ACADGILD

SESSION 3: FOUNDATIONAL R PROGRAMMING

Assignment 2

Problem Statement

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.

SOLUTION :

APPROACH-1: Using rbenchmark library

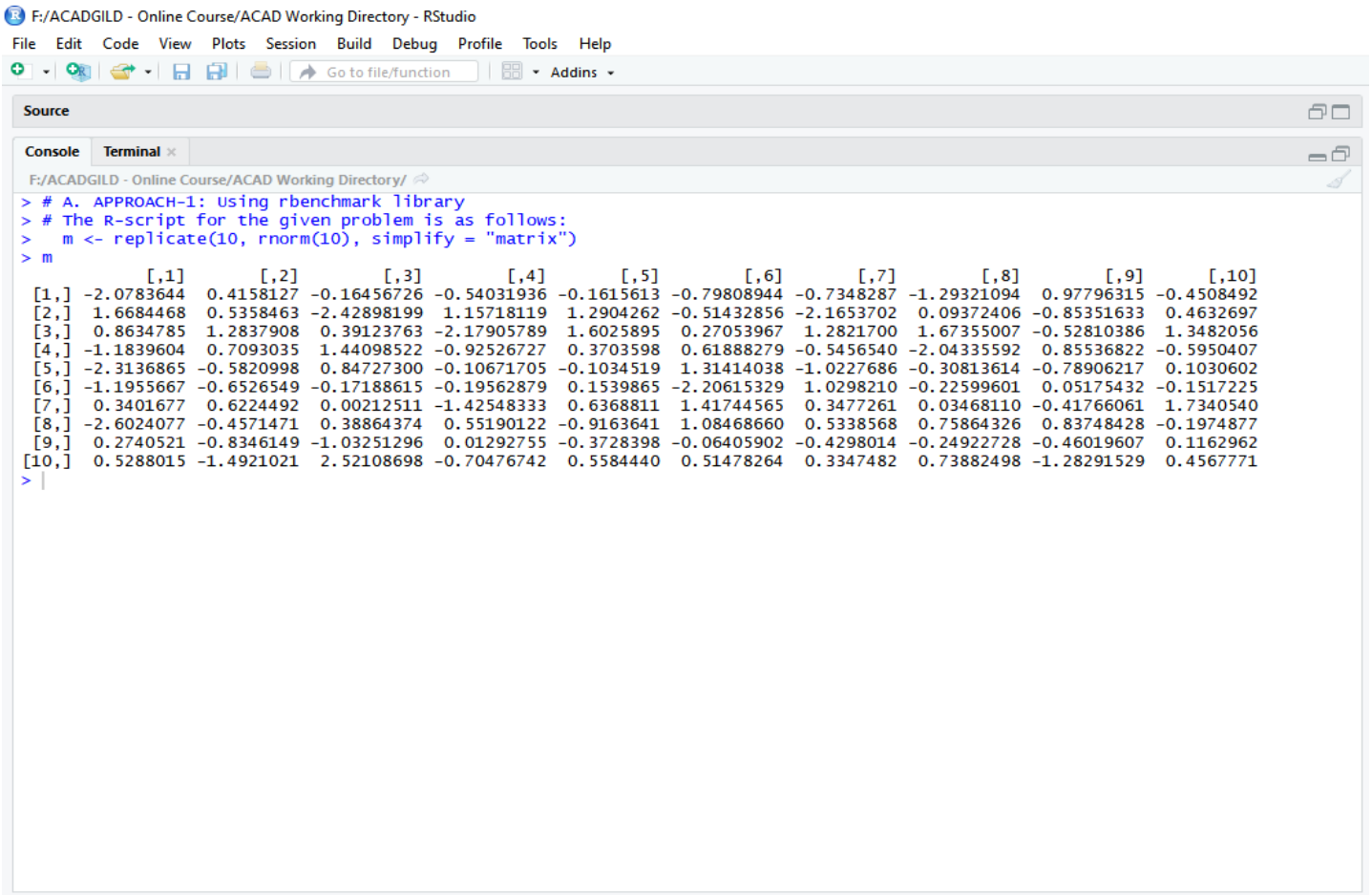
The R-script for the given problem is as follows:

```
m <- replicate(10, rnorm(10), simplify = "matrix")
m

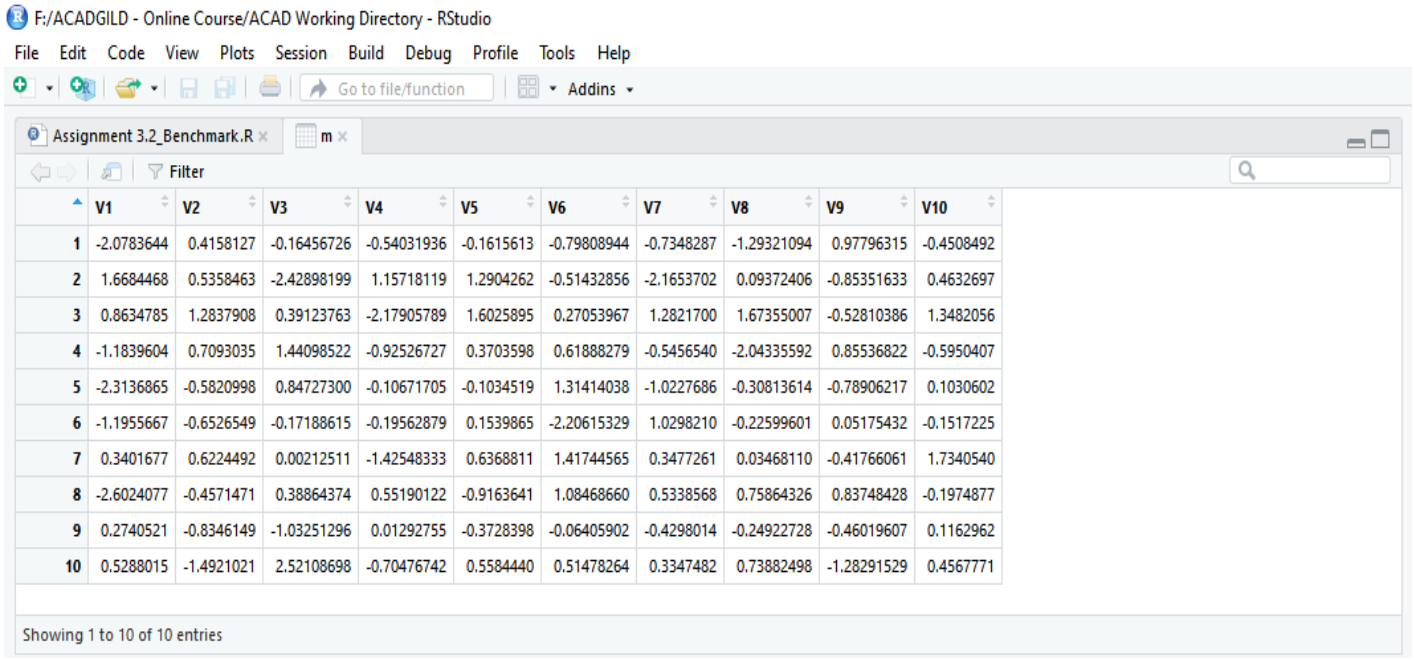
m <- as.data.frame(m)
View(m)

library(rbenchmark)
benchmark(
  vect = as.vector(m), # vecotrized form
  conc = (n <- as.vector(for (i in seq(nrow(m))) {
    for (j in seq(ncol(m))) {       # nested for
      print(2*sin(m[i, j]))                 # performing algebraic function on each element
    }
  }))
)
```

