Aim : To simulate the Brownian motion using Monte- Carlo technique.

Theory:

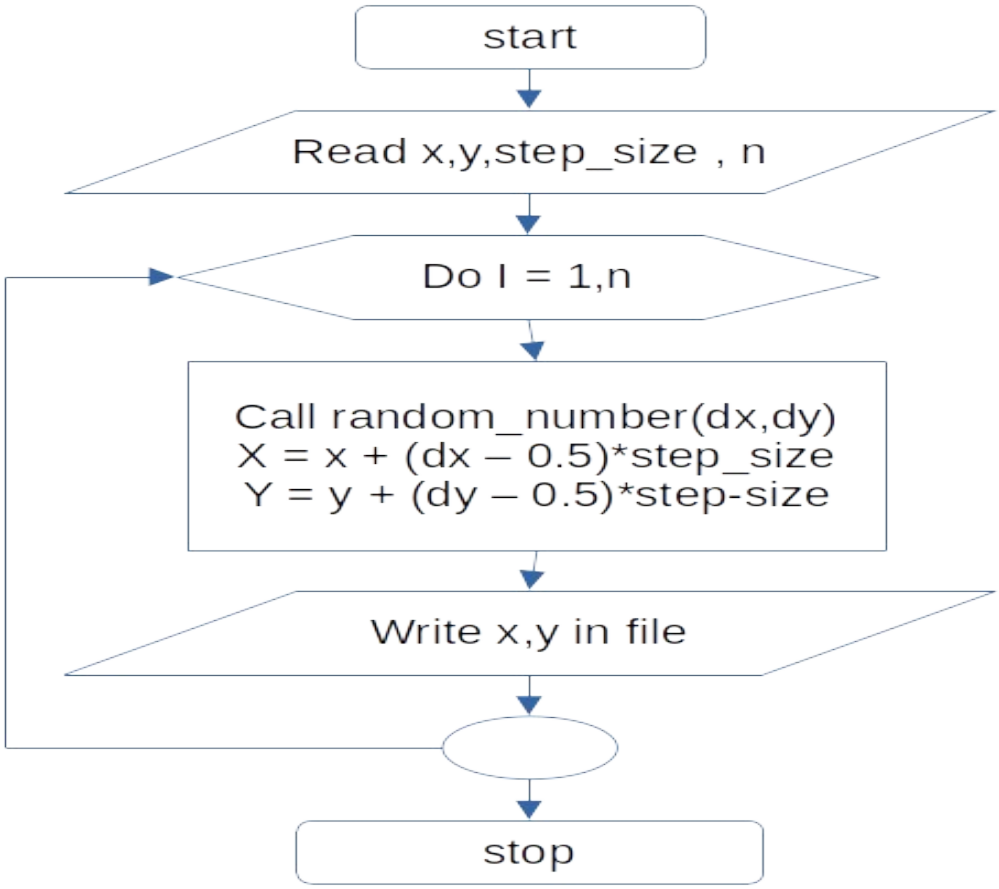
Monte-Carlo technique :

It is a technique in which we solve the problem by taking their random behavior as a tool.

Algorithm:

Take the initial points and also take the step size and number of steps , then run a loop from number of steps times , in the loop call two random number and minus 0.5 from them then multiple with step size and add into the initial point and that give the new point and repeat the loop for the new points.

Flow Chart :



Program in FORTRAN95:

```
program main
   implicit none ! declaring the variable to use in program

   real :: x,y,dx,dy,step_size   ! dx and dy are change in x and y
   integer :: number_step,i
   logical :: f1

   print*,"Enter the initial position of the particle :: "
   read*,x,y
   print*,"Enter the step size and number of steps for the motion:: "
   read*,step_size,number_step
```

```
    if (number_step < 0 ) stop "Invalid number of steps "

    inquire(file="points.dat",exist=f1) !opening the for store the x and y
    if(f1)then
       open(1,file="points.dat",status="replace")
    else
       open(1,file="points.dat",status="new",action="write")
    endif

    do i = 1,number_step       ! making loop generating the random dx and dy
       call random_number(dx)  ! and add into in the last position
       call random_number(dy)
       x = x + (dx - 0.5)*step_size
       y = y + (dy - 0.5)*step_size
       write(1,*)x,y
    enddo
    print*, "Simulation is complete"
    stop
end program
```

Output:

```
 Enter the initial position of the particle ::
0       0
 Enter the step size and number of steps for the motion::
2
1000
 Simulation is complete
```

Result: