

## README

In this lab, we studied how to generate the random number and perform the statistical test. In the code `randomnumber.cpp`, a standard normal distribution(SND) random number generator was build and the validation is analyzed using Chi-square test.

Programmed by: Chaolun Wang  
at: 09/20/2016

The folder lab3 includes:

`makefile`: which is the file help to compile the code

`randomnumber.cpp`: which is the source code for random number generator and chi square test

`report`: which is the report of lab3

`README`: which is the documentation of lab3

To compile and run the code:

32 bit linux environment is recommended, to compile the code type **make** in linux terminal. To run the code, type the command **`./randomnumber.x`**

Test results:

Test case 1 : 10000000 random number was generated for Chi-square test

The SND random number generator was used to generate 20 numbers:

0.690647  
-1.58676  
-0.782377  
-1.67852  
0.233779  
0.188637  
0.55719  
-0.62183  
-0.909391  
-1.61071  
0.452202  
-0.252679  
-1.82201  
0.111228  
-1.07339  
-2.50827  
0.300365  
-1.71984  
0.227421  
0.735193

100000000 random numbers with normal distribution have been generated

For each of the 6 bins:

region id	observed	expected
1	15866869	1.58655e+07

2	14992663	1.49885e+07
3	19144972	1.9146e+07
4	19143310	1.9146e+07
5	14987443	1.49885e+07
6	15864743	1.58655e+07

Performing Chi-square test, result is:  
1.81818

Test case 2 : 1000000 random number was generated for Chi-square test

The SND random number generator was used to generate 20 numbers:

-1.97893  
0.0760718  
1.59232  
-1.21864  
0.738414  
0.149933  
-1.21104  
0.440533  
-1.03193  
0.578569  
-0.458914  
1.44949  
-2.0346  
-0.9113  
0.151189  
0.626935  
-0.640326  
-2.73237  
-0.892066  
0.408265

10000000 random numbers with normal distribution have been generated

For each of the 6 bins:

region id	observed	expected
1	1587986	1.58655e+06
2	1501131	1.49885e+06
3	1915462	1.9146e+06
4	1914900	1.9146e+06
5	1495442	1.49885e+06
6	1585079	1.58655e+06

Performing Chi-square test, result is:  
14.3189

Test case 3 : 100000000 random number was generated for Chi-square test

The SND random number generator was used to generate 20 numbers:

0.755631

-0.957497  
-0.462858  
-0.494731  
0.939115  
-0.757339  
0.561096  
0.214214  
0.13585  
1.08937  
0.126752  
-0.454626  
0.106457  
-0.953469  
-0.0976405  
0.596785  
-1.04762  
-1.68614  
-1.01604  
-0.829771

1000000000 random numbers with normal distribution have been generated

For each of the 6 bins:

region id	observed	expected
1	158657422	1.58655e+08
2	149869303	1.49885e+08
3	191477602	1.9146e+08
4	191448659	1.9146e+08
5	149903798	1.49885e+08
6	158643216	1.58655e+08

Performing Chi-square test, result is:

7.20372