Data Structures

Random Number

What is a Random Number:

- Simply Random number is a number which is generated randomly from set of numbers.
- Very often we deal problems with random number generation.
- It is impossible to generate true random numbers so computers generate Pseudo random numbers.
- They're usually not truly random, but are called pseudo-random because they generate a number sequence that appears random. This is done with some interesting mathematical formulas. One of the most common is the Linear Congruential Generator.

How to generate a Random number????

- There is a function in c to generate number,that is “rand()”,this function generates random no. It returns a pseudo-random number in the range of 0 to RAND_MAX.
- Actually RAND_MAX is a constant whose default value may vary between implementations but it is granted to be at least 32767.
- To use “rand()” function we must include standard library(#include<stdlib.h>).

Example:

```c
#include<stdio.h>
#include<stdlib.h>

int main(){
    srand(5);
    int i;
    for(i=0;i<5;i++) {
        printf("%d  ",rand());
    }
    return 0;
}
```

41 18467 6334 26500 19169

- Problem with this approach!!!!
- To obtain different values of random numbers every time, the value of seed should change every time we run the program.

What is the thing that changes every time on the system???

- We make the time as seed for random number generator.
- To get the time we use time.h library.
- Srand(time(NULL));

```c
#include<stdio.h>
#include<stdlib.h>
#include<time.h>

int main(){
    srand(time(NULL));
    int i;
    for(i=0;i<5;i++) {
        printf("%d  ",rand());
    }
    return 0;
}
```

Here we have used time as seed,so the value of random numbers always changes on running it.

Generating random no's between 0 and 10:

- When you divide a no with 'n'(consider),we get a remainder between 0 and n-1.
- Apply mod operation to random number.

```c
#include<stdio.h>
#include<stdlib.h>
#include<time.h>

int main(){
    srand(time(NULL));
    printf("%d  ",rand()%11);
    return 0;
}
```

- Remember to seed only once.
- Output is between 0 and 10.

Some tips:

- To generate a random no between x and y(where x<y,including x and y),find rand() mod (y-x+1) and add x to it.

```
int main(){
    srand(time(NULL));
    int i,x,y;
    x=10;
    y=20;
    for(i=0;i<10;i++) {
        printf("%d  ", (rand()%(y-x+1))+x);
    }
    return 0;
}
```

output: 13 11 16 10 13 10 14 11 18 14

- To obtain float value just divide rand()%n with appropriate integers or add float value to rand()%n. Ex->`rand()%10/72.0+2.14;`