Muscle activity analyzer

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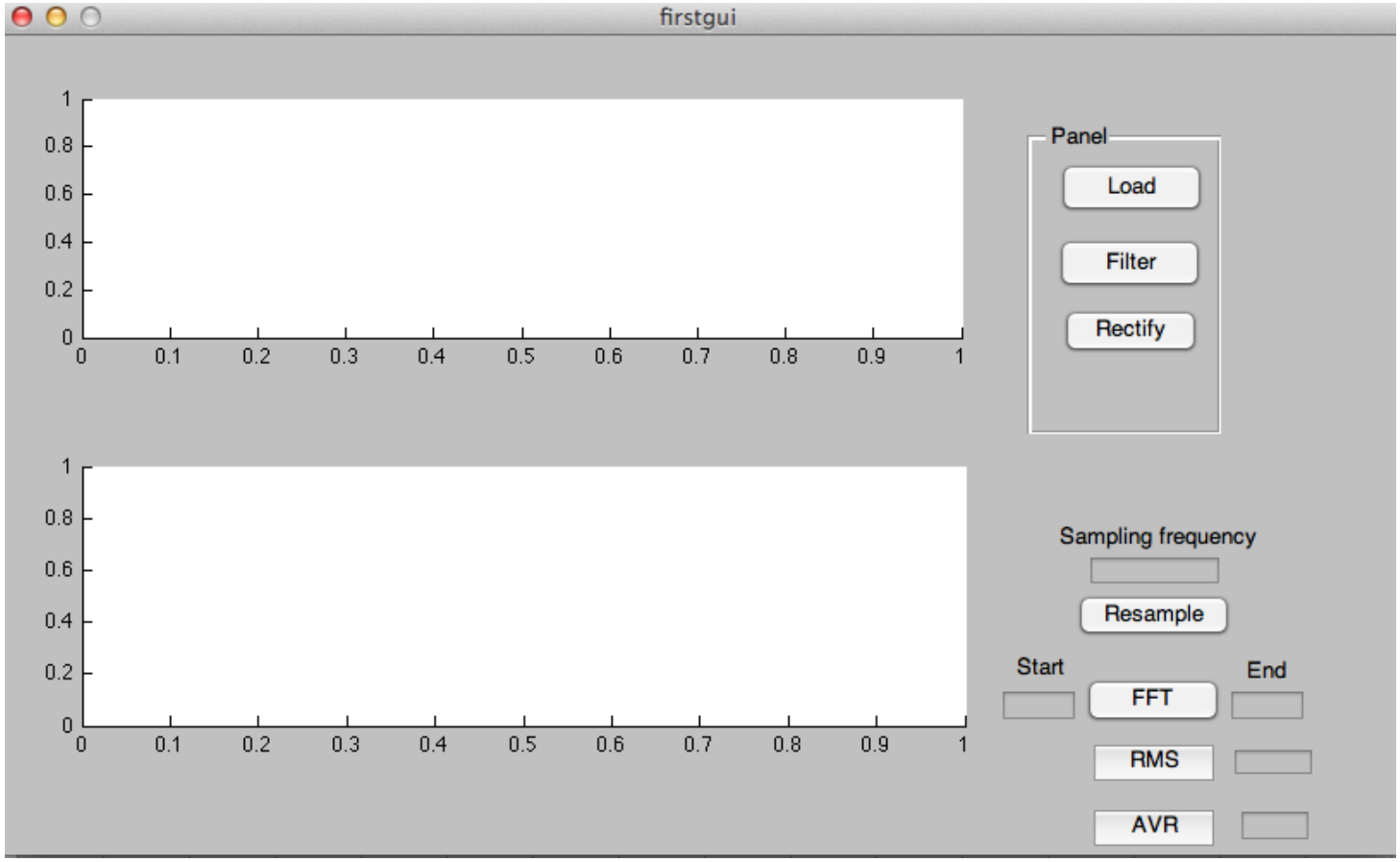
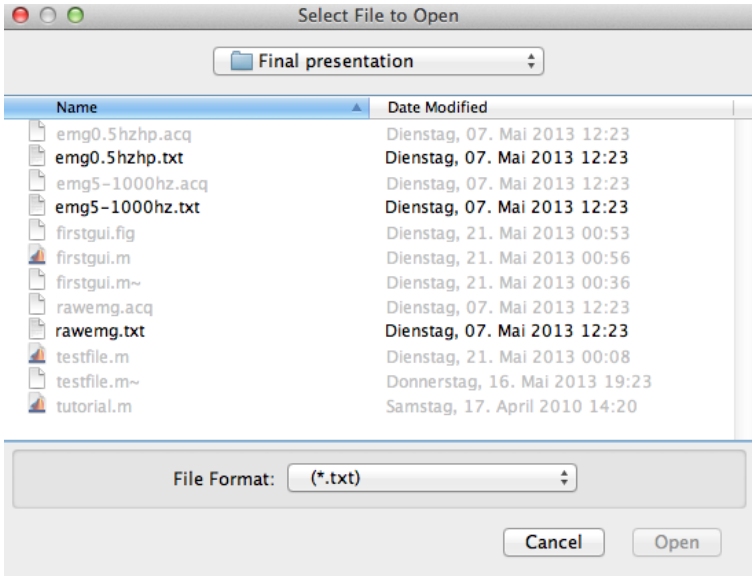
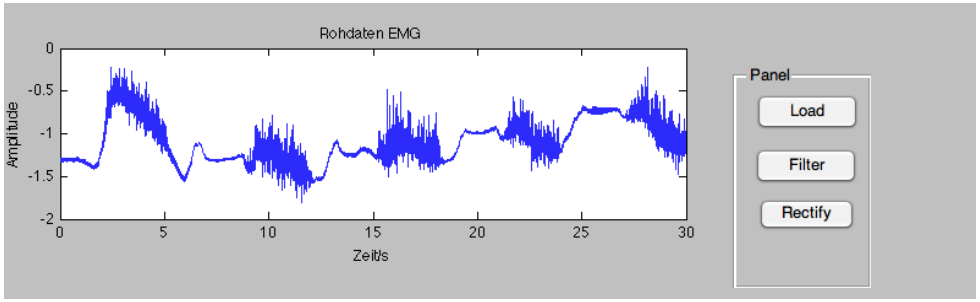
Layout


