Mise en œuvre de la classification (TP Splus)

Classification automatique sur un tableau présence absence

```
library(multidim,first=T)
```

Acquisition et transformation des données

```
        nasa1a_read.table("beer301.prn", header = T)
        nasa1b_read.table("beer302.prn", header = T)
        nasa1_cbind(nasa1a,nasa1b)
        etiq_c(scan("souch",what=character()))

carac <- names(nasa1)
nasa <- as.matrix(nasa1)
cat("\n matrices initiales :\n")
print(nasa[1:15,1:10])
```

```
 matrices initiales :
    C4 C5 C6 C10 C12 C13 C18 C21 C22 C23
 B2  0  0  0   1   1   1   0   1   0   0
 B4  0  0  0   1   1   0   1   1   0   0
 B5  0  0  0   1   1   0   0   0   0   0
 B7  0  0  0   1   1   0   0   1   1   0
 B8  0  0  0   1   1   0   0   0   0   1
B10  0  0  0   1   1   0   0   1   0   0
B11  0  0  0   1   1   0   0   0   0   0
B12  0  0  0   1   1   0   0   1   0   0
B14  0  0  0   1   1   0   0   1   0   0
B15  0  0  0   1   1   0   0   0   0   0
B16  0  0  0   1   1   0   0   0   0   0
B17  1  0  0   1   1   0   0   0   0   0
B18  0  0  0   1   1   0   0   1   0   0
B21  0  0  0   1   1   0   0   1   0   0
B25  1  0  0   1   1   0   0   1   0   0
```

```
        long_length(nasa[,1])
        larg_length(nasa[1,])
        tota_long*larg
cat("\n nombre de souches :\t")
print(long)
print(etiq)
```

```
 nombre de souches : [1] 72
 [1] "B2"  "B4"  "B5"  "B7"  "B8"  "B10" "B11" "B12" "B14" "B15" "B16" "B17"
[13] "B18" "B21" "B25" "B26" "B27" "B29" "T32" "T33" "T34" "T35" "T39" "B9"
[25] "B19" "T37" "T42" "T43" "T44" "T45" "T46" "T47" "T69" "T70" "R50" "R51"
[37] "R53" "R56" "R58" "B13" "T41" "R52" "R55" "H1"  "H2"  "H3"  "H4"  "H5"
[49] "H6"  "H7"  "H8"  "H9"  "H10" "B20" "B30" "T40" "T38" "R59" "B60" "B61"
[61] "B62" "B64" "B65" "R54" "B63" "B67" "T36" "B72" "B75" "B76" "B77" "B78"
```

```
cat("\n nombre de caracteres :\t")
print(larg)
print(carac)
```

```
 nombre de caracteres : [1] 31
 [1] "C4"  "C5"  "C6"  "C10" "C12" "C13" "C18" "C21" "C22" "C23" "C24" "C25"
[13] "C26" "C27" "C28" "C30" "C31" "C32" "C33" "C34" "C35" "C36" "C37" "C39"
[25] "C40" "E3"  "E4"  "E7"  "E8"  "E10" "E11"
```

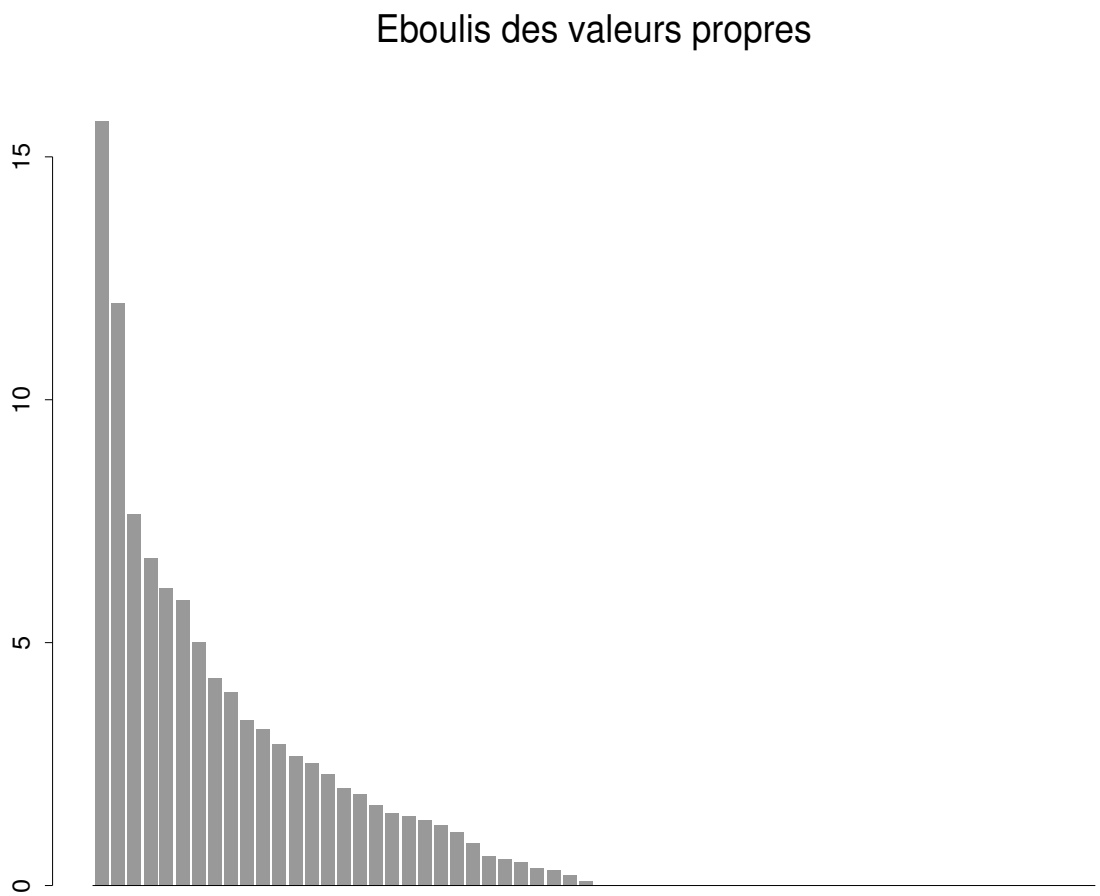
Décomposition en matrice indicatrice

```
        nasa.Z_matind((nasa+1))
cat("\n matrice des indicatrices :\n")
        print(nasa.Z[1:15,1:10])
```

```
 matrice des indicatrices :
    C41 C42 C51 C52 C61 C62 C101 C102 C121 C122
 B2   1   0   1   0   1   0    0    1    0    1
 B4   1   0   1   0   1   0    0    1    0    1
 B5   1   0   1   0   1   0    0    1    0    1
 B7   1   0   1   0   1   0    0    1    0    1
 B8   1   0   1   0   1   0    0    1    0    1
B10   1   0   1   0   1   0    0    1    0    1
B11   1   0   1   0   1   0    0    1    0    1
B12   1   0   1   0   1   0    0    1    0    1
B14   1   0   1   0   1   0    0    1    0    1
B15   1   0   1   0   1   0    0    1    0    1
B16   1   0   1   0   1   0    0    1    0    1
B17   0   1   1   0   1   0    0    1    0    1
B18   1   0   1   0   1   0    0    1    0    1
B21   1   0   1   0   1   0    0    1    0    1
B25   0   1   1   0   1   0    0    1    0    1
```

AFC sur tableau d'indicatrice (.z)

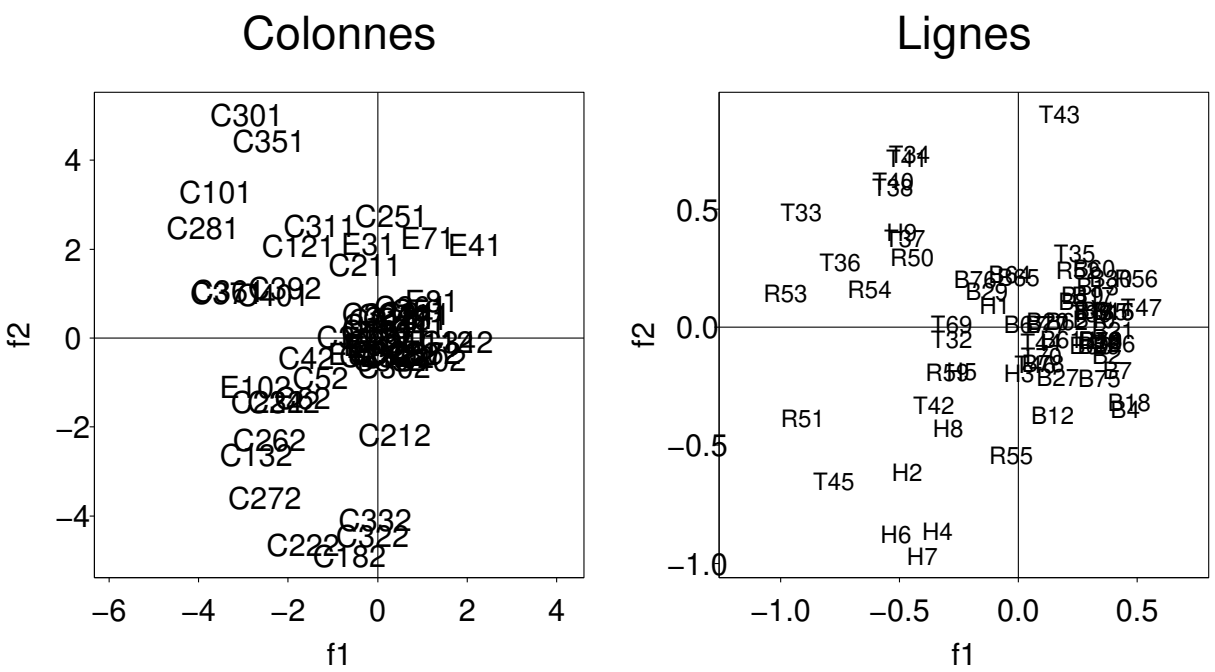
```
res_afc(nasa.Z)      Inertie totale:  1
eboulis(res)
```




```
print(prexpl(res))
```

```
Pourcentage de inertie expliquee
            f1 f2 f3 f4 f5 tot
inertie exp 16 12  8  7  6  48
inertie cum 16 28 35 42 48  48
```

```
biplot(res)
```


