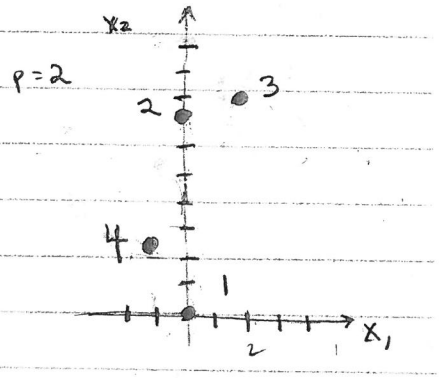
A dendrogram shows the mergers which have been made at each successive level.



Ex: n=4

(i) Single Linkage

$$D = \{d_{ik}\} = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & & & \\ 7 & 0 & & \\ 8 & 2 & 0 & \\ 3 & 5 & 6 & 0 \end{bmatrix} \end{array}$$

↑ Just use approximate values here for simplicity.

$\min_{i,k} d_{ik} = 2$

Objects 2 and 3 form the cluster (23).

Cluster Distances

$d_{(23)1} = \min\{d_{21}, d_{31}\} = 7$

$d_{(23)4} = \min\{d_{24}, d_{34}\} = 5$

Delete the row and column for objects 2 and 3 and add a row and column for cluster (23).

$$\begin{array}{c} \\ (23) \\ 1 \\ 4 \end{array} \begin{array}{c} \begin{array}{ccc} (23) & 1 & 4 \end{array} \\ \begin{bmatrix} 0 & & \\ 7 & 0 & \\ 5 & 3 & 0 \end{bmatrix} \end{array}$$

min distance in above matrix = 3

Merge objects 1 and 4 to form the cluster (14).

```
> TX <-  c(0, 0,
+          0, 7,
+          2, 8,
+         -1, 2.5)
>
> X <- matrix(data=TX,ncol=2,byrow=TRUE)
>
> library(ecodist) # assumes package ecodist is installed
>
> # Distances
> de <- distance(X, method = "euclidean")
> dm <- distance(X, method = "mahalanobis")
> d <- de
> d
         1        2        3
2 7.000000
3 8.246211 2.236068
4 2.692582 4.609772 6.264982
>
> # Peform cluster analysis
> fit <- hclust(d, method="single")
>
> # Display dendogram
> plot(fit)
> groups <- cutree(fit, k=2)
> groups
[1] 1 2 2 1
> #rect.hclust(fit,k=2,border="red")
> #rect.hclust(fit,h=3,border="blue")
```