The output of the R-Script is given as follows:



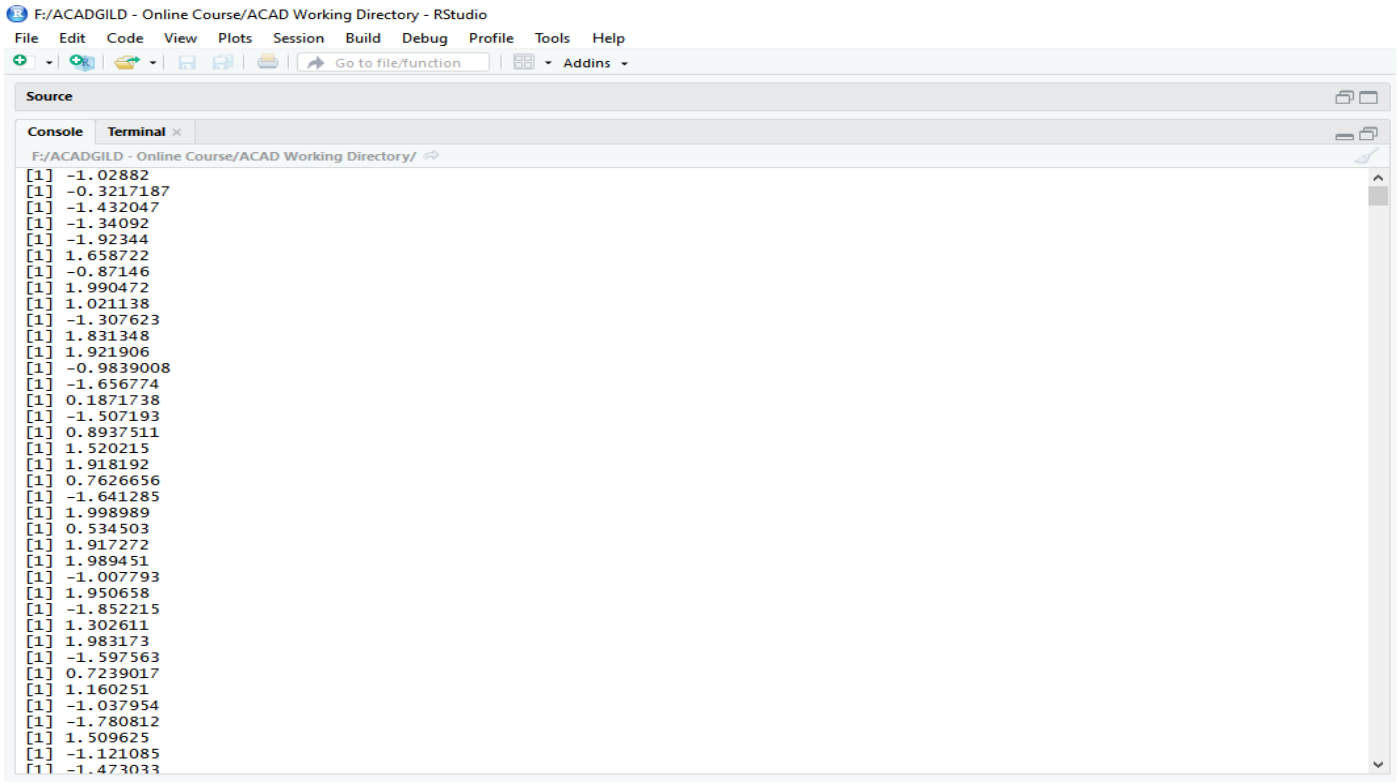

```
> m <- as.data.frame(m)
> View(m)
```



