| | |
|---|---|
| /INCD | Computes the inter-cluster distances. The result is stored in the current data folder in the wave M_InterClusterDistance, a 2D wave in which the [*i*][*j*] element contains the distance between cluster *i* and cluster *j*. |
| /MAXC=*nClusters* | Terminates the calculation when the number of clusters reaches the specified value. Note that this termination condition is sufficient but not necessary, i.e., the operation can terminate earlier if the farthest distance of an element from a hub is less than the average distance. |
| /MAXR=*maxRad* | Terminates the calculation when the maximum distance is less than or equal to *maxRad*. |
| /NOR | Normalizes the data on a column by column basis. The normalization makes each columns of the input span the range [0,1] so that even when *srcWave* contains columns that may be different by several orders of magnitude, the algorithm is not biased by a larger implied cartesian distance. |
| /Q | Don't print information to the history area. |
| /SHUB=*sHub* | Specifies the row which is used as a starting hub number. By default the operation uses the first row in *srcWave*. |
| /Z | No error reporting. |

**Details**

The input for FPClustering is a 2D wave *srcWave* which consists of M rows by N columns where each row represents a point in N-dimensional space. *srcWave* can contain only finite real numbers and must be of type SP or DP. The operation computes the clustering and produces the wave W_FPCenterIndex which contains the centers or "hubs" of the clusters. The hubs are specified by the zero-based row number in *srcWave* which contains the cluster center. In addition, the operation creates the wave W_FPClusterIndex where each entry maps the corresponding input point to a cluster index. By default, the operation continues to add clusters as long as the largest possible distance is greater than the average intercluster distance. You can also stop the processing when the operation has formed a specified number of clusters (see /MAXC).

The variable V_max contains the maximum distance between any element and its cluster hub.

It is possible that in some circumstances you can get slightly different clustering depending on your starting point. The default starting hub is row zero of *srcWave* but you can use the /SHUB flag to specify a different starting point.

FPClustering computes the Cartesian distance between points. As a result, if the scale of any dimension is significantly larger than other dimensions it might bias the clustering towards that dimension. To avoid this situation you can use the /NOR flag which normalizes each column to the range [0,1] and hence equalizes the weight of each dimension in the clustering process.

**See Also**

The **KMeans** operation.

**References**

Gonzalez, T., Clustering to minimize the maximum intercluster distance, *Theoretical Computer Science*, *38*, 293-306, 1985.

# fprintf

**fprintf *refNum*, *formatStr* [, *parameter*]…**

The fprintf operation prints formatted output to a text file.

**Parameters**

*refNum* is a file reference number from the **Open** operation used to open the file.

*formatStr* is the format string, as used by the **printf** operation.

*parameter* varies depending on *formatStr*.

**Details**

If *refNum* is 1, fprintf will print to the history area instead of to a file, as if you used printf instead of fprintf. This useful for debugging purposes.