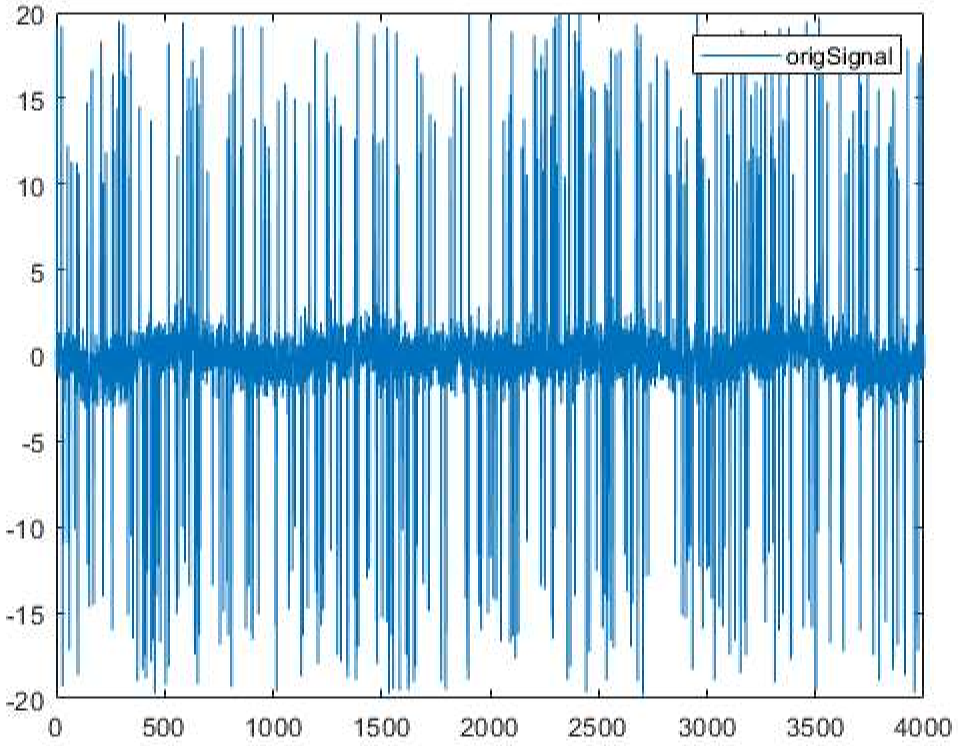
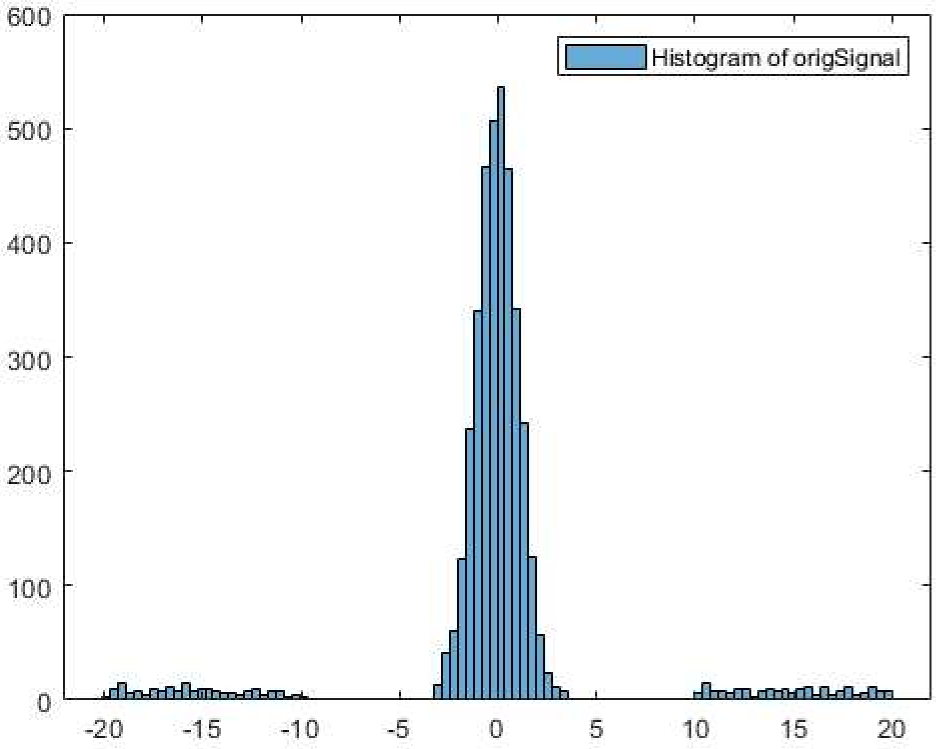
Contents