firstgui
1
0.8
0.6
0.4
0.2
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Panel
Load
Filter
Rectify
Sampling frequency
Resample
Start
End
FFT
RMS
AVR

Import Data

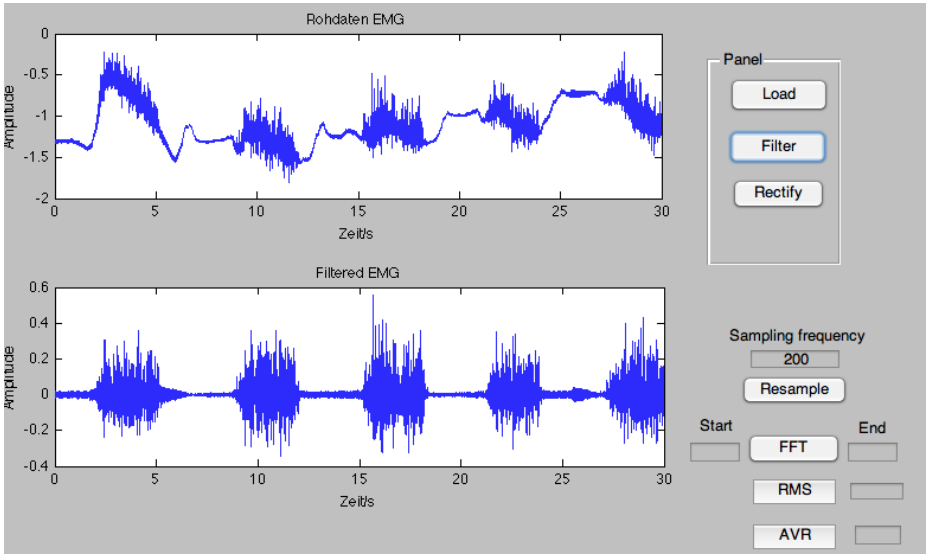





```
% --- Executes on button press in loadfile.
function loadfile_Callback(hObject, eventdata, handles)
% hObject    handle to loadfile (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
filename=uigetfile('.txt');
data=importdata(filename);
handles.xaxis=data.data(:,1);
handles.yaxis=data.data(:,2);
handles.fa=round(length(handles.xaxis)/handles.xaxis(length(handles.xaxis)));
handles.fa2=handles.fa;
handles.T=length(handles.yaxis)/handles.fa2;
set(handles.samplingr,'string',handles.fa);
plot(handles.axes1,handles.xaxis,handles.yaxis);
plot(handles.axes1,handles.xaxis,handles.yaxis);
title(handles.axes1,'Rohdaten EMG');
xlabel(handles.axes1,'Zeit/s');
ylabel(handles.axes1,'Amplitude');
guidata(hObject,handles);
```

