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EE 384 Classwork 8 Due 10 October 2021

PDF Questions:

4a:

> Scan start: 10000ps
> Scan stop: 23333ps.
> Time required for pulse to travel out to 2 meters: 13333ps.

4c:

> I began to see the reflection at around 13ns, which is near 13333ps.

5c (ii. And iii.) :

As you can see, near arrow on the "Target Plot" shows a disturbance. This disturbance is between 1.2 and 1.3 meters. This difference is shown on the "Difference Plot". Note that these values are not technically where the object was. This will be fixed by adjusting the scan stop and start times. (See 5d.)

Here the distance calculated is 0.924m.
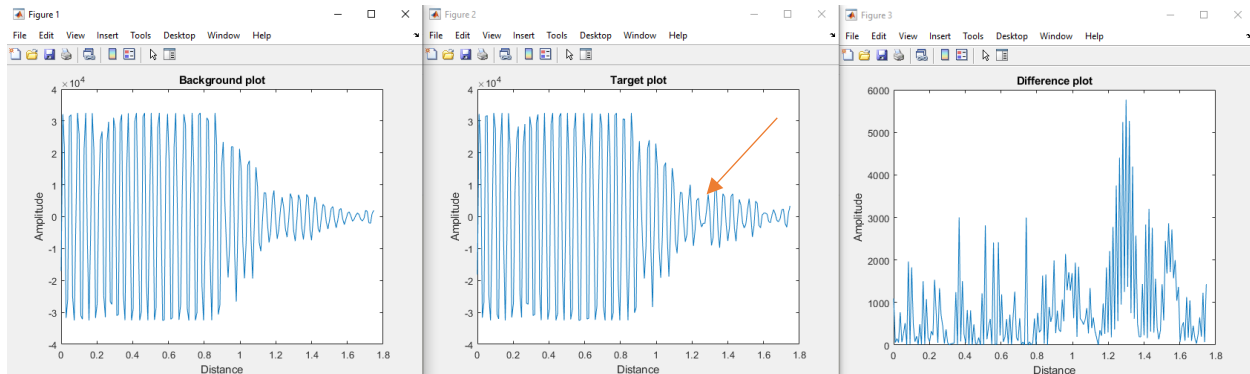
5d (i. and ii.) :

Similar to 5c, there is another disturbance at the orange arrow. However, this time the disturbance is closer to 1 meter. This is because I adjusted the scan start value from 10000 to 10500, and scan stop from 23333 to 23833. I did this by calculating the difference of expected 1 meter and actual measured distance of 0.924 meters for the previous calculation. 1m – 0.924m = 0.076. 2*(0.76)/c = 500 extra ps. This adjustment results in a more accurate difference plot. Notice how the spike is closer to 1 meter than in part c.

Here the distance calculated is 0.9423m, closer to 1m after adjusting the scan start / stop value.
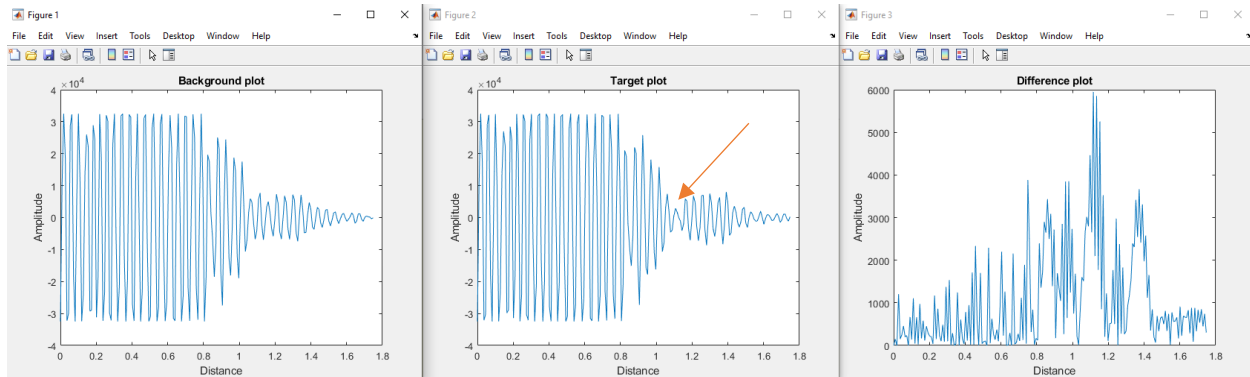
Questions and Further Explorations:

1. Examine your scan difference plot. The clutter was not completely eliminated. Explain the causes of the residual reflections that remain in the plot.

Obviously, radars record all values that they see in their given range. Noise in the image comes from just about anything, from a table to the ceiling projector. The reason we have this difference plot is so that we can see outstanding values in our data. Otherwise, just having a background and target plot, it is very difficult if not impossible to detect objects with a radar. Continually, the other reflections may come from other portions of the object. The radar may be picking up the PVC tube which would absolutely add noise to the difference plot.

2. Matlab code (commands) for 5c(iv)

See the code section below.

Calculating the Rbin values:
```
Rbin = c*(Tbin*(0:size(scan_difference(1,:),2)-1) - T0)/2;% Range Bins in
meters
```

Calculating Max of Rbin Values:
```
[a,i]=max(scan_difference(10,:));
distance = Rbin(i)
```

Code:

```
% plotMrmRetLog.m
% This script prompts the user for a MRM-RET logfile, reads, parses, and
% produces a "waterfall plot" of the motion filtered scans and detection
lists
% in the logfile
clear all; close all; clc

%% Query user for logfile
%dnm = '.'; fnm = 'MRM_002.csv';
[fnmb,dnmb] = uigetfile('*.csv');
fprintf('Reading logfile %s\n',fullfile(dnmb,fnmb));
[cfgb,reqb,scnb,det] = readMrmRetLog(fullfile(dnmb,fnmb));
```

```matlab
[fnmt,dnmt] = uigetfile('*.csv');
fprintf('Reading logfile %s\n',fullfile(dnmt,fnmt));
[cfgt,reqt,scnt,dett] = readMrmRetLog(fullfile(dnmt,fnmt));

%% Separate raw, bandpassed, and motion filtered data from scn structure
% (only motion filtered is used)

%% Pull out the raw scans (if saved)
rawscansI = find([scnb.Nfilt] == 1);
rawscansV_background = reshape([scnb(rawscansI).scn],[],length(rawscansI))';

rawscansI1 = find([scnt.Nfilt] == 1);
rawscansV_target = reshape([scnt(rawscansI1).scn],[],length(rawscansI1))';

scan_difference = abs(rawscansV_background(1:50,:) -
rawscansV_target(1:50,:));

%% Create the waterfall horizontal and vertical axes
Tbin = 32/(512*1.024);   % ns
T0 = 0; % ns
c = 0.29979;   % m/ns
Rbin = c*(Tbin*(0:size(scan_difference(1,:),2)-1) - T0)/2;% Range Bins in
meters

rbin = 90;
%Background plot
plot(rbin,rawscansV_background(49,:))
%Taget plot
figure; plot(Rbin,rawscansV_target(49,:))
% Difference plot
figure;plot(Rbin,scan_difference(49,:))

[a,i]=max(scan_difference(10,:));
distance = Rbin(i)
```