dempe_dutta_2_2

This classic example from Dempe and Dutta's 2012 paper [1, Example 2.2] demonstrates that the KKT-reformulation of a bilevel program may not have a global optimal solution even if its feasible set is not empty and bounded.

$$
\begin{aligned}
\underset{x,\ y_1^*, y_2^*}{\text{minimise}} \quad & x \\
\text{subject to} \quad & x \geq 0 \\
& y_1^*, y_2^* \in \underset{y_1, y_2}{\arg\min} \left\{ \begin{array}{ll} y_1 \\ \text{s.t.} & y_1^2 - y_2 \leq x \\ & y_1^2 + y_2 \leq 0 \end{array} \right.
\end{aligned}
$$

			Dimension	Type
Upper-level	x	variables	1	real
	F(x,y)	objective	1	linear
	G(x,y)	inequality	1	linear
	H(x,y)	equality	0	none
Lower-level	y	variables	2	real
	f(x,y)	objective	1	linear
	g(x,y)	inequality	2	quadratic
	h(x,y)	equality	0	none

References

[1] Stephan Dempe and Joydeep Dutta. Is bilevel programming a special case of a mathematical program with complementarity constraints? *Mathematical Programming*, 131:37–48, 2012.