Colonnes
Lignes
f1
f2
C301
C351
C101
C281
C311
C251
C121
E31
E71
E41
C211
C212
C262
C132
C272
C332
C322
C182
C52
T43
T33
T36
R50
R53
R54
T35
T69
T32
R51
T42
H8
B12
B4
R55
T45
H2
H6
H4
H7

```
print(res$cmpr[1:20,1:6])
```

```
            f1          f2           f3           f4          f5           f6
 B2  0.3719532 -0.11672491  0.039806767 -0.158104646  0.26919734 -0.055523139
 B4  0.4494255 -0.34541984  0.163194527 -0.049216190  0.23904087 -0.181740623
 B5  0.3989282  0.06801024 -0.044306776 -0.182097090 -0.03402045 -0.052807389
 B7  0.4164522 -0.18013446  0.152169289 -0.167273243  0.15307922 -0.082554744
 B8  0.2314296  0.11262520  0.101350567 -0.003533524 -0.25980485  0.117267771
B10  0.3191939  0.03526559  0.438786824  0.256636876  0.04120525  0.153377355
B11  0.3243586  0.07124845  0.028772398 -0.113537300 -0.15596669  0.015230428
B12  0.1454707 -0.37359513  0.306722518 -0.128725052 -0.03955731 -0.061947611
B14  0.3454898 -0.05197019  0.091356617 -0.153007402 -0.10553505 -0.007237367
B15  0.3989282  0.06801024 -0.044306776 -0.182097090 -0.03402045 -0.052807389
B16  0.3989282  0.06801024 -0.044306776 -0.182097090 -0.03402045 -0.052807389
B17  0.3164525  0.13499117 -0.323797534 -0.247804083 -0.19397572 -0.638808794
B18  0.4689952 -0.31600255  0.053055486 -0.326760346  0.53644328 -0.167163106
B21  0.4004325 -0.01362730  0.128245116 -0.071975772 -0.02521915  0.015022112
B25  0.3397808 -0.07773270 -0.142814488 -0.166186588  0.02288675 -0.125018918
B26  0.4040930 -0.06621840 -0.045517174 -0.043535963  0.11771361 -0.041403807
B27  0.1672833 -0.21049915  0.004524961 -0.038301738 -0.11873491 -0.020707238
B29 -0.1301485  0.15592718 -0.658033385  0.154908298 -0.25581887 -0.252929735
T32 -0.2780770 -0.05022512 -0.318059647 -0.119044303  0.01433910  0.005798797
T33 -0.9117838  0.48688779  0.444013037 -0.093686108  0.35583654 -0.216898218
```