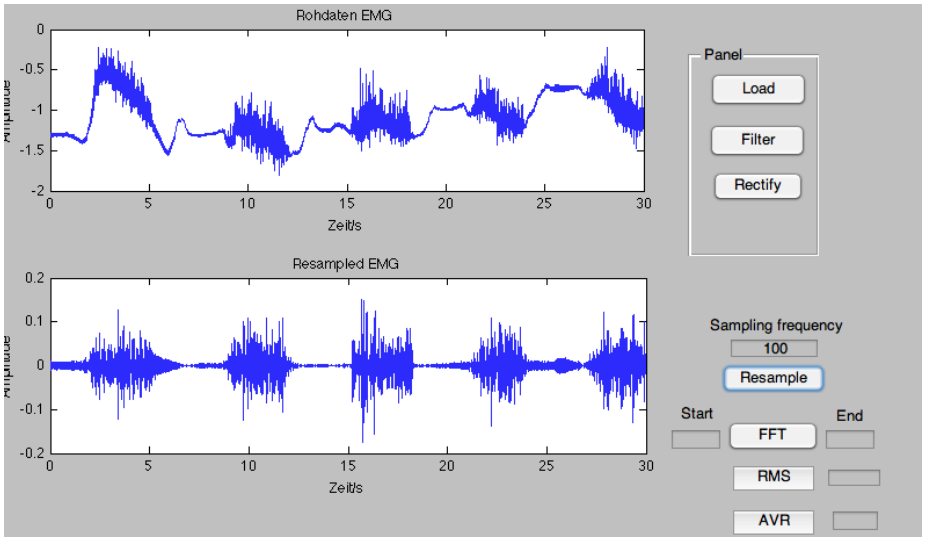
Filter

```
% --- Executes on button press in filter.
function filter_Callback(hObject, eventdata, handles)
% hObject    handle to filter (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
wu=30/handles.fa;
wo=250/handles.fa;
[b1,a1]=butter(2,2*wu,'high');
y=filtfilt(b1,a1,handles.yaxis);
set(handles.samplingr,'string',handles.fa);
handles.fa2=handles.fa;

%250 Hz lowpass only necessary if the sampling rate is higher
if handles.fa>=250 && handles.counter==0
        [b3,a3]=butter(2,2*wo,'low');
        y3=filtfilt(b3,a3,y);
        [b2,a2]=butter(2,[59/handles.fa,61/handles.fa],'stop');
        handles.y2=filtfilt(b2,a2,y3);

else
    [b2,a2]=butter(2,[59/handles.fa,61/handles.fa],'stop');
    handles.y2=filtfilt(b2,a2,y);
end
handles.x2=handles.xaxis;
plot(handles.axes2,handles.x2,handles.y2);
title(handles.axes2,'Filtered EMG');
xlabel(handles.axes2,'Zeit/s');
ylabel(handles.axes2,'Amplitude');
guidata(hObject,handles);
```