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	-2.0783644	0.4158127	-0.16456726	-0.54031936	-0.1615613	-0.79808944	-0.7348287	-1.29321094	0.97796315	-0.4508492
2	1.6684468	0.5358463	-2.42898199	1.15718119	1.2904262	-0.51432856	-2.1653702	0.09372406	-0.85351633	0.4632697
3	0.8634785	1.2837908	0.39123763	-2.17905789	1.6025895	0.27053967	1.2821700	1.67355007	-0.52810386	1.3482056
4	-1.1839604	0.7093035	1.44098522	-0.92526727	0.3703598	0.61888279	-0.5456540	-2.04335592	0.85536822	-0.5950407
5	-2.3136865	-0.5820998	0.84727300	-0.10671705	-0.1034519	1.31414038	-1.0227686	-0.30813614	-0.78906217	0.1030602
6	-1.1955667	-0.6526549	-0.17188615	-0.19562879	0.1539865	-2.20615329	1.0298210	-0.22599601	0.05175432	-0.1517225
7	0.3401677	0.6224492	0.00212511	-1.42548333	0.6368811	1.41744565	0.3477261	0.03468110	-0.41766061	1.7340540
8	-2.6024077	-0.4571471	0.38864374	0.55190122	-0.9163641	1.08468660	0.5338568	0.75864326	0.83748428	-0.1974877
9	0.2740521	-0.8346149	-1.03251296	0.01292755	-0.3728398	-0.06405902	-0.4298014	-0.24922728	-0.46019607	0.1162962
10	0.5288015	-1.4921021	2.52108698	-0.70476742	0.5584440	0.51478264	0.3347482	0.73882498	-1.28291529	0.4567771

Showing 1 to 10 of 10 entries

```
library(rbenchmark)
benchmark(
  vect = as.vector(m), # vecotrized form
  conc = (n <- as.vector(for (i in seq(nrow(m))) {
    for (j in seq(ncol(m))) { # nested for
      print(2*sin(m[i, j])) # performing algebraic function on each element
    }
  }))
)
```

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  test replications elapsed relative user.self sys.self user.child sys.child
2 conc          100     3.8       NA      3.77     0.09         NA        NA
1 vect          100     0.0       NA      0.00     0.00         NA        NA
```

B. APPROACH-2:

The R-script for the given problem is as follows:

```
#Vectorized form

set.seed(100)

#create matrix
mat_1<- replicate(10,rnorm(10))

#transform into data frame
df_1= data.frame(mat_1)
df_1<- df_1 + 2*sin(0.75*pi)

#non-vectorized form
set.seed(100)

#create matrix
mat_1<- replicate(10,rnorm(10))

#transform into data frame
df_1= data.frame(mat_1)
for(i in 1:10){
for(j in 1:10){
df_1[i,j]<- df_1[i,j] + 2*sin(0.75*pi)
print(df_1)
}
}

#time difference
system.time(
df_1[i,j]<- df_1[i,j] + 2*sin(0.75*pi)
)
system.time(
for(i in 1:10){
for(j in 1:10){
df_1[i,j]<- df_1[i,j] + 2*sin(0.75*pi)
}
}
)
```

The output of the R-Script is given as follows: