

MSMS - 105

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Assignment 05

❖ **Objective :** To create an animated plot that visually illustrates **Diffusion**.

⊕ **Theory :** Diffusion is the process by which molecules move from an area of higher concentration to an area of lower concentration, resulting in a uniform distribution of substances. This can occur in gases, liquids, and solids, and is driven by the random movement of particles.

Diffusion is an everyday phenomenon.

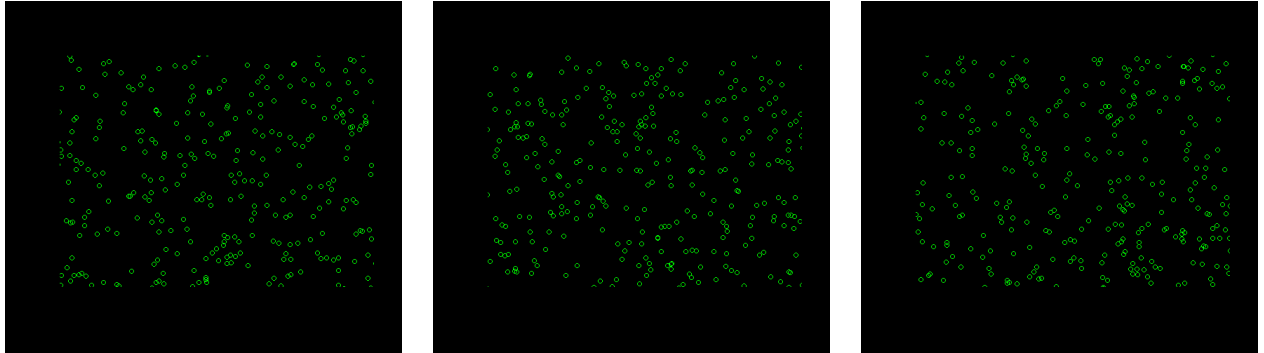
⊕ **Code :**

```
pause <- function(seconds){  
  start <- Sys.time()  
  while((Sys.time() - start) < seconds){}  
}
```

```
diffusion <- function(){  
  par(bg = "black")  
  
  for(i in seq(0.1, 1, 0.1)){  
  
    plot(NA, NA,  
         xlim = c(-1, 1),  
         ylim = c(-1, 1))  
  
    x <- runif(400, -1.3, 1.3); y <- runif(400, -1.3, 1.3)  
  
    points(x, y, col = "green")  
  
    pause(0.35)  
  }  
  
  for(i in seq(0.1, 1, 0.1)){  
  
    plot(NA, NA,  
         xlim = c(-1, 1),  
         ylim = c(-1, 1))  
  
    x <- runif(400, -1.3, 1.3); y <- runif(400, -1.3, 1.3)  
  
    x1 <- rnorm(100, 0, i); y1 <- rnorm(100, 0, i)  
  
    points(x, y, col = "green")  
  
    points(x1, y1, col = "red", pch = 19)  
  
    pause(1)  
  }  
}
```

```
diffusion()
```

⊕ **Visualization** : Suppose we have a container filled with gas. Its molecules make movements randomly (shown by **Green** dots).



A pocket of another gas (shown by **Red** dots) is dropped in the container and it gets mixed with the gas in the container uniformly over time.

