Report of Assignment 6 : hamming distance

Group: 2H

What is the C code about?
1. Generating N bits of 0 and 1.
2. Generating a random offset M such that M<N-P.
3. Taking P bits from thes N bits form P random locations between M to N.
4. Flipping Q random bits from these selected P bits.
5. Now taking x bits from these P bits and comparing hamming distance wtih various values of offset with the initial N bits.
6. Finding the minimum value of hamming distance.

Learning outcomes:
1. Use of pointers.
2. Use of arrays.
3. Different ways to use random number generator.
4. Generating distinct random numbers.
5. Returning an array from a function.
6. Taking imput from command line.

Inferences :
1. Minimum is obtained at same location of initial offset if errors are less ., if errors are increased there is a shift in the location location.

```
ee19b053@ee19b053-VirtualBox:~/Desktop$ ./a.out 100000 10000 5000
Please Enter the number of points to be revealed to compare the hamming distance
2000
Please wait ....
The final report is :
1.Number of bits transmitted: 100000
2.Number of bits received: 10000
3.Number of bits flipped: 5000
4.Number of bits revealed: 2000
5.The random offset generated at start is: 9901
6.The offset obtained after final comparision: 1877
7.The coressponding hamming distance is: 914
```
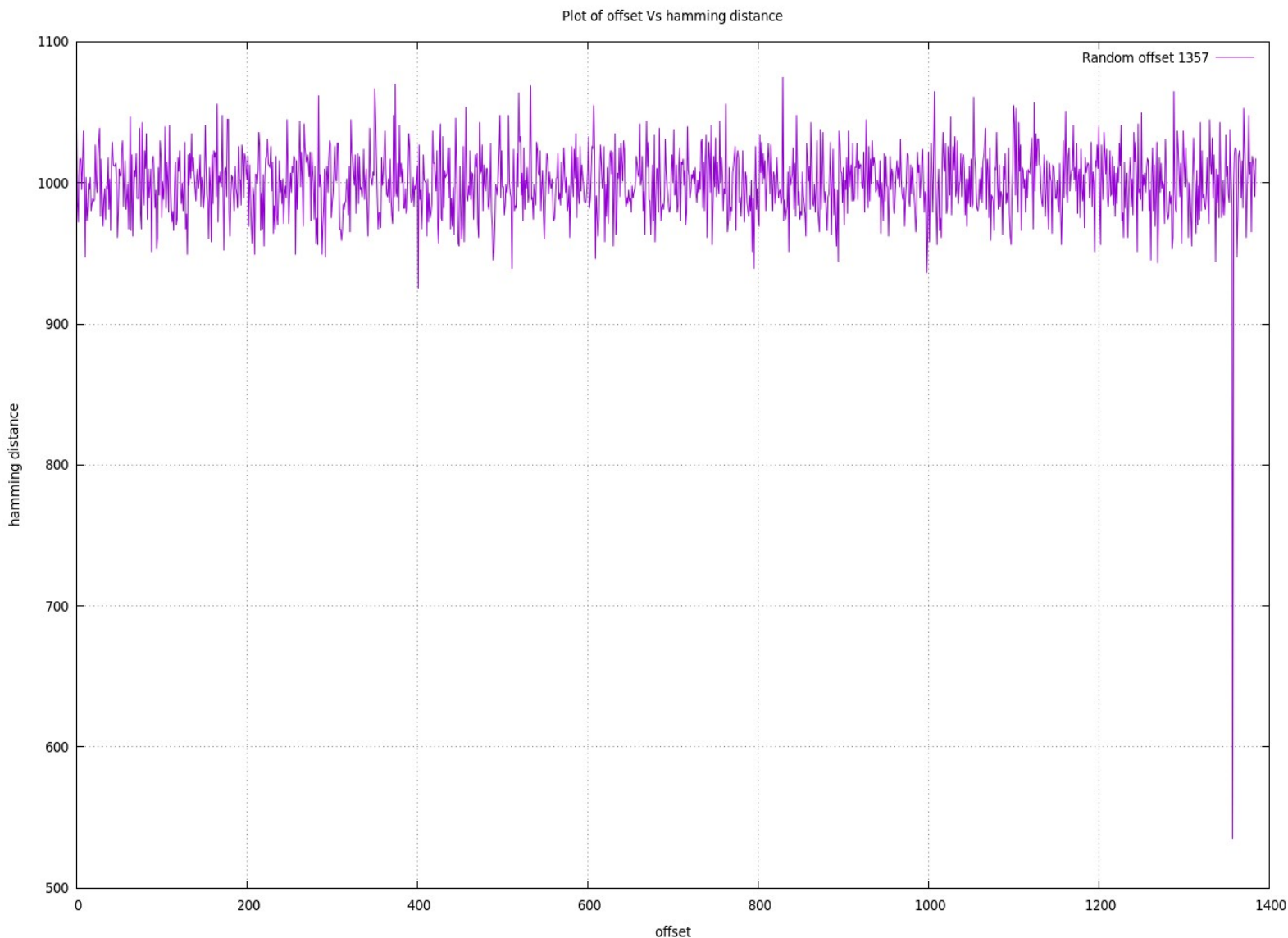
```
ee19b053@ee19b053-VirtualBox:~/Desktop$ ./a.out 100000 10000 2500
Please Enter the number of points to be revealed to compare the hamming distance
2000
Please wait ....
The final report is :
1.Number of bits transmitted: 100000
2.Number of bits received: 10000
3.Number of bits flipped: 2500
4.Number of bits revealed: 2000
5.The random offset generated at start is: 17935
6.The offset obtained after final comparision: 17935
7.The coressponding hamming distance is: 502
```

