EEE5120Z Project 2024

Ryan Jones

JNSRYA006

PDW Generator

Defined PDW Structure parameters as per Table 1 of the project brief.

```
% Table 1 - PDW Parameters
% In s
PDWParameters.TOA = struct('min',0, ...
                        'max',8.38, ...
                        'bits',24, ...
                        'resolution',500e-9);
% In degrees
PDWParameters.AOA = struct('min',0, ...
                        'max',360, ...
                        'bits',8, ...
                        'resolution',1.40625);
% In dB
PDWParameters.Amp = struct('min',-50, ...
                        'max',14, ...
                        'bits',6, ...
                        'resolution',1);
% In Hz
PDWParameters.Freq = struct('min',8e9, ...
                         'max',12e9, ...
                         'bits',10, ...
                         'resolution',3.90625e6);
% In s
PDWParameters.PW = struct('min',500e-9, ...
                       'max',10e-6, ...
                       'bits',5, ...
                       'resolution',500e-9);
```

Parameters of all four radars as per Table 2 in the project brief.

Can be editted by editing the .csv file.

```
% Table 2 - Radar Parameters
radarParameters = importRadarParameters('radarParameters.csv');
```

Generate Independent PDW Lists

```
% Generate PDWs
observationWindow = 3; % s
pulseLoss = 10;
PDWOut1 =
generatePDWList(PDWParameters,radarParameters,"radar1",observationWindow,p
ulseLoss);
```

```
PDWOut2 =
generatePDWList(PDWParameters,radarParameters,"radar2",observationWindow,p
ulseLoss);
PDWOut3 =
generatePDWList(PDWParameters,radarParameters,"radar3",observationWindow,p
ulseLoss);
PDWOut4 =
generatePDWList(PDWParameters,radarParameters,"radar4",observationWindow,p
ulseLoss);
```

Merge PDW Lists

Also writes PDW files to `.txt` file

```
PDWOutputs = {PDWOut1,PDWOut2,PDWOut3,PDWOut4};
for pdw_idx = 1:4
    pdw_file_name = sprintf('PDW_%d_uncertainty_10Loss.txt',pdw_idx);
    PDWToCSV(PDWOutputs{pdw_idx},pdw_file_name);
end
% Merge multiple PDWs together
mergedPDW = mergePDWLists(PDWOut1,PDWOut2,PDWOut3,PDWOut4);
PDWToCSV(mergedPDW,'Output Files/PDW/mergedPDW_uncertainty_10Loss.txt');
```

Plot Amplitude vs. ToA of PDW Lists

In order to plot, the *Figures* folder (and sub-folders) needs to be added to the Matlab path

```
% Plotting
for pdw_idx = 1:4
    pdw_file_name = sprintf('PDW_%d_noUncertainty_noLoss.txt',pdw_idx);
    pdw_plot_name = sprintf('PDW_%d_noUncertainty_noLoss',pdw_idx);
    plotAmplitudeTOA(pdw_file_name,pdw_plot_name,1);
end
plotAmplitudeTOA('Output Files/PDW/
mergedPDW_uncertainty_10Loss.txt','mergedPDW_uncertainty_10Loss',1);
```

Deinterleaver

Import PDW list

```
PDWImport = importPDWLists('Output Files/PDW/
mergedPDW_uncertainty_10Loss.txt');
```

Generate Clusters and Plot Scatter plot

```
clusters = clusterPDWs(PDWParameters,PDWImport,1);
```

ΔToA Analysis

```
bar_width = 2*PDWParameters.TOA.resolution;
delta_toa = differentialTOAAnalysis(clusters,bar_width,0); % Set last
parameter to 1 to plot
```

Sequencing

```
sequencing(PDWImport,delta_toa,radarParameters,'seqeunces.txt');
```