Rank Order Clustering Method

Step 1: Order rows: Assign value $2^{(N-k)}$ to column k. Evaluate each row. Sort rows in non-increasing order. If rows were previously ordered, and no change just occurred, stop; otherwise go to step 2.

Step 2: Order columns: Assign value $2^{(M-k)}$ to row k. Evaluate each column. Sort columns in non-increasing order. If no change, stop; otherwise go to step 1.

Example: Consider the N=9 parts and M=8 machines problem shown as follows. Find optimal part-machine grouping solution using ROC algorithm.

Parts

Machines	1	2	3	4	5	6	7	8	9
1			1				1		1
2	1			1	1				
3			1				1		1
4	1			1	1				
5	1			1	1				
6		1				1		1	
7			1				1		1
8		1				1		1	

Here we have parts and machines numbered from 1 to 9.

We are trying to find the optimal grouping. 1 means that certain parts need to be processed at that certain machine.

Iteration no.1 - Step 1: Row ordering

69 = 2^0*1+2^1*0.....

We make row calculations to find the binary value, using the values and the 1 values. You can see an example above.

Then we rank those binary values starting from the highest value.

	1	2	3	4	5	6	7	8	9	Binary Value	Rank
1	0	0	1	0	0	0	1	0	1	69	6
2	1	0	0	1	1	0	0	0	0	304	1
3	0	0	1	0	0	0	1	0	1	69	7
4	1	0	0	1	1	0	0	0	0	304	2
5	1	0	0	1	1	0	0	0	0	304	3
6	0	1	0	0	0	1	0	1	0	138	4
7	0	0	1	0	0	0	1	0	1	69	8
8	0	1	0	0	0	1	0	1	0	138	5
Value	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0		

Iteration no.1 - Step 2: Column ordering

Using those ranks, we change the order for the row. Than we make the same calculations for the column values.

	1	2	3	4	5	6	7	8	9	Value
2	1			1	1					2^7
4	1			1	1					2^6
5	1			1	1					2^5
6		1				1		1		2^4
8		1				1		1		2^3
1			1				1		1	2^2
3			1				1		1	2^1
7			1				1		1	2^0
Binary Value	224	24	7	224	224	24	7	24	7	
Rank	1	4	7	2	3	5	8	6	9	

Iteration no.2 - Step 1: Row ordering

Then again, for the row values.

	1	4	5	2	6	8	3	7	9	Binary Value	Rank
2	1	1	1							448	1
4	1	1	1							448	2
5	1	1	1							448	3
6				1	1	1				56	4
8				1	1	1				56	5
1							1	1	1	7	6
3							1	1	1	7	7
7							1	1	1	7	8
Value	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0		

Diagonal Block Solution

This is the result of the part-machine grouping.

	1	4	5	2	6	8	3	7	9
2	1	1	1						
4	1	1	1						
5	1	1	1						
6				1	1	1			
8				1	1	1			
1							1	1	1
3							1	1	1
7							1	1	1