Classification

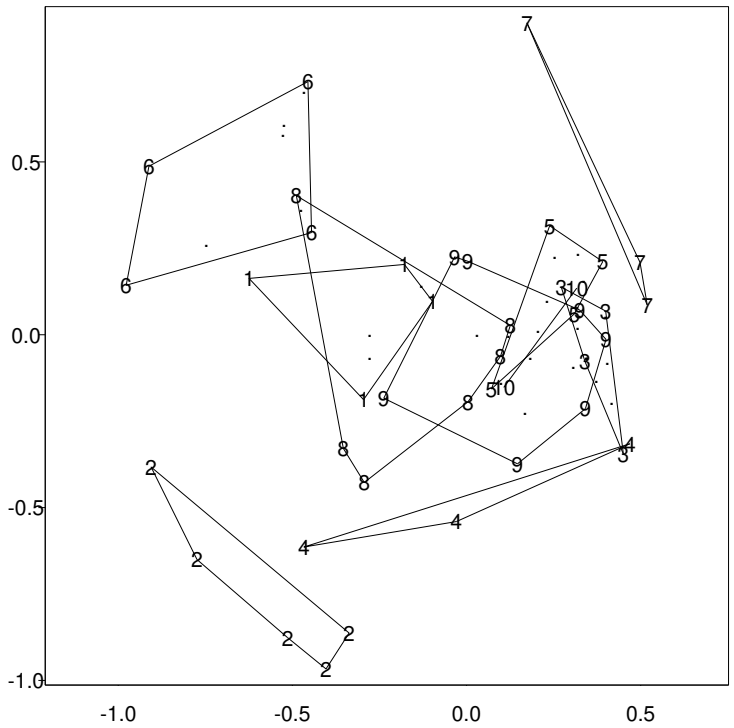
La classification automatique sera abordée de plusieurs façons :

1. À partir des composantes des individus obtenues après l'AFC sur le tableau des indicatrices,
   - classification type nuées dynamiques,
   - classification hiérarchique (critère de Ward).

   Ensuite possibilité d'effectuer une classification mixte,
   - classification hiérarchique puis nuées dynamiques.
2. À partir d'un tableau de distance entre individus. Ici, cette distance n'est pas euclidienne, elle s'obtient comme complément à 1 de l'indice de similarité de Jaccard.

Classification non hiérarchique, nuées dynamiques

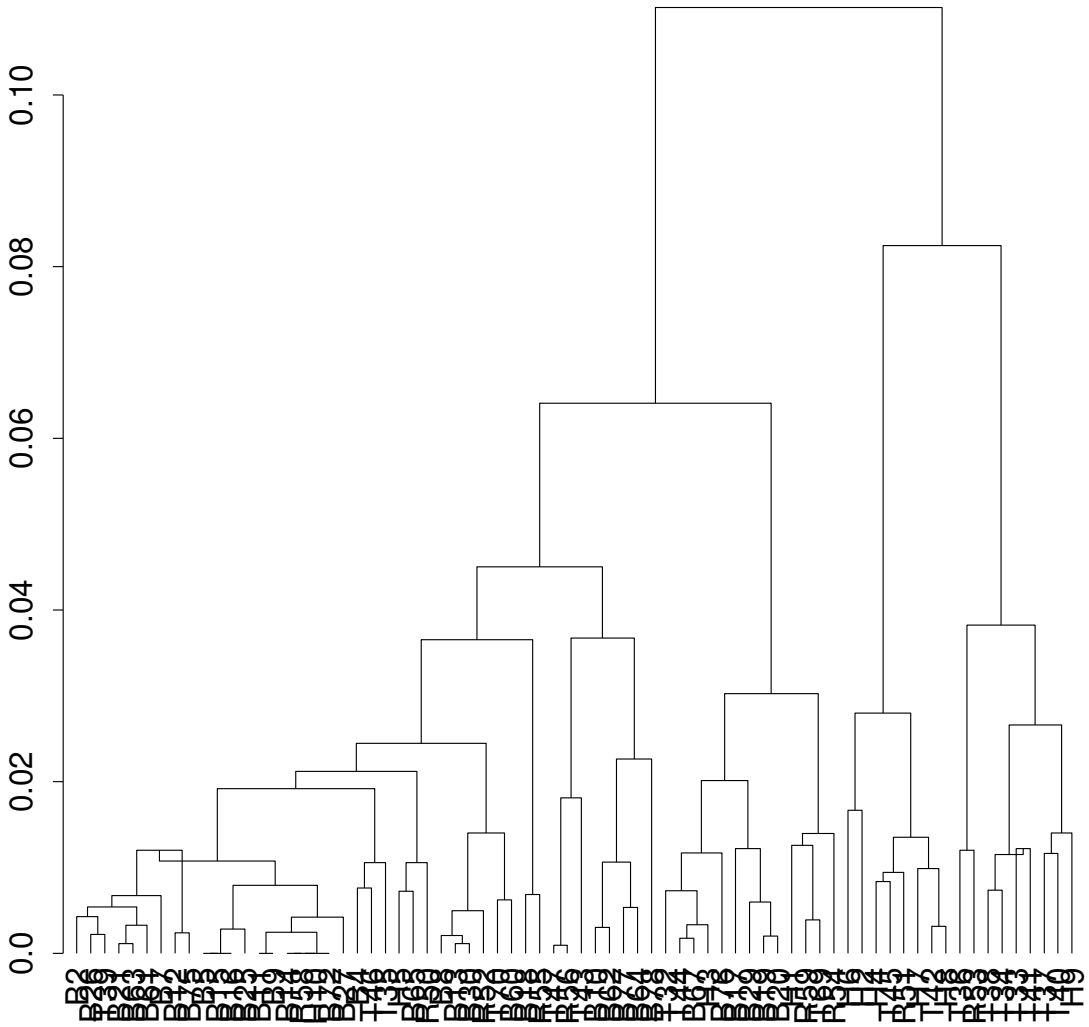
```
#    k classes demandees :
     k <- 10     #par exemple
#  res3_rkmeans(res$cmpr,k)                # au hasard
   res3_kmeans(res$cmpr,centers=rbind(res$cmpr[1:5,],
               res$cmpr[21:25,]))
   p3_res3$cluster
   plotcl(res$cmpr[,1:2],p3)
```



