```r
x<-c(1:10)
y<-c(11:20)#this is the 2D matrix .
k<- 2
center1<- c(x[1],y[1])
center2<-c(x[2],y[2])
dis<-matrix(nrow=length(x),ncol=k+1)
colnames(dis)<-c('dis_cen1',"dis_cen2","class")
c(x[3],y[3])
```

```
## [1]  3 13
```

```r
while(TRUE){
  for(i in 1:length(x)){
    #calculate each value distance one by one and judge which center is shotest center
    dis[i,1]<- sqrt((x[i]-center1[1])^2+(y[i]-center2[2])^2)
    dis[i,2]<- ((x[i]-center2[1])^2+(y[i]-center2[2])^2)^0.5
    dis[i,3]<-which.min(dis[i,1:2])
  }
  dis
  #print("return boolean value")
  dis[,3]==1#return boolean value
  #print("find the new center1 and center2")
  (center1new<-c(mean(x[dis[,3]==1]),mean(y[dis[,3]==1])))
  (center2new<-c(mean(x[dis[,3]==2]),mean(y[dis[,3]==2])))
  if(sum(center1==center1new)+sum(center2==center2new)==4){
    break
  }
  center1<- center1new
  center2<- center2new

}
```

```r
a<-c(1,2,3,4,5)
b<-c(1,1,1,1,1)
a<b
```

```
## [1] FALSE FALSE FALSE FALSE FALSE
```

we can apply function in a libaray to directly implement this effect

```r
iris2<- iris
iris2$Species<- NULL
iris2
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1            5.1         3.5          1.4         0.2
## 2            4.9         3.0          1.4         0.2
## 3            4.7         3.2          1.3         0.2
## 4            4.6         3.1          1.5         0.2
## 5            5.0         3.6          1.4         0.2
## 6            5.4         3.9          1.7         0.4
## 7            4.6         3.4          1.4         0.3
## 8            5.0         3.4          1.5         0.2
## 9            4.4         2.9          1.4         0.2
## 10           4.9         3.1          1.5         0.1
## 11           5.4         3.7          1.5         0.2
```

```
## 12          4.8         3.4          1.6         0.2
## 13          4.8         3.0          1.4         0.1
## 14          4.3         3.0          1.1         0.1
## 15          5.8         4.0          1.2         0.2
## 16          5.7         4.4          1.5         0.4
## 17          5.4         3.9          1.3         0.4
## 18          5.1         3.5          1.4         0.3
## 19          5.7         3.8          1.7         0.3
## 20          5.1         3.8          1.5         0.3
## 21          5.4         3.4          1.7         0.2
## 22          5.1         3.7          1.5         0.4
## 23          4.6         3.6          1.0         0.2
## 24          5.1         3.3          1.7         0.5
## 25          4.8         3.4          1.9         0.2
## 26          5.0         3.0          1.6         0.2
## 27          5.0         3.4          1.6         0.4
## 28          5.2         3.5          1.5         0.2
## 29          5.2         3.4          1.4         0.2
## 30          4.7         3.2          1.6         0.2
## 31          4.8         3.1          1.6         0.2
## 32          5.4         3.4          1.5         0.4
## 33          5.2         4.1          1.5         0.1
## 34          5.5         4.2          1.4         0.2
## 35          4.9         3.1          1.5         0.2
## 36          5.0         3.2          1.2         0.2
## 37          5.5         3.5          1.3         0.2
## 38          4.9         3.6          1.4         0.1
## 39          4.4         3.0          1.3         0.2
## 40          5.1         3.4          1.5         0.2
## 41          5.0         3.5          1.3         0.3
## 42          4.5         2.3          1.3         0.3
## 43          4.4         3.2          1.3         0.2
## 44          5.0         3.5          1.6         0.6
## 45          5.1         3.8          1.9         0.4
## 46          4.8         3.0          1.4         0.3
## 47          5.1         3.8          1.6         0.2
## 48          4.6         3.2          1.4         0.2
## 49          5.3         3.7          1.5         0.2
## 50          5.0         3.3          1.4         0.2
## 51          7.0         3.2          4.7         1.4
## 52          6.4         3.2          4.5         1.5
## 53          6.9         3.1          4.9         1.5
## 54          5.5         2.3          4.0         1.3
## 55          6.5         2.8          4.6         1.5
## 56          5.7         2.8          4.5         1.3
## 57          6.3         3.3          4.7         1.6
## 58          4.9         2.4          3.3         1.0
## 59          6.6         2.9          4.6         1.3
## 60          5.2         2.7          3.9         1.4
## 61          5.0         2.0          3.5         1.0
## 62          5.9         3.0          4.2         1.5
## 63          6.0         2.2          4.0         1.0
## 64          6.1         2.9          4.7         1.4
## 65          5.6         2.9          3.6         1.3
```

```
## 66          6.7         3.1          4.4         1.4
## 67          5.6         3.0          4.5         1.5
## 68          5.8         2.7          4.1         1.0
## 69          6.2         2.2          4.5         1.5
## 70          5.6         2.5          3.9         1.1
## 71          5.9         3.2          4.8         1.8
## 72          6.1         2.8          4.0         1.3
## 73          6.3         2.5          4.9         1.5
## 74          6.1         2.8          4.7         1.2
## 75          6.4         2.9          4.3         1.3
## 76          6.6         3.0          4.4         1.4
## 77          6.8         2.8          4.8         1.4
## 78          6.7         3.0          5.0         1.7
## 79          6.0         2.9          4.5         1.5
## 80          5.7         2.6          3.5         1.0
## 81          5.5         2.4          3.8         1.1
## 82          5.5         2.4          3.7         1.0
## 83          5.8         2.7          3.9         1.2
## 84          6.0         2.7          5.1         1.6
## 85          5.4         3.0          4.5         1.5
## 86          6.0         3.4          4.5         1.6
## 87          6.7         3.1          4.7         1.5
## 88          6.3         2.3          4.4         1.3
## 89          5.6         3.0          4.1         1.3
## 90          5.5         2.5          4.0         1.3
## 91          5.5         2.6          4.4         1.2
## 92          6.1         3.0          4.6         1.4
## 93          5.8         2.6          4.0         1.2
## 94          5.0         2.3          3.3         1.0
## 95          5.6         2.7          4.2         1.3
## 96          5.7         3.0          4.2         1.2
## 97          5.7         2.9          4.2         1.3
## 98          6.2         2.9          4.3         1.3
## 99          5.1         2.5          3.0         1.1
## 100         5.7         2.8          4.1         1.3
## 101         6.3         3.3          6.0         2.5
## 102         5.8         2.7          5.1         1.9
## 103         7.1         3.0          5.9         2.1
## 104         6.3         2.9          5.6         1.8
## 105         6.5         3.0          5.8         2.2
## 106         7.6         3.0          6.6         2.1
## 107         4.9         2.5          4.5         1.7
## 108         7.3         2.9          6.3         1.8
## 109         6.7         2.5          5.8         1.8
## 110         7.2         3.6          6.1         2.5
## 111         6.5         3.2          5.1         2.0
## 112         6.4         2.7          5.3         1.9
## 113         6.8         3.0          5.5         2.1
## 114         5.7         2.5          5.0         2.0
## 115         5.8         2.8          5.1         2.4
## 116         6.4         3.2          5.3         2.3
## 117         6.5         3.0          5.5         1.8
## 118         7.7         3.8          6.7         2.2
## 119         7.7         2.6          6.9         2.3
```

```
## 120          6.0         2.2          5.0         1.5
## 121          6.9         3.2          5.7         2.3
## 122          5.6         2.8          4.9         2.0
## 123          7.7         2.8          6.7         2.0
## 124          6.3         2.7          4.9         1.8
## 125          6.7         3.3          5.7         2.1
## 126          7.2         3.2          6.0         1.8
## 127          6.2         2.8          4.8         1.8
## 128          6.1         3.0          4.9         1.8
## 129          6.4         2.8          5.6         2.1
## 130          7.2         3.0          5.8         1.6
## 131          7.4         2.8          6.1         1.9
## 132          7.9         3.8          6.4         2.0
## 133          6.4         2.8          5.6         2.2
## 134          6.3         2.8          5.1         1.5
## 135          6.1         2.6          5.6         1.4
## 136          7.7         3.0          6.1         2.3
## 137          6.3         3.4          5.6         2.4
## 138          6.4         3.1          5.5         1.8
## 139          6.0         3.0          4.8         1.8
## 140          6.9         3.1          5.4         2.1
## 141          6.7         3.1          5.6         2.4
## 142          6.9         3.1          5.1         2.3
## 143          5.8         2.7          5.1         1.9
## 144          6.8         3.2          5.9         2.3
## 145          6.7         3.3          5.7         2.5
## 146          6.7         3.0          5.2         2.3
## 147          6.3         2.5          5.0         1.9
## 148          6.5         3.0          5.2         2.0
## 149          6.2         3.4          5.4         2.3
## 150          5.9         3.0          5.1         1.8
```

```r
(kmeans_result<-kmeans(iris2,3))
```

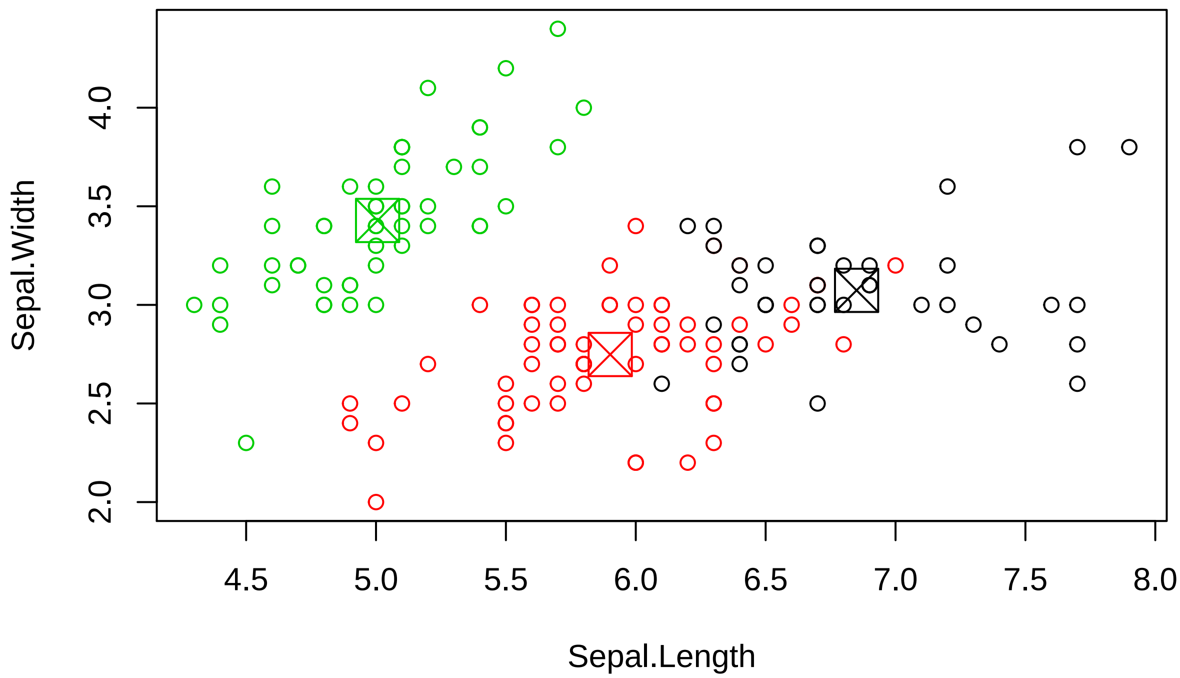
```
## K-means clustering with 3 clusters of sizes 38, 62, 50
##
## Cluster means:
##   Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 3     5.006000    3.428000     1.462000    0.246000
##
## Clustering vector:
##   [1] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
##  [36] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
##  [71] 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 1 1 1
## [106] 1 2 1 1 1 1 1 1 2 2 1 1 1 1 2 1 2 1 2 1 1 2 2 1 1 1 1 1 2 1 1 1 1 2 1
## [141] 1 1 2 1 1 1 2 1 1 2
##
## Within cluster sum of squares by cluster:
## [1] 23.87947 39.82097 15.15100
##  (between_SS / total_SS =  88.4 %)
##
## Available components:
##
```

```
## [1] "cluster"      "centers"      "totss"        "withinss"
## [5] "tot.withinss" "betweenss"    "size"         "iter"
## [9] "ifault"
```

```r
table(iris$Species,kmeans_result$cluster)
```

```
##
##                 1  2  3
##   setosa        0  0 50
##   versicolor    2 48  0
##   virginica    36 14  0
```

```r
plot(iris2[c("Sepal.Length","Sepal.Width")],col=kmeans_result$cluster)
points(kmeans_result$centers[,c("Sepal.Length","Sepal.Width")],col=1:3,pch=7,cex=3)
```




```r
iris
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 1            5.1         3.5          1.4         0.2     setosa
## 2            4.9         3.0          1.4         0.2     setosa
## 3            4.7         3.2          1.3         0.2     setosa
## 4            4.6         3.1          1.5         0.2     setosa
## 5            5.0         3.6          1.4         0.2     setosa
## 6            5.4         3.9          1.7         0.4     setosa
## 7            4.6         3.4          1.4         0.3     setosa
## 8            5.0         3.4          1.5         0.2     setosa
## 9            4.4         2.9          1.4         0.2     setosa
## 10           4.9         3.1          1.5         0.1     setosa
## 11           5.4         3.7          1.5         0.2     setosa
## 12           4.8         3.4          1.6         0.2     setosa
## 13           4.8         3.0          1.4         0.1     setosa
## 14           4.3         3.0          1.1         0.1     setosa
## 15           5.8         4.0          1.2         0.2     setosa
## 16           5.7         4.4          1.5         0.4     setosa
```

```
## 17          5.4         3.9          1.3         0.4     setosa
## 18          5.1         3.5          1.4         0.3     setosa
## 19          5.7         3.8          1.7         0.3     setosa
## 20          5.1         3.8          1.5         0.3     setosa
## 21          5.4         3.4          1.7         0.2     setosa
## 22          5.1         3.7          1.5         0.4     setosa
## 23          4.6         3.6          1.0         0.2     setosa
## 24          5.1         3.3          1.7         0.5     setosa
## 25          4.8         3.4          1.9         0.2     setosa
## 26          5.0         3.0          1.6         0.2     setosa
## 27          5.0         3.4          1.6         0.4     setosa
## 28          5.2         3.5          1.5         0.2     setosa
## 29          5.2         3.4          1.4         0.2     setosa
## 30          4.7         3.2          1.6         0.2     setosa
## 31          4.8         3.1          1.6         0.2     setosa
## 32          5.4         3.4          1.5         0.4     setosa
## 33          5.2         4.1          1.5         0.1     setosa
## 34          5.5         4.2          1.4         0.2     setosa
## 35          4.9         3.1          1.5         0.2     setosa
## 36          5.0         3.2          1.2         0.2     setosa
## 37          5.5         3.5          1.3         0.2     setosa
## 38          4.9         3.6          1.4         0.1     setosa
## 39          4.4         3.0          1.3         0.2     setosa
## 40          5.1         3.4          1.5         0.2     setosa
## 41          5.0         3.5          1.3         0.3     setosa
## 42          4.5         2.3          1.3         0.3     setosa
## 43          4.4         3.2          1.3         0.2     setosa
## 44          5.0         3.5          1.6         0.6     setosa
## 45          5.1         3.8          1.9         0.4     setosa
## 46          4.8         3.0          1.4         0.3     setosa
## 47          5.1         3.8          1.6         0.2     setosa
## 48          4.6         3.2          1.4         0.2     setosa
## 49          5.3         3.7          1.5         0.2     setosa
## 50          5.0         3.3          1.4         0.2     setosa
## 51          7.0         3.2          4.7         1.4 versicolor
## 52          6.4         3.2          4.5         1.5 versicolor
## 53          6.9         3.1          4.9         1.5 versicolor
## 54          5.5         2.3          4.0         1.3 versicolor
## 55          6.5         2.8          4.6         1.5 versicolor
## 56          5.7         2.8          4.5         1.3 versicolor
## 57          6.3         3.3          4.7         1.6 versicolor
## 58          4.9         2.4          3.3         1.0 versicolor
## 59          6.6         2.9          4.6         1.3 versicolor
## 60          5.2         2.7          3.9         1.4 versicolor
## 61          5.0         2.0          3.5         1.0 versicolor
## 62          5.9         3.0          4.2         1.5 versicolor
## 63          6.0         2.2          4.0         1.0 versicolor
## 64          6.1         2.9          4.7         1.4 versicolor
## 65          5.6         2.9          3.6         1.3 versicolor
## 66          6.7         3.1          4.4         1.4 versicolor
## 67          5.6         3.0          4.5         1.5 versicolor
## 68          5.8         2.7          4.1         1.0 versicolor
## 69          6.2         2.2          4.5         1.5 versicolor
## 70          5.6         2.5          3.9         1.1 versicolor
```

```
## 71           5.9         3.2          4.8         1.8 versicolor
## 72           6.1         2.8          4.0         1.3 versicolor
## 73           6.3         2.5          4.9         1.5 versicolor
## 74           6.1         2.8          4.7         1.2 versicolor
## 75           6.4         2.9          4.3         1.3 versicolor
## 76           6.6         3.0          4.4         1.4 versicolor
## 77           6.8         2.8          4.8         1.4 versicolor
## 78           6.7         3.0          5.0         1.7 versicolor
## 79           6.0         2.9          4.5         1.5 versicolor
## 80           5.7         2.6          3.5         1.0 versicolor
## 81           5.5         2.4          3.8         1.1 versicolor
## 82           5.5         2.4          3.7         1.0 versicolor
## 83           5.8         2.7          3.9         1.2 versicolor
## 84           6.0         2.7          5.1         1.6 versicolor
## 85           5.4         3.0          4.5         1.5 versicolor
## 86           6.0         3.4          4.5         1.6 versicolor
## 87           6.7         3.1          4.7         1.5 versicolor
## 88           6.3         2.3          4.4         1.3 versicolor
## 89           5.6         3.0          4.1         1.3 versicolor
## 90           5.5         2.5          4.0         1.3 versicolor
## 91           5.5         2.6          4.4         1.2 versicolor
## 92           6.1         3.0          4.6         1.4 versicolor
## 93           5.8         2.6          4.0         1.2 versicolor
## 94           5.0         2.3          3.3         1.0 versicolor
## 95           5.6         2.7          4.2         1.3 versicolor
## 96           5.7         3.0          4.2         1.2 versicolor
## 97           5.7         2.9          4.2         1.3 versicolor
## 98           6.2         2.9          4.3         1.3 versicolor
## 99           5.1         2.5          3.0         1.1 versicolor
## 100          5.7         2.8          