Denoising a signal - How to clean a specific noisy signal

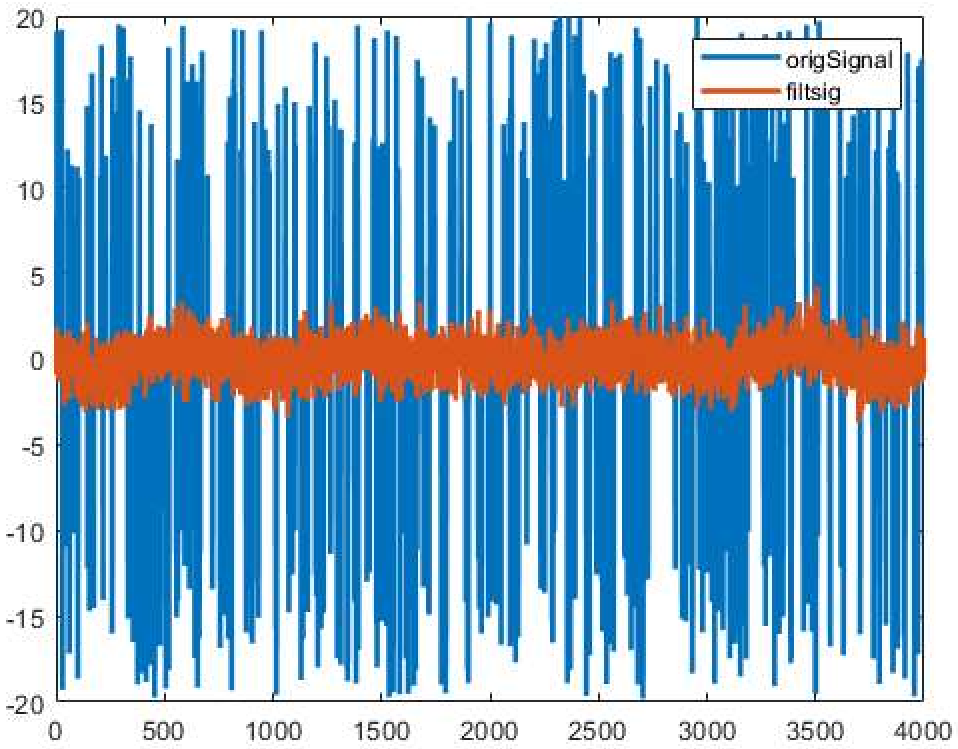
```
load denoising_code.mat
% whos
%   origSignal 1x4000 (noisy signal)
figure(1), clf
plot(origSignal);
legend({'origSignal'})

% Use hist to pick threshold
figure(2), clf
histogram(origSignal,100)
legend({'Histogram of origSignal'})
%zoom on

n = 4000;

% Visual-picked threshold
threshold1 = 5;
threshold2 = -5;

% Find data values above threshold1 & below threshold2
datathresh1 = find (origSignal > threshold1);
datathresh2 = find (origSignal < threshold2);

% Initialize filtered signal
filtsig = origSignal;
```