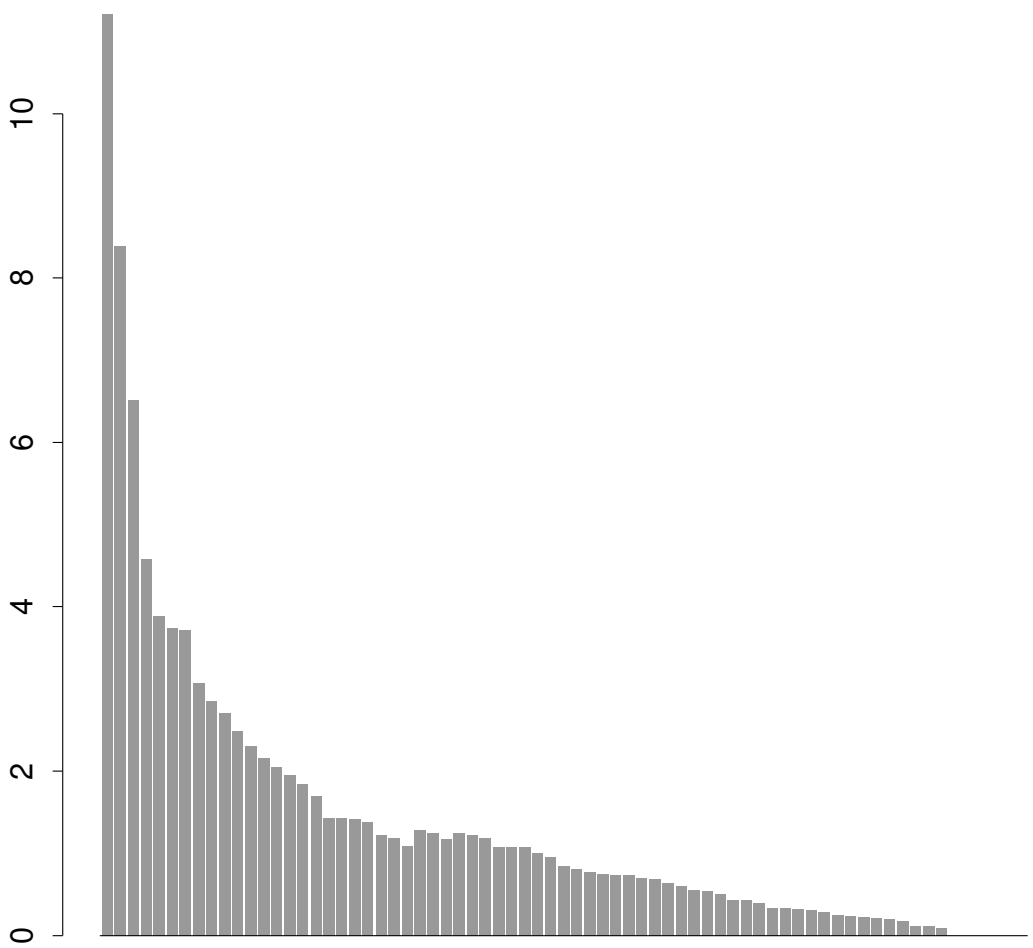

```
     cat("\n repartion des souches dans les groupes : \n")
     print(p3)

 repartion des souches dans les groupes :
 [1] 3  3  3  3  5  9  9  9  9  3  3 10  4  9  3  3  9  8  1  6  6  5  5  9  3
[26] 8  8  7  8  2  5  7  1  5  6  2  6  7  9  5  6  5  4  1  4  8  2  9  2  2
[51] 8  8  9  8  5  6  6  1  5  9  9  9  9  1  9  8  6  9  9  1  9 10

     cat("\n inertie inter apres classification non hierarchique, \n")
     cat("              noyaux tires au sort :  \t")
     print(interx(res$cmpr,p3))

 inertie inter apres classification non hierarchique,
             noyaux tires au sort :   [1] 0.4699885
```