4.1         1.3 versicolor
## 101          6.3         3.3          6.0         2.5  virginica
## 102          5.8         2.7          5.1         1.9  virginica
## 103          7.1         3.0          5.9         2.1  virginica
## 104          6.3         2.9          5.6         1.8  virginica
## 105          6.5         3.0          5.8         2.2  virginica
## 106          7.6         3.0          6.6         2.1  virginica
## 107          4.9         2.5          4.5         1.7  virginica
## 108          7.3         2.9          6.3         1.8  virginica
## 109          6.7         2.5          5.8         1.8  virginica
## 110          7.2         3.6          6.1         2.5  virginica
## 111          6.5         3.2          5.1         2.0  virginica
## 112          6.4         2.7          5.3         1.9  virginica
## 113          6.8         3.0          5.5         2.1  virginica
## 114          5.7         2.5          5.0         2.0  virginica
## 115          5.8         2.8          5.1         2.4  virginica
## 116          6.4         3.2          5.3         2.3  virginica
## 117          6.5         3.0          5.5         1.8  virginica
## 118          7.7         3.8          6.7         2.2  virginica
## 119          7.7         2.6          6.9         2.3  virginica
## 120          6.0         2.2          5.0         1.5  virginica
## 121          6.9         3.2          5.7         2.3  virginica
## 122          5.6         2.8          4.9         2.0  virginica
## 123          7.7         2.8          6.7         2.0  virginica
## 124          6.3         2.7          4.9         1.8  virginica
```

```
## 125          6.7         3.3          5.7         2.1  virginica
## 126          7.2         3.2          6.0         1.8  virginica
## 127          6.2         2.8          4.8         1.8  virginica
## 128          6.1         3.0          4.9         1.8  virginica
## 129          6.4         2.8          5.6         2.1  virginica
## 130          7.2         3.0          5.8         1.6  virginica
## 131          7.4         2.8          6.1         1.9  virginica
## 132          7.9         3.8          6.4         2.0  virginica
## 133          6.4         2.8          5.6         2.2  virginica
## 134          6.3         2.8          5.1         1.5  virginica
## 135          6.1         2.6          5.6         1.4  virginica
## 136          7.7         3.0          6.1         2.3  virginica
## 137          6.3         3.4          5.6         2.4  virginica
## 138          6.4         3.1          5.5         1.8  virginica
## 139          6.0         3.0          4.8         1.8  virginica
## 140          6.9         3.1          5.4         2.1  virginica
## 141          6.7         3.1          5.6         2.4  virginica
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 145          6.7         3.3          5.7         2.5  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 149          6.2         3.4          5.4         2.3  virginica
## 150          5.9         3.0          5.1         1.8  virginica
```

```
(centers<- kmeans_result$centers[kmeans_result$cluster,])
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
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## 3     5.006000    3.428000     1.462000    0.246000
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## 3     5.006000    3.428000     1.462000    0.246000
## 3     5.006000    3.428000     1.462000    0.246000
## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
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## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
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## 2     5.901613    2.748387     4.393548    1.433871
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## 2     5.901613    2.748387     4.393548    1.433871
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## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
```

