Contents

```matlab
clear all; close all; clc;
```

White Frequency Noise (Phase Random Walk)

```matlab
%----Simulation Setup
% Number of simulations
ensemble = 1000;
% Number of Samples per simulation;
Ns = 49999;
% Sampling interval
T = 0.001; % 1ms Given
% Noise parameters
sigma_omega = 0.01;      % radians

%----- Simulation
DeltaOmega = sigma_omega*randn(Ns,ensemble);
DeltaTheta_omega = cumsum(DeltaOmega,1);
for ii= 1: ensemble
    Ccoh(ii) =computeCoherence(DeltaTheta_omega(:,ii),Ns);
end
Ccoh2_mean = mean(Ccoh.^2)
tau = T*Ns;
fprintf(['Coherence Time from white frequency noise: %f \n'],tau)
```

```
Ccoh2_mean =

     0.50603


Coherence Time from white frequency noise: 49.999000
```

White Frequency Rate Noise (Frequency Random Walk)

```matlab
%---- Simulation Setup
% Number of simulations
ensemble = 1000;
% Number of Samples per simulation;
Ns_alpha = 1600;
% Sampling interval
T = 0.001; % 1ms Given
% Noise parameters
sigma_alpha = 0.0001;    % radians


%----- Simulation
DeltaAlpha = sigma_alpha*randn(Ns_alpha,ensemble);
DeltaOmega_alpha = cumsum(DeltaAlpha,1);
```

```matlab
DeltaTheta_alpha = cumsum(DeltaOmega_alpha,1);
for ii= 1: ensemble
    Ccoh_alpha(ii) =computeCoherence(DeltaTheta_alpha(:,ii),Ns_alpha);
end
Ccoh2_mean_alpha = mean(Ccoh_alpha.^2)
tau_alpha = T*Ns_alpha;
fprintf(['Coherence Time from white frequency Rate noise: %f \n'],tau_alpha)
```

```
Ccoh2_mean_alpha =

        0.5047


Coherence Time from white frequency Rate noise: 1.600000
```

White Phass noise (Phase Random Walk)

```matlab
%----Simulation Setup
% Number of simulations
ensemble = 1000;
% Number of Samples per simulation;
Ns = 10000;
% Sampling interval
T = 0.001; % 1ms Given
% Noise parameters
sigma = 0.8;      % radians

%----- Simulation
Delta = sigma*randn(Ns,ensemble);
for ii= 1: ensemble
    Ccoh(ii) =computeCoherence(Delta(:,ii),Ns);
end
Ccoh2_mean = mean(Ccoh.^2)
tau = T*Ns;
fprintf(['Coherence Time from white frequency noise: Ccoh^2 stalls at 0.5275'])

fprintf(['\n -------------------------------------------------\n'])
fprintf(['It doesn''t make sense to estimate the coherence time for the \n'...
        'white phase noise process because with the coherence time, we also seek \n ' ...
        'how many samples we can accumulate before the coherence drops to a value.\n' ...
        'The individual samples of this white noise are completely independent \n' ...
        'of each other and random. The samples are inherently not related to each other.'])
```

```
Ccoh2_mean =

        0.52716


Coherence Time from white frequency noise: Ccoh^2 stalls at 0.5275
 -------------------------------------------------
It doesn't make sense to estimate the coherence time for the
white phase noise process because with the coherence time, we also seek
 how many samples we can accumulate before the coherence drops to a value.
The individual samples of this white noise are completely independent
of each other and random. The samples are inherently not related to each other.
```