Classification hiérarchique ascendante après une AFC

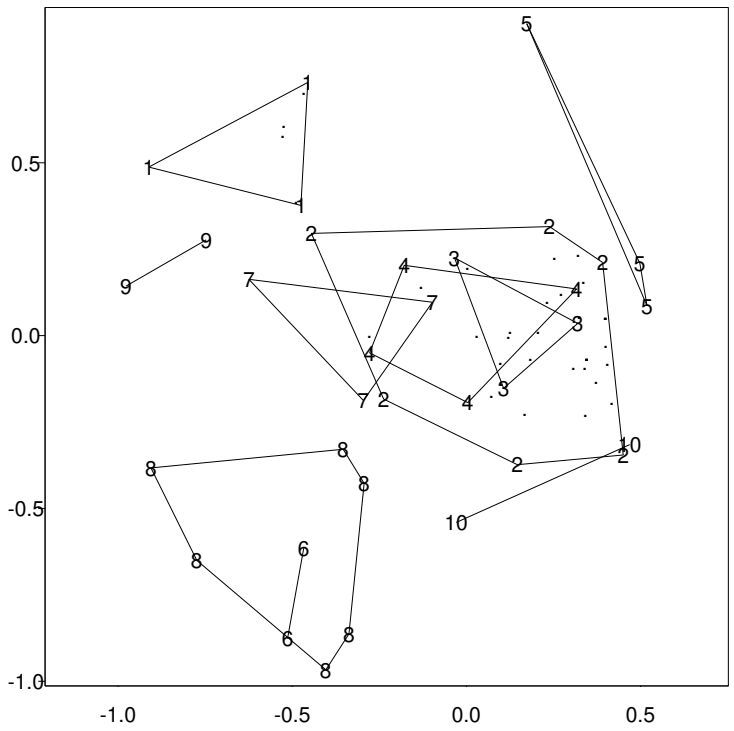
```
dista_dist(res$cmpr) # distance euclidienne arpenteur
hcz_cahd(dista)      # sur le resultat d une AFC
                     # critere du saut de ward

#     construction de l arbre :

      graph_plclust(hcz, hang=-1,plot = F)
      plclust(hcz, hang=-1, label = F)
      labclust(graph, label = etiq)
```



```
scan()
eboulis(hcz)
```



```
    scan()
    cat("\n repartition en k groupes et inertie inter \n")
    po.hcz_cutree(hcz,k)
    cat("\n inertie inter apres cah / ward apres AFC :\t")
    print(interx(res$cmpr,po.hcz))

 inertie inter apres cah / ward apres AFC : [1] 0.4713956

    plotcl(res$cmpr[,1:2],po.hcz)
```



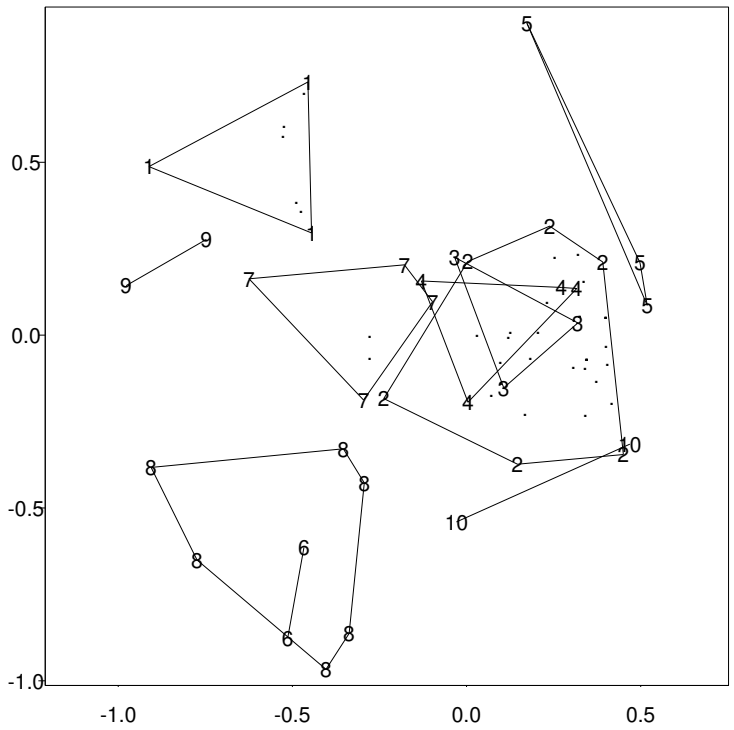

```
    scan()
    cat("\n repartion des souches dans les groupes : \n")
    print(po.hcz)

 repartion des souches dans les groupes :
 [1] 2  2  2  2  2  3  2  2  2  2  2  4 10  2  2  2  2  4  4  1  1  2  2  2  4
[26] 1  8  5  4  8  2  5  7  2  2  8  9  5  2  2  1  2 10  7  6  4  8  2  6  8
[51] 8  1  2  4  2  1  1  7  2  2  3  3  2  7  2  4  9  2  2  4  3  3

attr(, "height"):
 [1] 0.026579937 0.024464628 0.022651687 0.020092169 0.018102579 0.016661802
 [7] 0.013909425 0.013473909 0.011987222 0.006799995
```

