

IAM566 Numerical Optimization

Computer Assignment 2

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1 Numerical Results

Table 1: Numerical results for Algorithm-1 with different initial values (tol=1e-6)

x_0	λ_0	s_0	x	Num. of iterations
[29, 1, 10, 1]	[-0.5, -0.5]	[0.5, 2, 0.5, 0.5]	[30, 0, 10, 0]	13
[29, 1, 10, 1]	[-1, -1]	[2, 3, 1, 1]	[30, 0, 10, 0]	14
[1, 1, 38, 57]	[-1, -1]	[2, 3, 1, 1]	[30, 0, 10, 0]	15
[1, 10, 29, 48]	[-1, -10]	[20, 12, 1, 10]	[30, 0, 10, 0]	17
[10, 1, 29, 39]	[-1, -10]	[20, 12, 1, 10]	[30, 0, 10, 0]	16
[0.5, 30, 0.4, 20]	[-10, -10]	[29, 21, 10, 10]	[30, 0, 10, 0]	17
[0.5, 30, 0.4, 20]	[-1, -100]	[200, 102, 1, 100]	[30, 0, 10, 0]	19
[10, 10, 20, 20]	[-10, -10]	[1, 1, 10, 10]	[10, 30, 0, 0]	16

Table 2: Numerical results for Algorithm-2 with different initial values (tol=1e-6)

x_0	λ_0	s_0	x	Num. of iterations
[29, 1, 10, 1]	[-0.5, -0.5]	[0.5, 2, 0.5, 0.5]	[30, 0, 10, 0]	4
[29, 1, 10, 1]	[-1, -1]	[2, 3, 1, 1]	[30, 0, 10, 0]	4
[1, 1, 38, 57]	[-1, -1]	[2, 3, 1, 1]	[30, 0, 10, 0]	6
[1, 10, 29, 48]	[-1, -10]	[20, 12, 1, 10]	[30, 0, 10, 0]	6
[10, 1, 29, 39]	[-1, -10]	[20, 12, 1, 10]	[30, 0, 10, 0]	5
[0.5, 30, 0.5, 20]	[-10, -10]	[29, 21, 10, 10]	[30, 0, 10, 0]	8
[0.5, 30, 0.4, 20]	[-1, -100]	[200, 102, 1, 100]	[30, 0, 10, 0]	10
[10, 10, 20, 20]	[-10, -10]	[1, 1, 10, 10]	[30, 0, 10, 0]	5

Table 3: Numerical results for *linprog* with different initial values (tol=1e-6)

x_0	λ_0	s_0	x	Num. of iterations
-	-	-	[30, 0, 0, 0]	4

2 Comments

Note that in Table 1 and Table 2, all rows except the last one are feasible initial values.

In general, we see that Algorithm 2 takes shorter time to reach to the minimum that satisfies the conditions, compared to Algorithm 1.

However, further away from the minimum (where $c^T x = -30$ and $x^* = [30, 0, \cdot, \cdot]^T$), we also observe that the number of iterations increase for both of the algorithms.

For the infeasible case (last rows in Table 1 and 2), Algorithm 2 (Mehrotra) manages to reach to the minimum (we get $c^T x = -30$), while Algorithm 1 (Primal-Dual) can not (we get $c^T x = 20$).

As for the results from Matlab built-in function *linprog*, my version (2016a) did not have the option to provide the initial point (It gave me "The interior-point algorithm uses a built-in starting point; ignoring supplied X0."). Hence, I could not try the values in Table 1 and 2 for Table 3. By using its own initial value assignment, it was able to reach to the minimum in 4 iterations, which is close to Algorithm 2 (Mehrotra) run by hand provided values.