    yprev = temp1
  }

  return(Matr)
}
```

We can see the filtered signal and its spectrum.

Mat2 := join mat cols(dt , aout) Graph of the filtered ECG signal



yout := fft1(aout) Spectrum of the filtered ECG signal

y1out := |yout| Amplitude spectrum of the filtered ECG signal

Mat3 := join mat cols(ft , y1out) Graph of the amplitude spectrum of the filtered ECG signal