Classification mixte hiérarchique ascendante puis nuées dynamiques avec les pôles initiaux les centres de gravité obtenus en CAH

```
cntr1 <- gravc(res$cmpr, po.hcz)
res1_kmeans(res$cmpr,cntr1)
p1.hcz_res1$cluster

cat("\n inertie inter apres mixte : kmeans / AFC :\t")
print(interx(res$cmpr,p1.hcz))
```

```
 inertie inter apres mixte : kmeans / AFC : [1] 0.4789649
```

```
plotcl(res$cmpr[,1:2],p1.hcz)
```

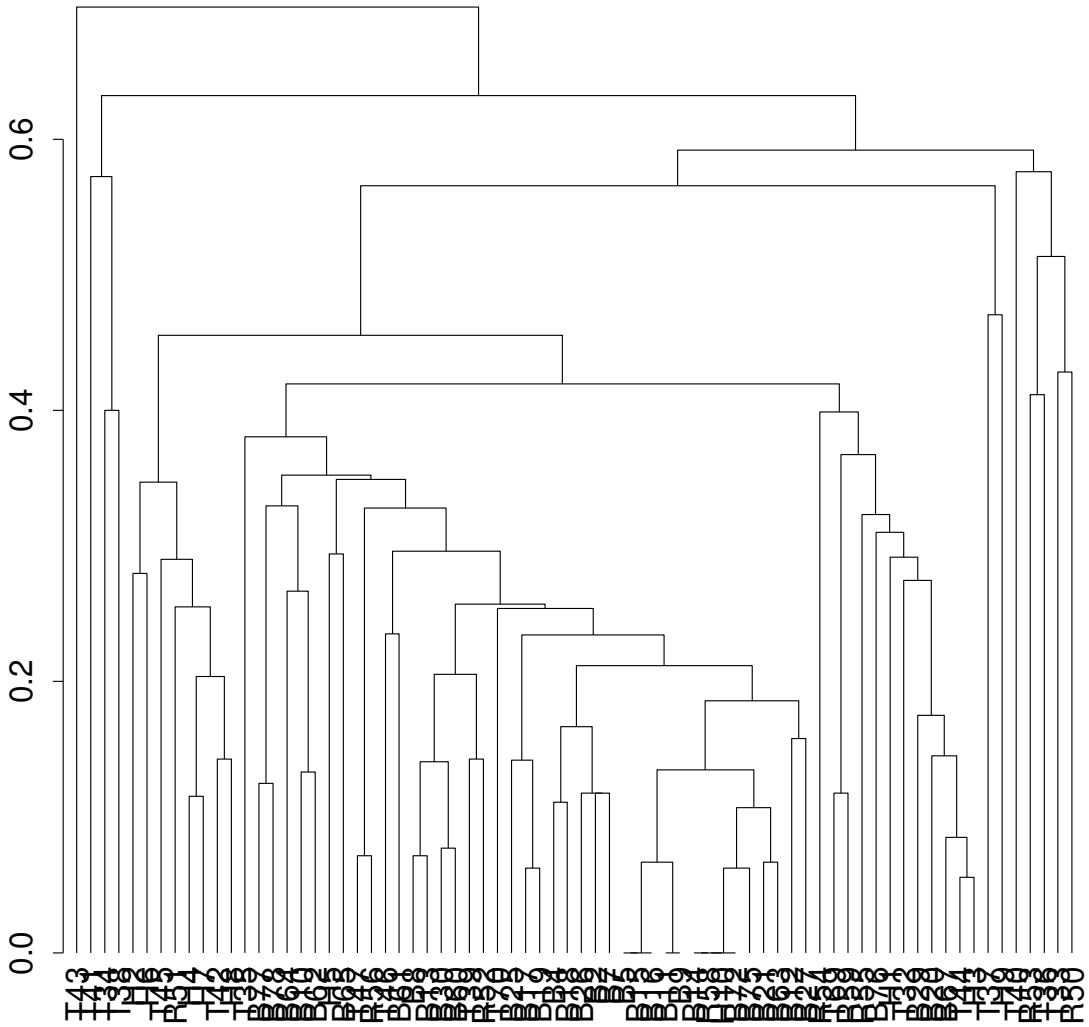



```
scan()
cat("\n repartion des souches dans les groupes : \n")
print(p1.hcz)
```

