

# 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 .xlsx file .

```
a:= excel read("ECG.xlsx" , "Sheet 1" , "A1:A100" , false)  Read data from .xlsx file
```

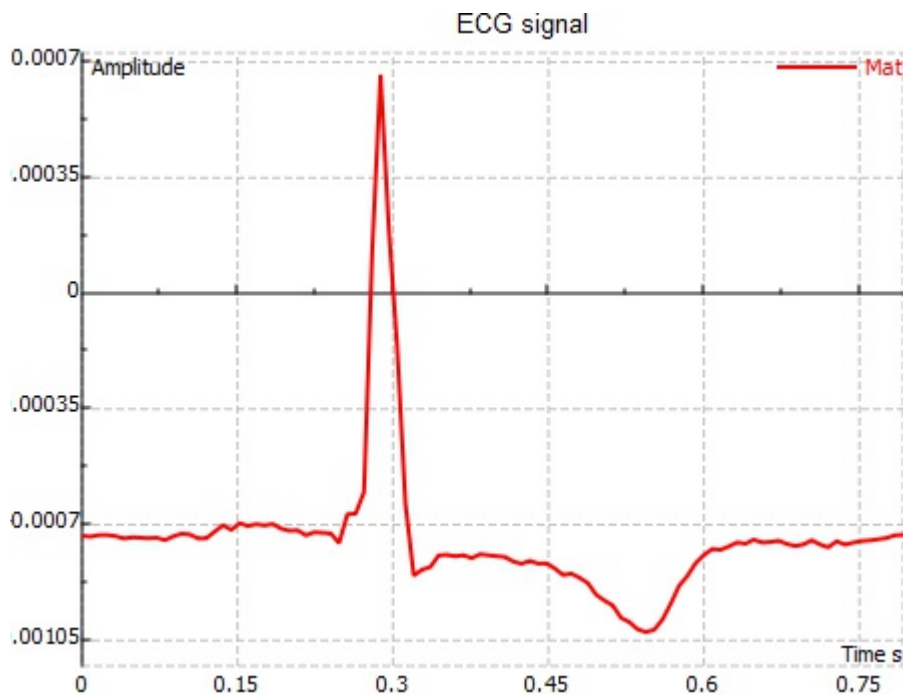
```
Fs:= 125  Hz, sampling frequency
```

```
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.

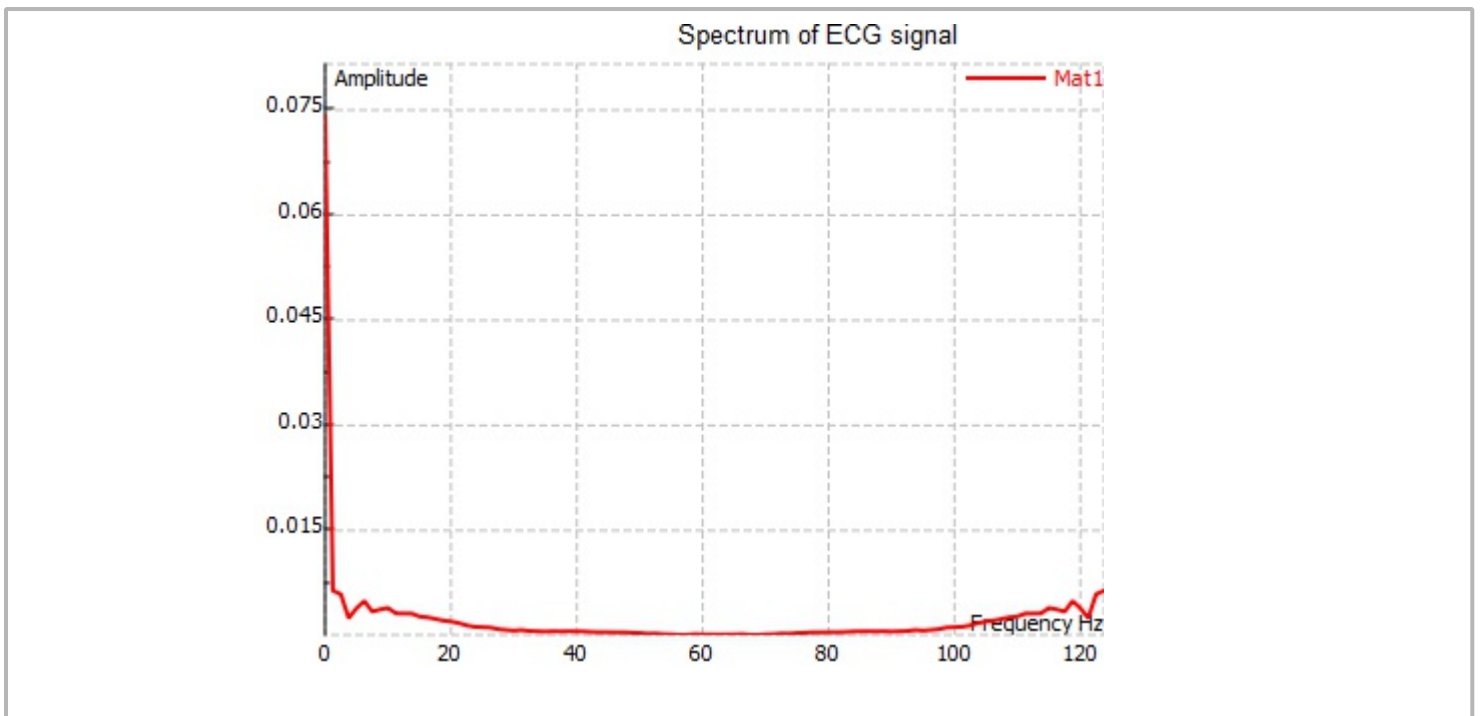
```
y:= fft1(a)  Spectrum of the input ECG signal
```

