Apple Bread - I

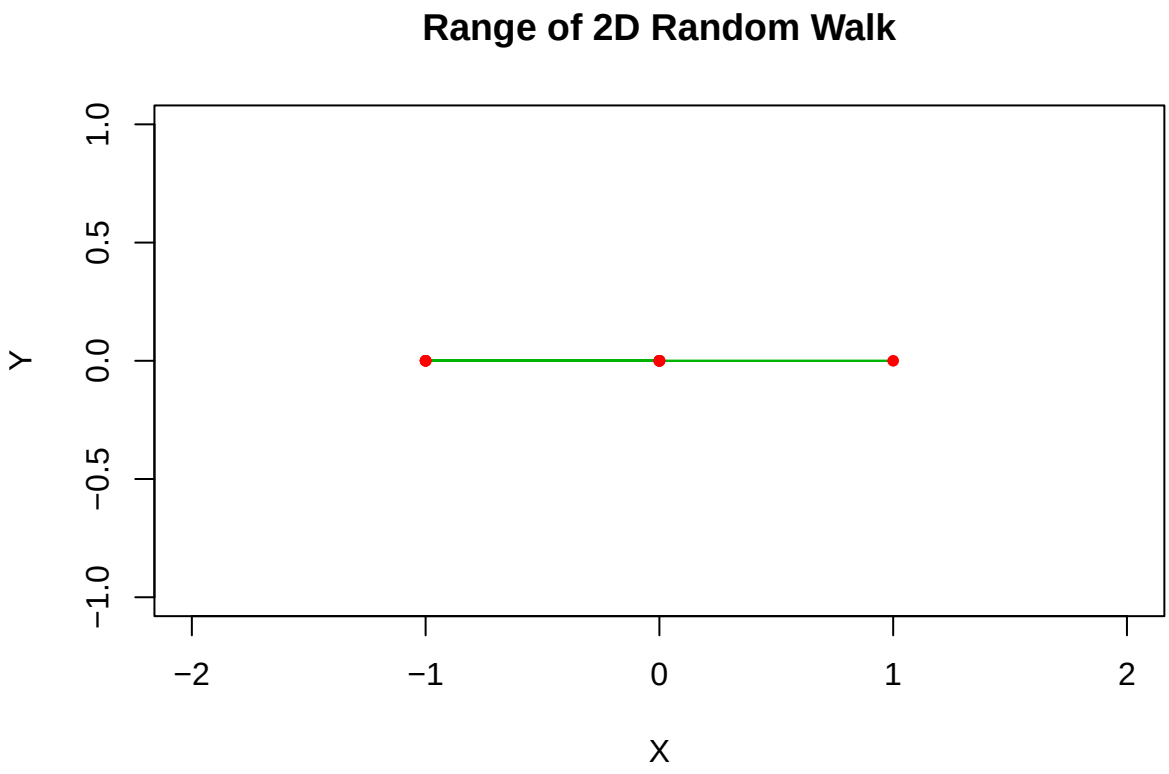
Aritrabha Majumdar(BMAT2311)

2024-03-16

```
## Loading required package: viridisLite
```

(a)

```
random_walk_2d <- function(num_steps,start = c(0,0)) {
x <- start[1]
y <- start[2]
positions <- start
i = 2
repeat{
if(sample(c(x,y),1) == x)
{
x = x + sample(c(1,-1),1)
y = y
}
else
{
x = x
y = y + sample(c(1,-1),1)
}
positions[(2*i)-1] = x
positions[2*i] = y
i = i + 1
if(i > num_steps)
{
break
}
}
pos <- matrix(positions, ncol = 2, byrow = T)
return(pos)
}
plot_range <- function(positions)
{
plot(positions[,1], positions[,2], type='l', col="#00b300",
xlab='X', ylab='Y', main='Range of 2D Random Walk',
xlim=c(min(positions[,1])-1, max(positions[,1])+1),
ylim=c(min(positions[,2])-1, max(positions[,2])+1))
  points(positions[,1], positions[,2], col='red', pch=20)
}
num_steps <- 10
positions <- random_walk_2d(num_steps)
plot_range(positions)
```



(b)

```
random_walk_2d <- function(num_steps,start = c(0,0)) {
x <- start[1]
y <- start[2]
positions <- start
i = 2
repeat{
if(sample(c(x,y),1) == x)
{
x = x + sample(c(1,-1),1)
y = y
}
else
{
x = x
y = y + sample(c(1,-1),1)
}
positions[(2*i)-1] = x
positions[2*i] = y
i = i + 1
if(i > num_steps)
{
break
}
}
pos <- matrix(positions, ncol = 2, byrow = T)
```

```
return(pos)
}
plot_range <- function(positions)
{
plot(positions[,1], positions[,2], type='l', col="#00b300",
xlab='X', ylab='Y', main='Range of 2D Random Walk',
xlim=c(min(positions[,1])-1, max(positions[,1])+1),
ylim=c(min(positions[,2])-1, max(positions[,2])+1))
points(positions[,1], positions[,2], col='red', pch=20)
}
num_steps <- 100
positions <- random_walk_2d(num_steps)
plot_range(positions)
```