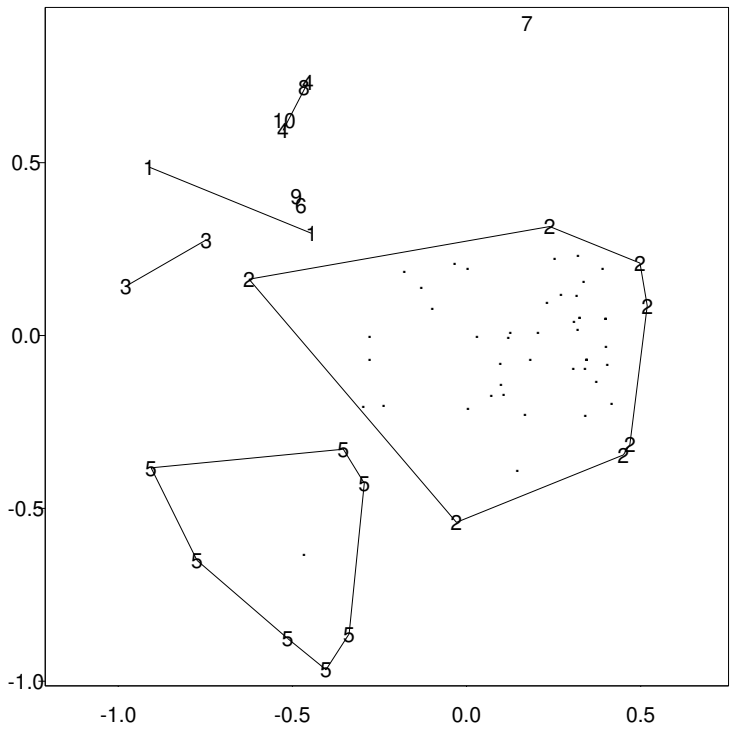
```
 repartion des souches dans les groupes :
 [1] 2  2  2  2  2  3  2  2  2  2  2  4 10  2  2  2  2  4  7  1  1  2  2  2  4
[26] 1  8  5  4  8  2  5  7  2  1  8  9  5  2  2  1  2 10  7  6  4  8  2  6  8
[51] 8  1  2  4  2  1  1  7  2  2  3  3  2  7  2  4  9  2  2  7  3  3
```

Méthode des bactériologistes, indice de Jaccard

```
disnasa <- dist(nasa, metric = "binary")        # 1-indice de jaccard
arbnasa <- hclust(disnasa, method = "average")  # saut moyen

#     construction de l arbre :

graph <- plclust(arbnasa, hang=-1,plot = F)
plclust(arbnasa, hang=-1, label = F)
labclust(graph, label = etiq)
```



```
     scan()
#    repartition en k groupes :
     po_cutree(arbnasa,k)
     cat("\n inertie inter avec la methodes des bacteriologistes :\t")
     print(interx(res$cmpr,po))

 inertie inter avec la methodes des bacteriologistes : [1] 0.3444748

     plotcl(res$cmpr[,1:2],po)
```




```
     scan()
     cat("\n repartion des souches dans les groupes : \n ")
     print(po)

 repartion des souches dans les groupes :
 [1] 2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  2  1  4  2  2  2  2
[26] 6  5  7  2  5  2  2  2  2  1  5  3  2  2  2  8  2  2  2  5  2  5  2  5  5
[51] 5  9  2  2  2 10  4  2  2  2  2  2  2  2  2  2  3  2  2  2  2  2

attr(, "height"):

 [1] 0.4285714 0.4197177 0.4117647 0.4000000 0.3469404 0.0000000 0.0000000
 [8] 0.0000000 0.0000000 0.0000000
```