

Signal Power, Noise, SNR and Auto and Cross Correlation

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Contents

1	Problem 1.1	2
1.1	rand and randn	2
1.2	Examples	2
2	Problem 1.2	4
3	Problem 1.3	5
4	Conclusions	6

1 Problem 1.1

1.1 rand and randn

The MATLAB functions `rand` and `randn` are used to generate sequences of random numbers.

rand Uniformly distributed random numbers in the interval $(0, 1)$

randn Normally distributed random numbers with $\mu = 0$ and $\sigma = 1$

The functions support the same combinations of input arguments. They can be used to return a single scalar when called with no parentheses, or a matrix of $n_1 \times n_2 \times \dots \times n_N$ elements.

1.2 Examples

Here there will be shown example usages of the two functions, and proofs of their properties. The following code snippets generate a vector of 1000 numbers using `rand` and `randn` respectively, calculates their mean value and plot the histogram of the sequence.

```
a = rand(1000, 1);  
mean(a)  
hist(a)
```

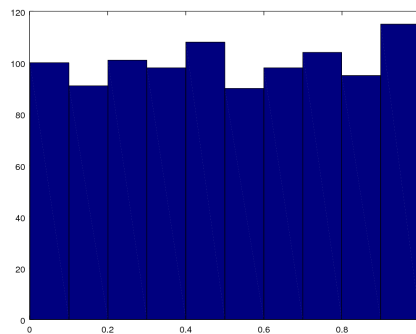


Figure 1: Histogram of rand function

As it can be seen from the figure above, the distribution of the numbers is approximately uniform, with all the values within the interval $(0, 1)$. The mean of the sequence is very close to 0.5.

```
a = randn(1000, 1);  
mean(a)  
std(a)  
hist(a)
```

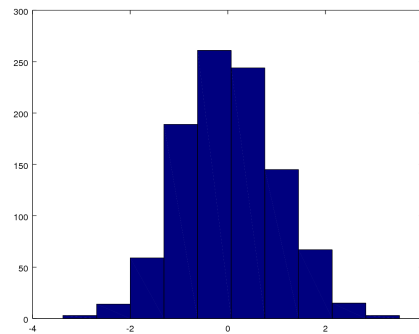


Figure 2: Histogram of randn function

As it can be seen from the figure above, the distribution of the numbers follows a gaussian curve. The mean of the sequence is very close to 0, and its standard deviation to 1.

2 Problem 1.2

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3 Problem 1.3

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4 Conclusions

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