Algorithm for clustering using customer pair wise fit function

Step1: Input the number of customer to consider (i=1,2...N)
Step 2: Input the number of dimensions to consider (j=1,2,...M)
Step 3: Input tolerance value t_j for each dimension j
Step 4: Input measurement of each customer for each dimension
Step 5: Input number of clusters (C)to consider $\alpha = 1,2 \dots C$
Step 6: Form the customer pair-wise matrix using ω_{ikj} as a binary state of fit between ideal customer $'i'$ and $'k'$ for dimension $'j'$

$$\omega_{ikj} = \begin{cases} 1, if \ |x_{ij} - x_{kj}| \leq t_j \\ 0, \quad Otherwise \end{cases} \qquad (1.0)$$

Where x_{ij} and x_{kj} are measurements of customers i and k for dimension j
Step 7: Let B_{ik} be expressed as its binary vector such that:

$$B_{ik} = \begin{bmatrix} \omega_{ik1} \\ \omega_{ik2} \\ \omega_{ik3} \\ \vdots \\ \vdots \\ \\ \omega_{ikm} \end{bmatrix} \qquad (2.0)$$

The scalar expression of fit between any pair of customers $'i'$ and $'k'$ may be defined as

$$r_{ik} = \left[\frac{({B_{ik}}^T)B_{ik}}{({B_{ii}}^T)B_{ii}}\right] \qquad (3.0)$$

${B_{ik}}^T$: is the transpose of B_{ik} and B_{ii} is theoretically the identity of a customer compared to himself.

Step 8 : Determine relation index of i : $R_i = \sum_{k=1}^{N} r_{ik} \qquad for\ i \neq k$ (4.0)

Step 9: Procedure for clustering: This solution procedure iterates on a set of customers denoted as set S. S is initially set as a sorted list of customers in descending order of R_i In the process of iteration, a customer is considered ideal if it has the maximum R_i in set S
and not in any of the existing cluster α.

(a) Update set S and set $\alpha = \alpha + 1$
(b) Set customer i with maximum relation index R_i as ideal customer for cluster α . For two or more possible customers with equal maximum R_i , randomly select one.
(c) For $i \neq k$, find maximum value of r_{ik} $(say\ r_{ik} = 1)$, assign all customer k with $max\ (r_{ik})$ into cluster α

Compute percentage degree of fit for cluster α : $h_\alpha = \frac{\sum_{k=1}^{n_\alpha} 100 r_{ik}}{n_\alpha}$ while n_α is the number of customers assigned to cluster α

(d) Compute aggregate loss index of fit for cluster $\alpha + 1$:

$Aggregate\ loss\ index = \sqrt{\frac{(\sum_{k=1}^{n_\alpha}\sum_{j=1}^{m}(x_{ij} - x_{kj})^2)}{n_\alpha}}$ while n_α is the number of customers assigned to cluster α

(e) Eliminate i and k in α from set S.
(f) If $\alpha = C - 1,$ assign all unassigned customers to cluster C and End, else go to step $(9b)$