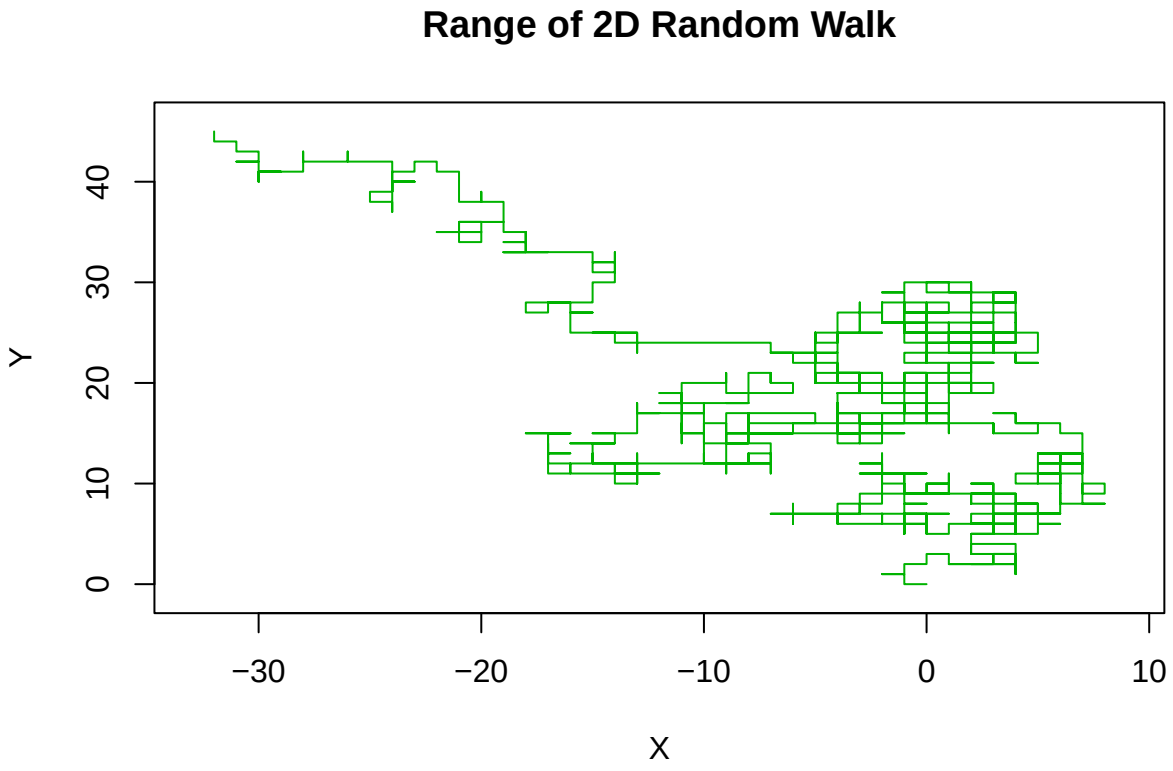
(c)

```
random_walk_2d <- function(start = c(0,0)) {
x <- start[1]
y <- start[2]
positions <- start
i = 2
d1 = 0
d2 = 0
repeat{
if(sample(c(x,y),1) == x)
{
```

```
x = x + sample(c(1,-1),1)
y = y
}
else
{
x = x
y = y + sample(c(1,-1),1)
}
positions[(2*i)-1] = x
positions[2*i] = y
i = i+1
if(sqrt(x^2 + y^2) >= 55)
{
break
}
}
pos <- matrix(positions, ncol = 2, byrow = T)
print("Number of steps:")
print(i)
return(pos)
}
plot_range <- function(pos) {
plot(pos[,1], pos[,2], type='l', col="#00b300",
xlab='X', ylab='Y', main='Range of 2D Random Walk',
xlim=c(min(pos[,1])-1, max(pos[,1])+1),
ylim=c(min(pos[,2])-1, max(pos[,2])+1))
}
positions <- random_walk_2d()
```

```
## [1] "Number of steps:"
## [1] 1065
```

```
plot_range(positions)
```




```
nrow(unique(data.frame(positions)))
```

```
## [1] 420
```

(d)

```
random_walk_2d <- function(start = c(55,0)) {
x <- start[1]
y <- start[2]
positions <- start
i = 2
repeat{
if(sample(c(x,y),1) == x)
{
x = x + sample(c(1,-1),1)
y = y
}
else
{
x = x
y = y + sample(c(1,-1),1)
}
positions[(2*i)-1] = x
positions[2*i] = y
i = i + 1
```

```
if(x == 0 & y == 0)
{
break
}
}
pos <- matrix(positions, ncol = 2, byrow = T)
print("Number of steps:")
print(i)
return(pos)
}
plot_range <- function(positions)
{
plot(positions[,1], positions[,2], type='l', col='#00b300',
xlab='X', ylab='Y', main='Range of 2D Random Walk',
xlim=c(min(positions[,1])-1, max(positions[,1])+1),
ylim=c(min(positions[,2])-1, max(positions[,2])+1))
}
positions <- random_walk_2d()
```

```
## [1] "Number of steps:"
## [1] 725903
```

```
plot_range(positions)
```

