```
% gda01_06
%
% filter example, using seismometer response as an exemplary filter
%
% Note: this routine uses fairly advanced techniques to
% construct a seismometer response filter that are not
% going to be explained in sufficient detail for a reader
% to follow.  Sorry about that ...  Note that the response
% (which is just a time series) is stored in a the vector
% uoutf1() and in the file ../data/seismometer_response.txt.

clear all;

% response of the Broadband East component of station J59A of
% of the US Transportable array is in this file (in inscruitable
% IRIS RESP format).
respfile1='../data/TA_J59A_BHE.txt';

% read the IRIS RESP file for this seismometer
[ Nzeroes, zero, Npoles, pole, F, status ] = gda_read_resp( respfile1 );

% set up an input ground motion with a single small spike
N=100;
Dt = 0.025;
t = Dt*[0:N-1]';
uin = zeros(N,1);
uin(1) = (1e-6);

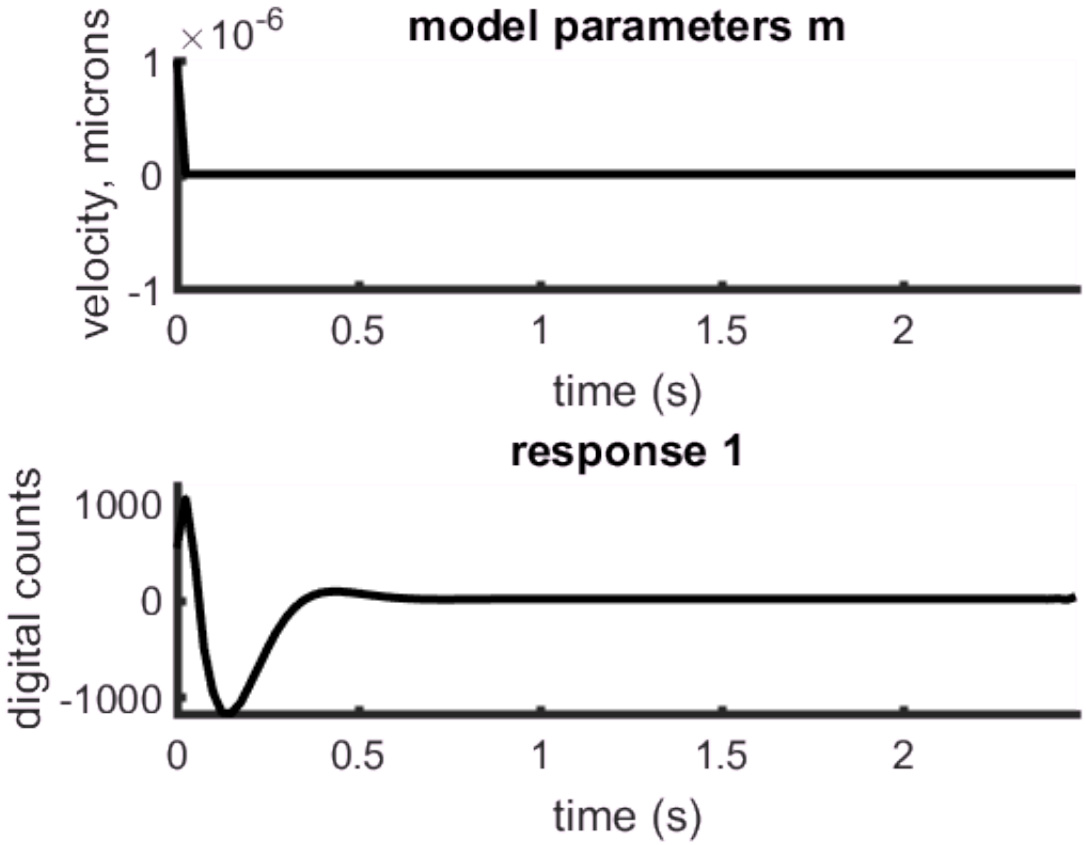
% apply station 1 response, filter result, and plot
[ uout1, status ] = gda_apply_response( uin, Dt, respfile1 );
flow = 0.005;
fhigh = 1.0;
uoutf1 = gda_chebyshevfilt(uout1, Dt, flow, fhigh);

% save the response filter in a text file
dlmwrite('../data/seismometer_response.txt', [t, uoutf1], 'delimiter', '\t');

% plot a spike in ground motion
figure(1);
clf;
subplot(2,1,1);
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [0, Dt*(N-1), -abs(max(uin)), abs(max(uin)) ] );
plot( Dt*[0:N-1]', uin, 'k-', 'LineWidth', 3 );
title('model parameters m');
xlabel('time (s)');
ylabel('velocity, microns');

% plot the response of the seismometer
subplot(2,1,2);
hold on;
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
axis( [0, Dt*(N-1), -max(abs(uoutf1)), max(abs(uoutf1)) ] );
plot( Dt*[0:N-1]', uoutf1, 'k-', 'LineWidth', 3 );
title('response 1');
xlabel('time (s)');
```

```
ylabel('digital counts');
```

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% Figure. (A) Hypothetical ground displacement m(t) consisting of a single spike. (B) Output o
% of a typical seismometer to this ground displacement. The output associated with a single sp
% called the seismometer's response g(t).