```
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)

```

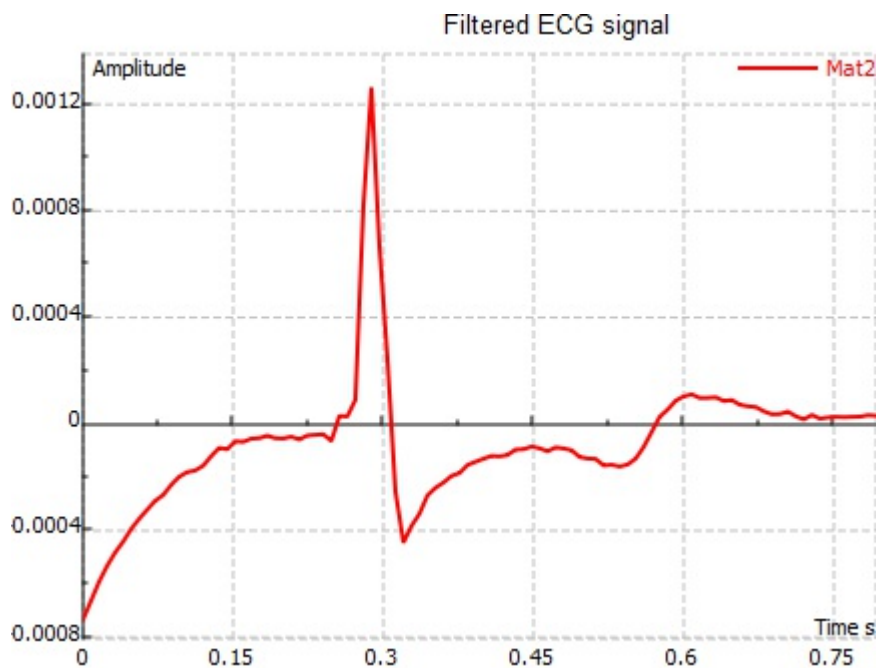
{
1  sz:= size(vec)
2  xprev:= 0.0
3  yprev:= 0.0
4  pole:= 0.9
5  Matr:= vector create(sz , false , 0)
  for(i:= 0 , i<sz , i+= 1 )
  {
6    1  temp:= vec[i]
      2  temp1:= (temp - xprev )+ yprev · pole
      3  Matr[i] = temp1
      4  xprev= temp
      5  yprev= temp1
  }
7
8  return(Matr)
}

```

IIR filter implemented to remove DC bias

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

