Chapter 1

Udacity Radar Target Generation and Detection - Final Project Report

1.1 MP.1 Selection of Training, Guard cells and offset

```
%Select the number of Training Cells in both the dimensions.
Tr = 10;
Td = 8;

% *%TODO* :
%Select the number of Guard Cells in both dimensions around
%the Cell under
Gr = 4;
Gd = 4;

% *%TODO* :
% offset the threshold by SNR value in dB
offset = 1.4;
```

1.2 MP.2 Implementation steps for the 2D CFAR process

Loop over all elements, starting and ending at indices which leave appropriate margins

```
for i = Tr+Gr+1:(Nr/2)-(Gr+Tr)
    for j = Td+Gd+1:Nd-(Gd+Td)
```

For each iteration loop over the training cells "excluding the guarding cells" to sum their values and calculate average noise.

```
for p = i-(Tr+Gr) : i+(Tr+Gr)
    for q = j-(Td+Gd) : j+(Td+Gd)
            if (abs(i-p) > Gr || abs(j-q) > Gd)
                noise_level = noise_level + db2pow(RDM(p,q));
            end
    end
end
```

Convert using pow2db and add offset.

```
% Calculate threshould from noise average then add the offset
threshold = pow2db(noise_level/(2*(Td+Gd+1)*2*(Tr+Gr+1)-(Gr*Gd)-1));
threshold = threshold + offset;
```

If the CUT is greater then the threshold replace it by 1, else 0 and thats all for the Implementation.

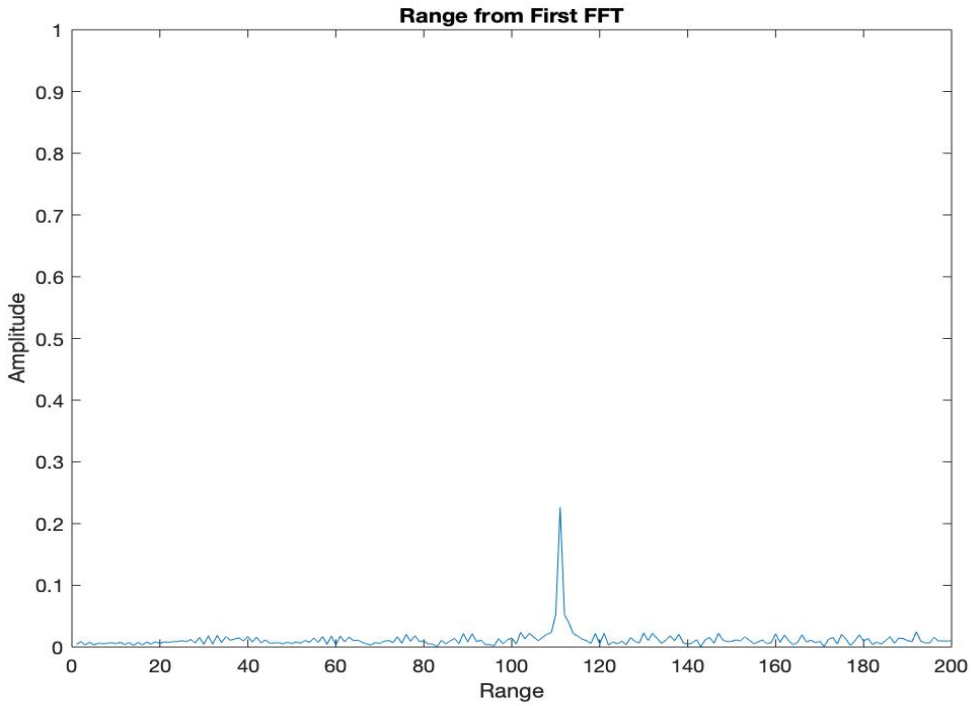
```
CUT = RDM(i,j);
if (CUT < threshold)
   RDM(i,j) = 0;
else
   RDM(i,j) = 1;
end
```