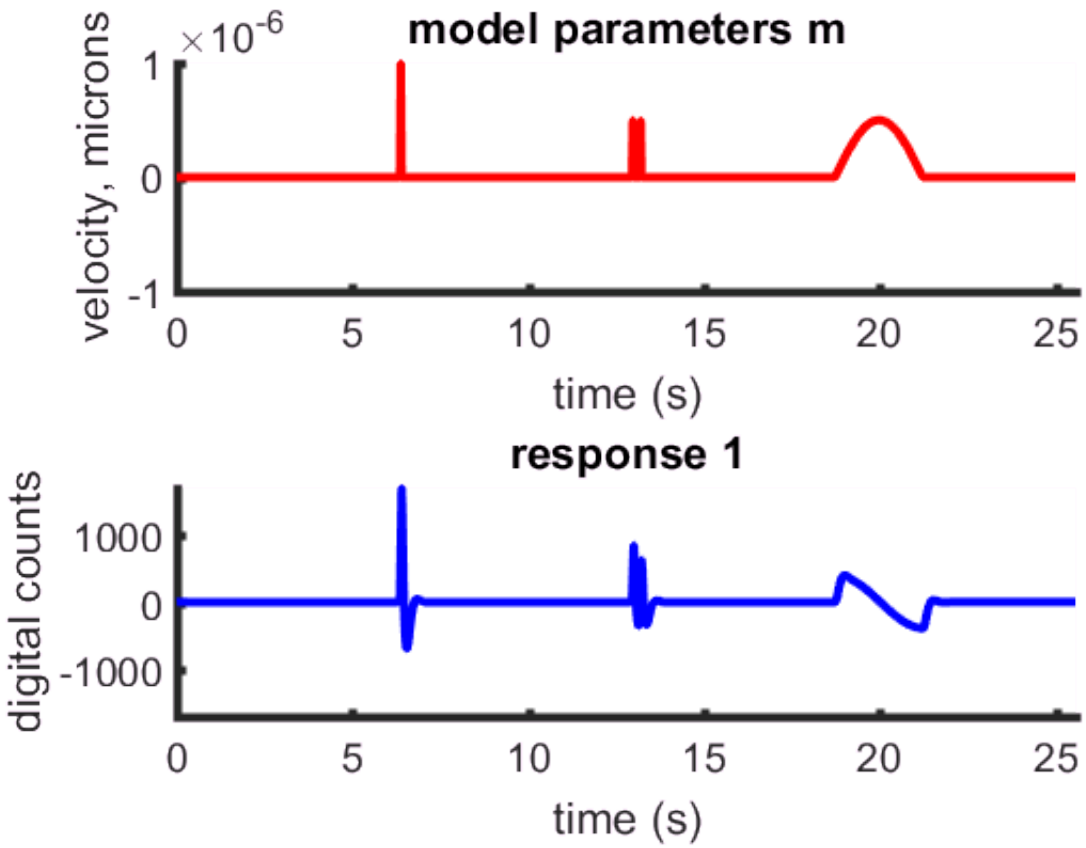
% set up an input seismogram with several small spikes
% and a smoothly varying function
N=1024;
Dt = 0.025;
t = Dt*[0:N-1]';
uin = zeros(N,1);
uin(floor(N/4)) = (1e-6);
uin(floor(8+N/2)) = 0.5*(1e-6);
uin(floor(17+N/2)) = 0.5*(1e-6);
uin(750:850) = 0.5*(1e-6)*sin( pi*([750:850]'-750)/100 );

% apply the response
[ uout1, status ] = gda_apply_response( uin, Dt, respfile1 );
flow = 0.005;
fhigh = 1.0;
uoutf1 = gda_chebyshevfilt(uout1, Dt, flow, fhigh);

% plot the complicated ground motion
figure(2);
clf;
subplot(2,1,1);
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [0, Dt*(N-1), -max(abs(uin)), max(abs(uin)) ] );
```

```
plot( Dt*[0:N-1]', uin, 'r-', 'LineWidth', 3 );
title('model parameters m');
xlabel('time (s)');
ylabel('velocity, microns');

% plot the corresponding seismometer response
subplot(2,1,2);
set(gca,'LineWidth',3);
set(gca,'FontSize',14);
hold on;
axis( [0, Dt*(N-1), -max(abs(uoutf1)), max(abs(uoutf1)) ] );
plot( Dt*[0:N-1]', uoutf1, 'b-', 'LineWidth', 3 );
title('response 1');
xlabel('time (s)');
ylabel('digital counts');
```




```
% Figure 1.6 (A) Hypothetical ground displacement m(t) consisting of a single spike, followed
% pair of closely spaced spikes, followed by a smooth function. (B) Output d(t) of a typical
% seismometer to the ground displacement.  While the output has some correspondence to the inp
% the shapes of features are different. The output associated with a single spike is called th
% seismometer's response g(t). MatLab script gda01_06.
```