looping through the data threshold points and set to median of k

```
% The higher the k value the smoother the filtsig will be
k = 20; % actual window is k*2+1

% Looping through the data above the threshold (datathresh1)
for ti=1:length(datathresh1)

    % find lower and upper bounds
    lowbnd1 = max(1,datathresh1(ti)-k);
    uppbnd1 = min(datathresh1(ti)+k,n);

    % compute median of surrounding points
    filtsig(datathresh1(ti)) = median(origSignal(lowbnd1:uppbnd1));
end

% Looping through the data below the threshold (datathresh2)
for ti=1:length(datathresh2)

    % find lower and upper bounds
    lowbnd2 = max(1,datathresh2(ti)-k);
    uppbnd2 = min(datathresh2(ti)+k,n);

    % compute median of surrounding points
    filtsig(datathresh2(ti)) = median(origSignal(lowbnd2:uppbnd2));
end

% plot
figure(3), clf
plot(1:n,origSignal, 1:n,filtsig, 'linew',2)
legend({'origSignal'; 'filtsig'})
%zoom on
```



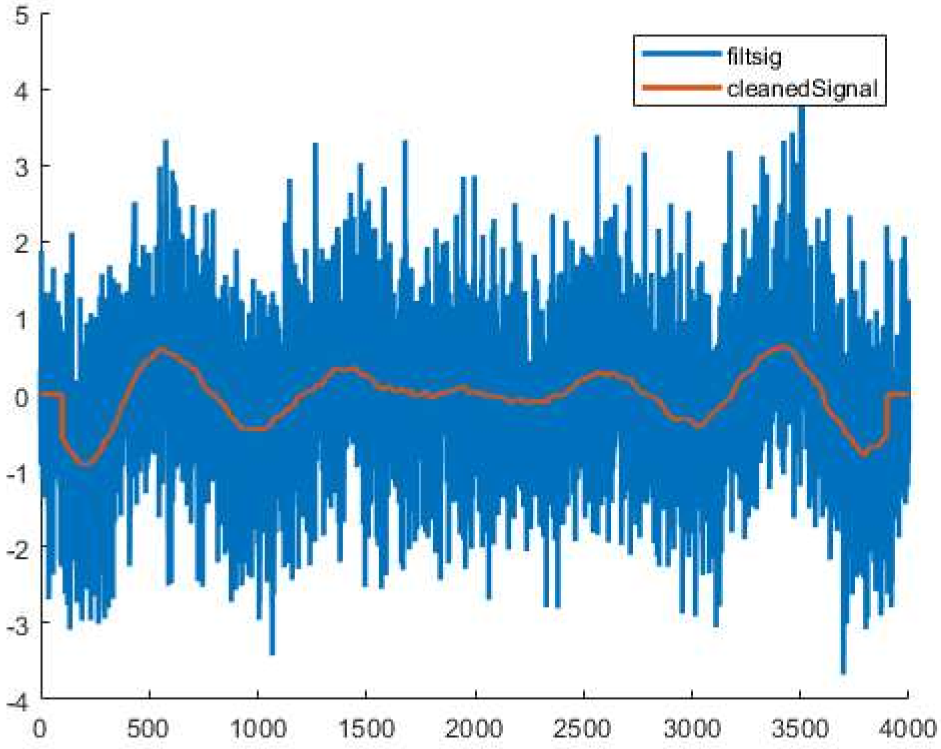
Implement the running mean (smoothing) filter to the generated filtsig

```
% Initialize filtered signal vector using zeros at the edges of the filter
% ie the output of the filter is initialized to zero
cleanedSignal = zeros(size(filtsig));

% Initialize to the signal (2nd option)
% This will generate hi-frequency activity at the beginning and at the end
% cleanedSignal = filtsig;

% Note: Edges are always going to look weird
```

```
time = 0:3999;

% Implement the running mean filter
k = 100; % filter window is actually k*2+1
         % Increasing k makes the mean value smoother
for i=k+1:n-k-1
    % each point is the average of k surrounding points
    cleanedSignal(i) = mean(filtsig(i-k:i+k));
end
```

Plot the filtsig and final cleanedSignal signals

```
figure(4), clf, hold on
plot(time,filtsig, time,cleanedSignal, 'linew',2)
legend({'filtsig'; 'cleanedSignal'})
```



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