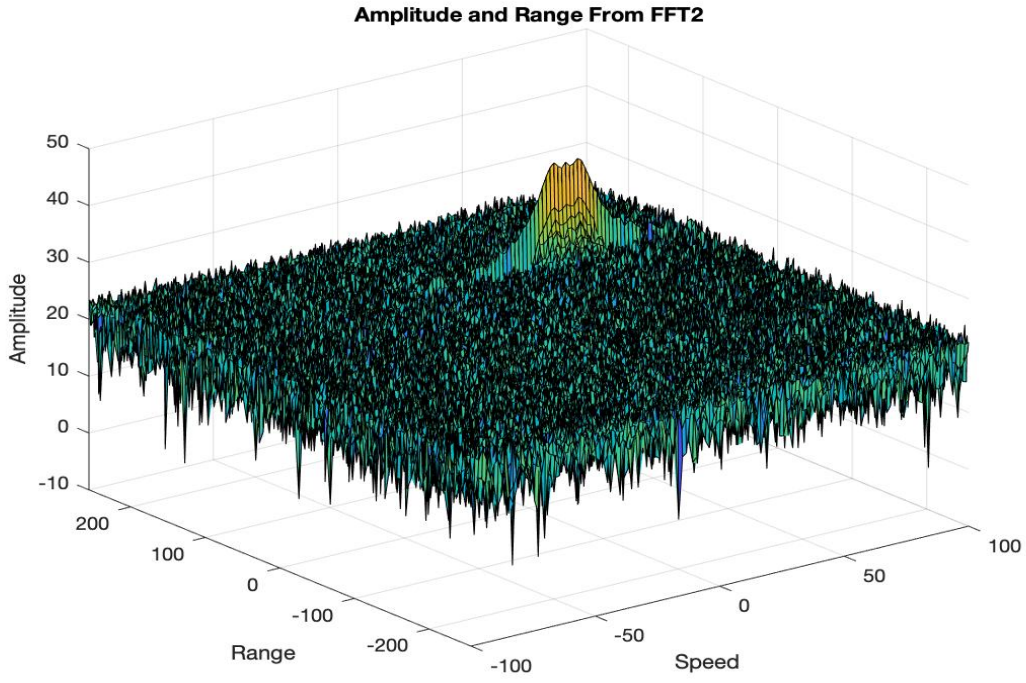
1.3 MP.3 Suppress the non-thresholded cells at the edges

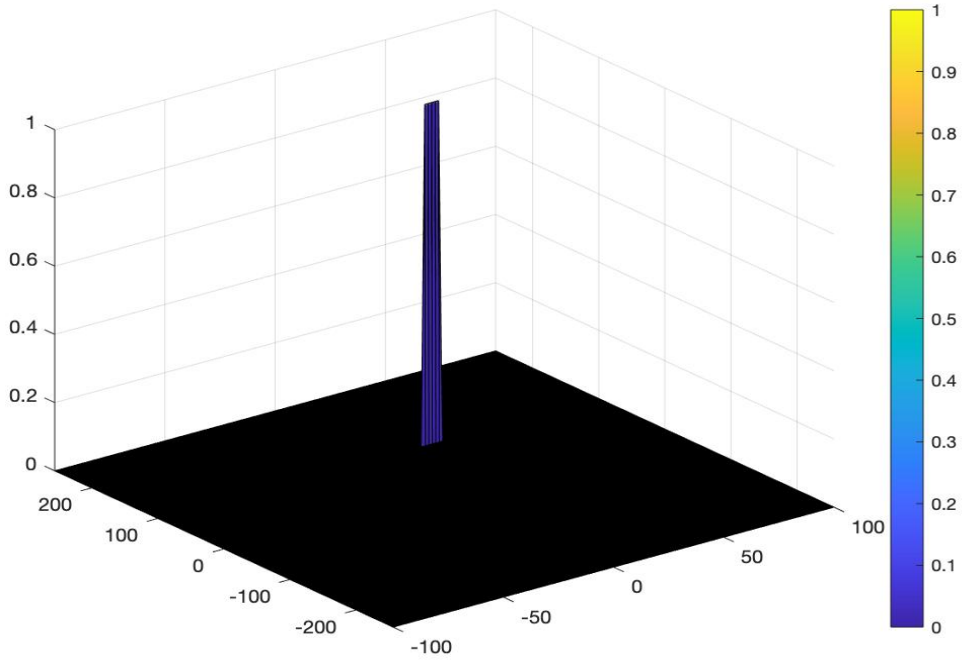
The previous process above will generate a thresholded block, which is smaller than the Range Doppler Map as the CUT cannot be located at the edges of matrix. Hence,few cells will not be thresholded. To keep the map size same set those values to 0.

```
RDM(union(1:(Tr+Gr),end-(Tr+Gr-1):end),:) = 0;  % Rows
RDM(:,union(1:(Td+Gd),end-(Td+Gd-1):end)) = 0;  % Columns
```

1.4 MP.4 Output




Amplitude and Range From FFT2
Amplitude
50
40
30
20
10
0
-10
200
100
0
-100
-200
Range
-100
-50
0
50
100
Speed


1
0.8
0.6
0.4
0.2
0
200
100
0
-100
-200
-100
-50
0
50
100
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0