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## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
## 1     6.850000    3.073684     5.742105    2.071053
## 1     6.850000    3.073684     5.742105    2.071053
## 2     5.901613    2.748387     4.393548    1.433871
```

```
(distance<-sqrt(rowSums((iris2-centers)^2)))
```

```
##   [1] 0.14135063 0.44763825 0.41710910 0.52533799 0.18862662 0.67703767
##   [7] 0.41518670 0.06618157 0.80745278 0.37627118 0.48247280 0.25373214
##  [13] 0.50077939 0.91322505 1.01409073 1.20481534 0.65420180 0.14415270
##  [19] 0.82436642 0.38933276 0.46344363 0.32860310 0.64029681 0.38259639
##  [25] 0.48701129 0.45208406 0.20875823 0.21536016 0.21066561 0.40838707
##  [31] 0.41373905 0.42565244 0.71552778 0.91977171 0.34982853 0.35039977
##  [37] 0.52685861 0.25686572 0.76077592 0.11480418 0.18541845 1.24803045
##  [43] 0.66901420 0.38675574 0.60231221 0.48205809 0.41034132 0.47199576
##  [49] 0.40494444 0.14959947 1.22697525 0.68414100 1.01903626 0.73153652
##  [55] 0.63853451 0.26937898 0.76452634 1.58388575 0.75582717 0.85984838
##  [61] 1.53611907 0.32426175 0.80841374 0.39674141 0.87269542 0.87306498
##  [67] 0.41229163 0.53579956 0.63676390 0.71254917 0.70937310 0.46349013
##  [73] 0.69373966 0.43661144 0.54593856 0.74313017 0.98798453 0.84636259
##  [79] 0.21993519 1.02437260 0.86396528 0.97566381 0.55763082 0.73395781
##  [85] 0.57500396 0.68790275 0.92700552 0.61459444 0.50830256 0.62911910
##  [91] 0.48790256 0.38266958 0.49185351 1.54856350 0.38560870 0.44284695
##  [97] 0.34498790 0.37241653 1.66064034 0.38393196 0.77731871 0.85382472
## [103] 0.30610139 0.65293923 0.38458885 1.14225684 1.07101875 0.78573677
## [109] 0.65454939 0.84355960 0.74552218 0.75289837 0.25958095 0.88917352
## [115] 1.20227628 0.68288333 0.50991553 1.47791217 1.52971038 0.82617494
## [121] 0.26952816 0.81891975 1.31149299 0.74269596 0.27627819 0.52766931
## [127] 0.62526165 0.70228926 0.54629196 0.59428255 0.73126650 1.43802246
## [133] 0.56055720 0.81536685 1.12133058 0.95311851 0.73306362 0.57903109
## [139] 0.61011676 0.34794609 0.38934920 0.68403844 0.85382472 0.30952112
## [145] 0.50939919 0.61173881 0.89747884 0.65334214 0.83572418 0.83452741
```

```
(outliers<-order(distance,decreasing = T)[1:5])
```

```
## [1]  99  58  94  61 119
```

```
print (outliers)
```

```
## [1]  99  58  94  61 119
```

```
print(iris2[outliers,])
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width
```

```
## 99           5.1         2.5          3.0         1.1
## 58           4.9         2.4          3.3         1.0
## 94           5.0         2.3          3.3         1.0
## 61           5.0         2.0          3.5         1.0
## 119          7.7         2.6          6.9         2.3
```