Assignment 1

Simulation of Mining System

Name: Ajay Kumar

Roll: 12MI31001

Algorithm :

- The solution is written in C++ language
- The <random> header is used to generate the random number over the uniform distribution
- The 500 random numbers in between 0 and 1 are generated and stored in array called V.
- Now we have counted for every interval that how many Head and Tail we are getting by the assumption that if V[i] > 0.5 we consider it as head else tail.
- Now for every increasing interval of 10 the number of head and tail we get are stored in array H and T respectively.
- Now Probability is calculated for every trials.

C++ Implementation

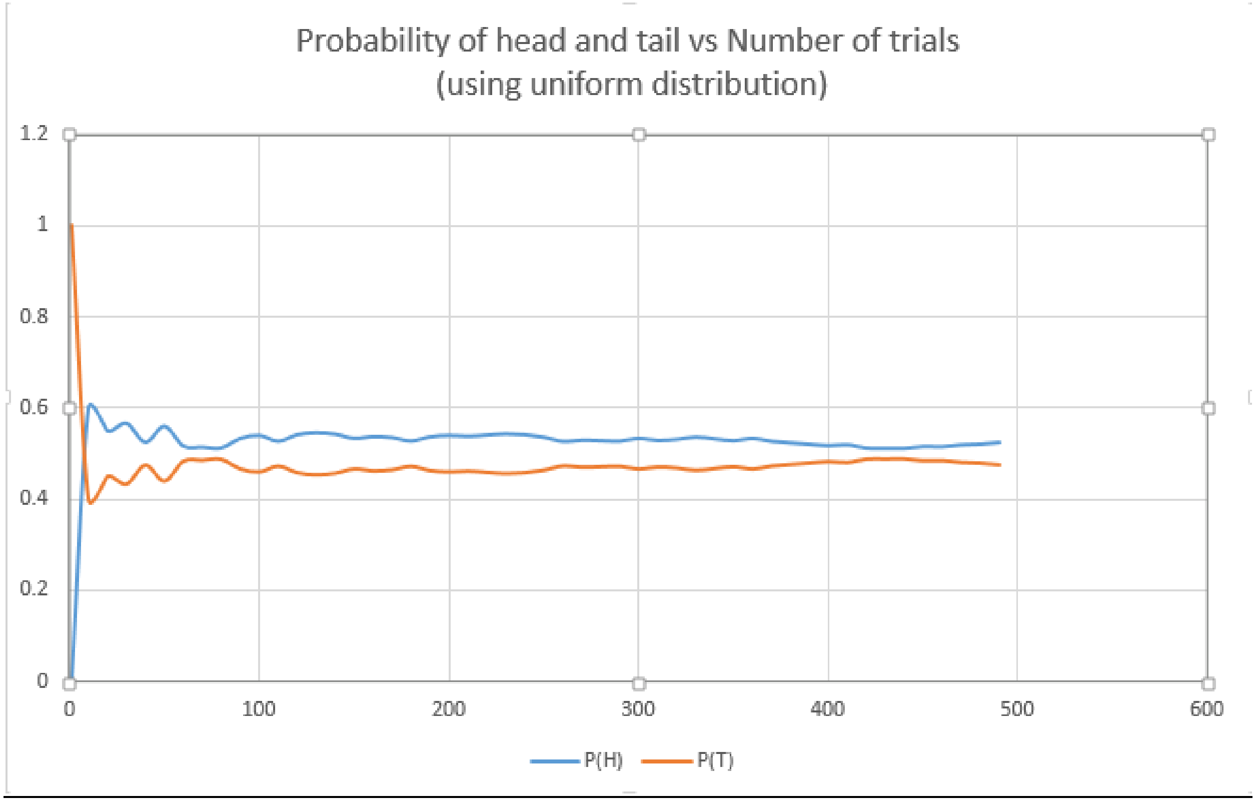
```
#include <iostream>
#include <random>
#include <chrono>
#include <vector>
using namespace std;
int main() {
  unsigned seed = std::chrono::system_clock::now().time_since_epoch().count();
  std::default_random_engine generator (seed);
  std::uniform_real_distribution<double> distribution (0.0,1.0);
  int H[50]={0},T[50]={0},interval = 10;
  double Values[500];
  for (int i=0; i<500;i++){
    Values[i] = distribution(generator);
  }
  for(int i =0;i<500;i+=interval){
   for(int j =0;j<i;j++){
    if(Values[j]>0.5){
     H[j/interval]+=1;
    }
    else{
     T[j/interval] +=1;
    }
   }
  }
  cout<<"Head,Tail,P(H),P(T)"<<endl;
  for (int i=49; i>=0;i--){
   cout<<H[i]<<","<<T[i]<<","<<float(H[i])/float(H[i]+T[i])<<","<<float(T[i])/float(H[i]+T[i])<<endl;
  }
 return 0;
}
```

Data Generated using uniform distribution for 500 number of trials with coin:

Tosses	Head	Tail	P(H)	P(T)
1	0	1	0	1
10	6	4	0.6	0.4
20	11	9	0.55	0.45
30	17	13	0.566667	0.433333
40	21	19	0.525	0.475
50	28	22	0.56	0.44
60	31	29	0.516667	0.483333

70	36	34	0.514286	0.485714
80	41	39	0.5125	0.4875
90	48	42	0.533333	0.466667
100	54	46	0.54	0.46
110	58	52	0.527273	0.472727
120	65	55	0.541667	0.458333
130	71	59	0.546154	0.453846
140	76	64	0.542857	0.457143
150	80	70	0.533333	0.466667
160	86	74	0.5375	0.4625
170	91	79	0.535294	0.464706
180	95	85	0.527778	0.472222
190	102	88	0.536842	0.463158
200	108	92	0.54	0.46
210	113	97	0.538095	0.461905
220	119	101	0.540909	0.459091
230	125	105	0.543478	0.456522
240	130	110	0.541667	0.458333
250	134	116	0.536	0.464
260	137	123	0.526923	0.473077
270	143	127	0.52963	0.47037
280	148	132	0.528571	0.471429
290	153	137	0.527586	0.472414
300	160	140	0.533333	0.466667
310	164	146	0.529032	0.470968
320	170	150	0.53125	0.46875
330	177	153	0.536364	0.463636
340	181	159	0.532353	0.467647
350	185	165	0.528571	0.471429
360	192	168	0.533333	0.466667
370	195	175	0.527027	0.472973
380	199	181	0.523684	0.476316
390	203	187	0.520513	0.479487
400	207	193	0.5175	0.4825
410	213	197	0.519512	0.480488
420	215	205	0.511905	0.488095
430	220	210	0.511628	0.488372
440	225	215	0.511364	0.488636
450	232	218	0.515556	0.484444
460	237	223	0.515217	0.484783
470	244	226	0.519149	0.480851
480	250	230	0.520833	0.479167
490	257	233	0.52449	0.47551

The Plot for above result:


Probability of head and tail vs Number of trials
(using uniform distribution)
P(H)
P(T)