Algorithm S1: Spatial Clustering Methods  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Compute the mean vent location of the full set

If

Return

Return

Otherwise

Determine maximum number of clusters to consider

Initialize , , ,

Do n🡨n-1

Find the two nearest clusters

Merge the two nearest clusters

If

Else

Determine the major and minor axes of the distribution of the merged vents

Compute the axis ratio

If or

Otherwise

End

End

Remove jth cluster from the full set

If

Compute Davis-Bouldin Index

If

End

End

End

End

Where:

= total # of vents in the full set

= Minimum distance threshold to consider multiple events

K = user defined absolute maximum number of events to consider

= denotes Euclidean Distance

= denotes an event cluster based on the vent locations in v, modeled by the mean position

= denotes an event cluster based on the vent locations in v, modeled by the line segment of length L, centered at , and orientated by angle

= denotes an integral along the modeled line segment of a cluster

= number of vents associated to the kth cluster