2.The Graph of Hamming distance Vs offset has a minimum at the point of initial offset for small errors.
   The Graph of Hamming distance Vs offset for one set of Data

Plot of offset Vs hamming distance

3.The value of offset obtained would be different from initial offset if the number of values revealed is less.

```
Please Enter the number of points to be revealed to compare the hamming distance
100
Please wait ....
The final report is :
1.Number of bits transmitted: 100000
2.Number of bits received: 10000
3.Number of bits flipped: 2500
4.Number of bits revealed: 100
5.The random offset generated at start is: 53041
6.The offset obtained after final comparision: 42945
7.The coressponding hamming distance is: 29
```

4.Bitwise logic operators work faster.

Dieharder Test result on random set of data:

```
#=============================================================================#
#            dieharder version 3.31.1 Copyright 2003 Robert G. Brown          #
#=============================================================================#
   rng_name    |           filename             |rands/second|
        mt19937|                        bits.txt|   3.76e+07  |
#=============================================================================#
        test_name   |ntup| tsamples |psamples|  p-value |Assessment
#=============================================================================#
   diehard_birthdays|   0|      100|    100|0.86503945|   PASSED
     diehard_operm5|   0|  1000000|    100|0.90648420|   PASSED
  diehard_rank_32x32|   0|    40000|    100|0.48101695|   PASSED
   diehard_rank_6x8|   0|   100000|    100|0.00992140|   PASSED
    diehard_bitstream|   0|  2097152|    100|0.61171247|   PASSED
         diehard_opso|   0|  2097152|    100|0.89783095|   PASSED
         diehard_oqso|   0|  2097152|    100|0.61965256|   PASSED
          diehard_dna|   0|  2097152|    100|0.53510963|   PASSED
 diehard_count_1s_str|   0|   256000|    100|0.27395444|   PASSED
 diehard_count_1s_byt|   0|   256000|    100|0.94718235|   PASSED
  diehard_parking_lot|   0|    12000|    100|0.57621075|   PASSED
    diehard_2dsphere|   2|     8000|    100|0.95289812|   PASSED
    diehard_3dsphere|   3|     4000|    100|0.84443638|   PASSED
     diehard_squeeze|   0|   100000|    100|0.86145313|   PASSED
         diehard_sums|   0|      100|    100|0.54507012|   PASSED
         diehard_runs|   0|   100000|    100|0.02683331|   PASSED
         diehard_runs|   0|   100000|    100|0.06685201|   PASSED
        diehard_craps|   0|   200000|    100|0.77715277|   PASSED
        diehard_craps|   0|   200000|    100|0.46246854|   PASSED
  marsaglia_tsang_gcd|   0| 10000000|    100|0.81069742|   PASSED
  marsaglia_tsang_gcd|   0| 10000000|    100|0.51013125|   PASSED
          sts_monobit|   1|   100000|    100|0.54008494|   PASSED
             sts_runs|   2|   100000|    100|0.12533243|   PASSED
           sts_serial|   1|   100000|    100|0.97840656|   PASSED
```