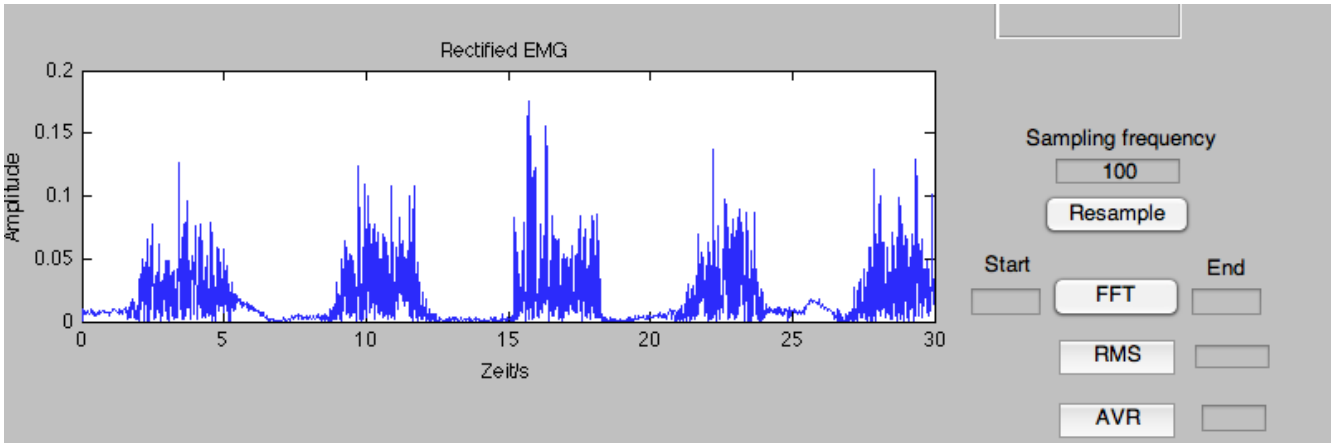
Resample

```
% --- Executes on button press in resample.
function resample_Callback(hObject, eventdata, handles)
% hObject    handle to resample (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
if handles.y2==0
    yaxisnew=resample(handles.yaxis,handles.fanew,handles.fa2);
    new=0:1/handles.fanew:30-1/handles.fanew;
    plot(handles.axes2,new,yaxisnew);
    title(handles.axes2,'Resampled EMG');
    xlabel(handles.axes2,'Zeit/s');
    ylabel(handles.axes2,'Amplitude');
    handles.y2=yaxisnew;
    handles.fa2=handles.fanew;
    handles.x2=new;
else
yaxisnew=resample(handles.y2,handles.fanew,handles.fa2);
new=0:1/handles.fanew:30-1/handles.fanew;
plot(handles.axes2,new,yaxisnew);
title(handles.axes2,'Resampled EMG');
xlabel(handles.axes2,'Zeit/s');
ylabel(handles.axes2,'Amplitude');
handles.y2=yaxisnew;
handles.fa2=handles.fanew;
handles.x2=new;
end
handles.counter=1;
guidata(hObject,handles);
```




```
function samplingr_Callback(hObject, eventdata, handles)
% hObject    handle to samplingr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of samplingr as text
%        str2double(get(hObject,'String')) returns contents of samplingr as a double

handles.fanew=str2double(get(hObject,'String'));
guidata(hObject,handles);
```

