

Problem EVOP-1

Goal: Determine optimum conversion using Evolutionary Operations Technique

Given: Reactor Conversion as function of Temperature & Feed Concentration

$$\text{Conversion} = 84 + T + C + 0.4 T \cdot C + T^2/4 + C^2/4$$

Assume: without random measurement error
Starting Point: T = 6, C = 1; step sizes of 1

Approach: Set up initial EVOP Simplex
evaluate each point, rank & discard lowest
EVOP move & repeat

Calculations:

Initial Search	Step	T	C	CON	
	1	6	1	84.15	2 nd discard
Initial Simplex	2	7	1	82.3	lowest 1 st discard
	3	6.5	2	86.1375	best 3 rd discard
EVOP move 1	4	5.5	2	87.3375	4 th discard
	5	6	3	88.95	5 th discard
	6	5	3	89.5	6 th discard
	7	5.5	4	90.7375	8 th discard
	8	4.5	4	90.6375	7 th discard
	9	5	5	91.5	9 th discard
	10	6	5	91.75	10 th discard
	11	5.5	6	92.1375	11 th discard
	12	6.5	6	92.5375	12 th discard
	13	6	7	92.55	13 th discard
	14	7	7	93.1	15 th discard
	15	6.5	8	92.7375	14 th discard
	16	7.5	8	93.4375	17 th discard
	17	8	7	93.15	16 th discard
Simplex 19	18	8.5	8	93.6375	2 nd worst 19 th discard
	19	8	9	93.55	18 th discard
Simplex 21, 22	20	9	9	93.9	
Simplex 20	21	9.5	8	93.3375	new point is worst, alt. move discard 2 nd worst; later 20 th discard
	Just flip-flopping now, so go back and reject second worst point				
Simplex 21	22	10	9	93.75	21 st discard
Simplex 21, 22	23	9.5	10	93.9375	
Simplex 22	24	8.5	10	93.4375	new point is worst, alt. move discard 2 nd worst
	25	9	11	93.1	new point is worst
	Just flip-flopping now, so go back to Simplex 21 and reject second worst point				
Sequence 2	20	9	9	93.9	22 nd discard 2 nd worst
Simplex 24 22	22	10	9	93.75	24 th discard
Simplex 24, 25 23	23	9.5	10	93.9375	
Simplex 24, 25, 26	26	10.5	10	93.9375	
Simplex 25, 26	27	10	11	93.75	If this is rejected it will just flip again, so reject second worst point
Simplex 26	28	11	11	93.9	If this is rejected it will just flip again, so reject second worst point
	29	11.5	10	93.4375	new point is worst

Answer a.) Note: marching around symmetric high points (9.5, 10) and (10.5, 10) at 93.9375
and symmetric 2nd highest points (9, 9) and (11, 11) at 93.9000
and symmetric 3rd highest points (10, 9) and (10, 11) at 93.7500

Bracket 3	23	9.5	10	93.9375
	22	10	9	93.75
	26	10.5	10	93.9375
	27	10	11	93.75
	23	9.5	10	93.9375

So now is the time to give in and admit that I can't get to the maximum, but my high value of 93.9375 appears at two points, (10.5, 10) and (9.5, 10), so in an effort to get a single point I am going to calculate between those points at (10, 10)

best value)	30	10	10	94 ←	This is the best value
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True Optimum

Discussion:

EVOP-1 Reaction Conversion Maximization

