1. Create an m x n matrix with replicate(m, rnorm(n)) with m=10 column vectors of n=10 elements each, constructed with rnorm(n), which creates random normal numbers.

Then we transform it into a dataframe (thus 10 observations of 10 variables) and perform an algebraic operation on each element using a nested for loop: at each iteration, every element referred by the two indexes is incremented by a sinusoidal function, compare the vectorized and non-vectorized form of creating the solution and report the system time differences.

Answer:

m=10; n=10;

#creating matrix of normal random numbers

mymat=replicate(m, rnorm(n))

# transform into data frame

mydframe=data.frame(mymat)

for (i in 1:m) {

for (j in 1:n) {

mydframe[i,j]=mydframe[i,j] + 10\*sin(0.75\*pi)

print(mydframe)

#### vectorized version

set.seed(42);

m=10; n=10;

mymat=replicate(m, rnorm(n))

mydframe=data.frame(mymat)

mydframe=mydframe + 10\*sin(0.75\*pi)

### measure vectorized execution

system.time(mydframe<-mydframe + 10\*sin(0.75\*pi) )

## user system elapsed

0.003 0.001 0.003