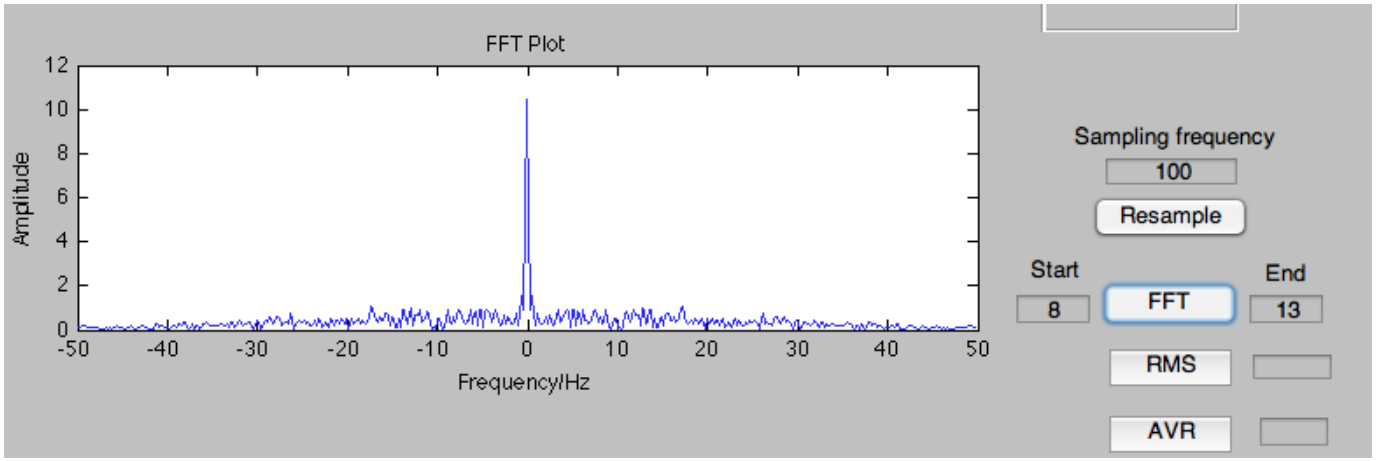
Rectify



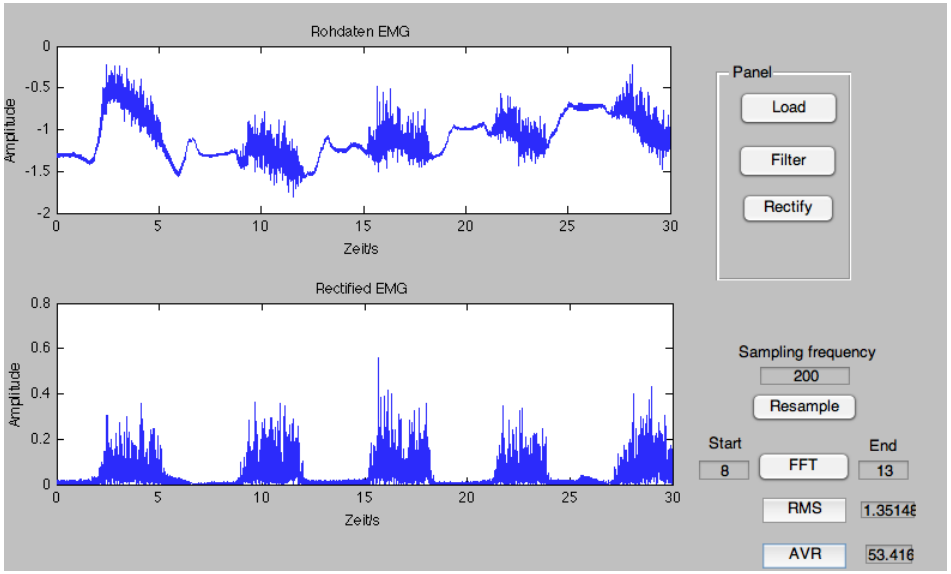

```
% --- Executes on button press in rectify.
function rectify_Callback(hObject, eventdata, handles)
% hObject    handle to rectify (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
handles.y2=abs(handles.y2);
plot(handles.axes2,handles.x2,handles.y2);
title(handles.axes2,'Rectified EMG');
xlabel(handles.axes2,'Zeit/s');
ylabel(handles.axes2,'Amplitude');
guidata(hObject,handles);
```

FFT

```
% --- Executes on button press in fft.
function fft_Callback(hObject, eventdata, handles)
% hObject    handle to fft (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
start1=handles.fa2*handles.startpoint;
end1=handles.fa2*handles.endpoint;
ytransform=handles.y2(start1:end1);
T=length(ytransform)/handles.fa2;
xfft=-handles.fa2/2:1/T:handles.fa2/2-1/T;
yfft=fft(ytransform);
plot(handles.axes2,xfft,fftshift(abs(yfft)));
title(handles.axes2,'FFT Plot');
xlabel(handles.axes2,'Frequency/Hz');
ylabel(handles.axes2,'Amplitude');
```



RMS and AVR




```
function start_Callback(hObject, eventdata, handles)
% hObject    handle to start (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of start as text
%        str2double(get(hObject,'String')) returns contents of start as a double
handles.startpoint=str2double(get(hObject,'String'));
guidata(hObject,handles);
```

```
function end2_Callback(hObject, eventdata, handles)
% hObject    handle to end2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of end2 as text
%        str2double(get(hObject,'String')) returns contents of end2 as a double
handles.endpoint=str2double(get(hObject,'String'));
guidata(hObject,handles);
```

```
% --- Executes on button press in RMS.
function RMS_Callback(hObject, eventdata, handles)
% hObject    handle to RMS (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
yrms=handles.yaxis(handles.fa*handles.startpoint:handles.fa*handles.endpoint);
rms=sqrt(mean(yrms.^2));
set(handles.rms,'string',rms);
```

```
% --- Executes on button press in AVR.
function AVR_Callback(hObject, eventdata, handles)
% hObject    handle to AVR (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
yavr=handles.y2(handles.fa2*handles.startpoint:handles.fa2*handles.endpoint);
avr=sum(yavr);
set(handles.avr,'string',avr);
```